

Material Aspirations, Cultural Change, and the Transition towards Sustained Growth*

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Abstract

This study highlights the role of economic materialism, i.e., the set of values and personality traits that prioritise the pursuit of material goals, as a cultural phenomenon of significance in relation to economic transformation and development. It presents a model in which, by inducing material aspirations, an endogenous cultural change towards more widespread adherence to materialistic values is both a cause and an effect of productivity growth. This cultural-economic complementarity is a powerful mechanism of endogenous productivity growth; it also determines the prevalence of different cultural values *vis-à-vis* the prominence of material objectives. From a historical perspective, the model draws attention to a novel mechanism through which the Protestant Reformation may have contributed to the take-off towards sustained economic growth. It also investigates the role of consumption-focused reforms, such as sumptuary laws, in determining the timing of this take-off.

Keywords: Aspirations; Cultural transmission; Economic growth; Economic materialism; Productivity

JEL Classification: D11; O1; O41; Z1

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1 Introduction

In recent years, a growing body of literature incorporates elements of cultural change to investigate issues pertaining to economic growth and comparative economic development.¹ This literature has already identified the important role of endogenous cultural change for economic activity, with regard to attitudes on corruption (Hauk and Sáez-Martí, 2002; Varvarigos, 2023); on political institutions (Bisin and Verdier, 2024); on leisure, patience, and occupational choice (Doepke and Zilibotti, 2008; Klasing and Milionis 2014); on education (Varvarigos, 2020); on trust (Francois and Zabojnik, 2010); on the esteem attached to different occupations (Corneo and Jeanne, 2010); on entrepreneurship (Chakraborty *et al.*, 2016); on family ties (Varvarigos, 2021); and on altruism (Alonso-Carrera and Bouché, 2022). There is also an abundance of empirically-oriented studies, such as those by Knack and Keefer (1997), Inglehart and Baker (2000), Guiso *et al.* (2006), Tabellini (2010) and Alesina and Giuliano (2015), who provide evidence on a significant relation between culture and economic development.

One cultural aspect that has eluded the attention of the previously mentioned strand of literature involves the role of *economic materialism*, i.e., the set of values, beliefs, personality traits and attitudes that attach significant importance to the pursuit of material goals, thus promoting the acquisition and consumption of material goods.² This oversight is by no means warranted though. On the contrary, it obscures the role of an important cultural factor for economic progress. Even though the choice of self-gratification through material possessions may seem vain and unappealing, the truth is that it provides a strong motivation for improving the means through which people can indulge their predilection for material goods. Put differently, the objective to increase one's worldly possessions offers an incentive to pursue ventures that increase productivity and, therefore, income; for an economy as a whole, the presence of

¹ Of course, there are seminal studies (e.g., Galor and Weil, 2000) that provide lucid explanations of economic transformation and development, without explicit consideration of cultural factors. See also Galor (2011) and the references therein.

² Economic materialism and consumerism are conceptually related. For example, Stearns (2001) defines a consumerist society as one “in which many people formulate their goals in life partly through acquiring goods that they clearly do not need for subsistence” (Stearns, 2001; p. ix).

materialists can boost economic growth through productivity improvements.³ At the same time, there is every reason to presume that the diffusion and prevalence of cultural values and traits, which differ with regard to their emphasis on material aspirations, are by no means impervious to the economic transformation that occurs in the process of development. Certainly, one can hardly dispute with the idea that economic progress influences the cultural traits that collectively shape a society's values, customs and norms – the stock of cultural capital to which the traits that form economic materialism belong.

The aforementioned arguments motivate this study. Its objective is to provide a formal, systematic analysis of the idea that a cultural change towards more widespread assimilation of material aspirations among the population induces and, in turn, is induced by economic transformation. This underlying complementarity effectuates a powerful mechanism of transition from stagnation to sustained productivity growth, and determines the prevalence of cultural values that differ *vis-à-vis* the prominence of material objectives.

From an empirical perspective, the theory we advance is related to Weber's (1905) thesis that – by dispelling the view of wealth and material possessions as signs of moral transgression – the Protestant Reformation sowed the seeds of capitalist economies. Motivated by Weber's hypothesis, McClelland (1961) postulated that Protestantism occasioned behavioural changes towards rising aspirations and standards of achievement in material conditions which, in turn, promoted an entrepreneurial spirit and, therefore, contributed to economic growth – ideas that are consistent with our theoretical model. To some extent, these ideas complement the novel contribution of Becker and Woessmann (2009) who proposed a different mechanism to what Weber surmised in relation to Protestantism and the work ethic: Using data from 19th century Prussia, they found evidence of a positive, causal effect of Protestantism on literacy rates. Based on this, they argued that the Protestant Reformation's contribution to economic prosperity was rooted in Luther's *desideratum* that people should be able to read the scriptures by themselves – an outcome that prompted the accumulation of

³ One could argue that material aspirations may also generate modes of behaviour whereby agents try to gratify them through predatory actions (e.g., theft, rent-seeking). However, we seek to highlight the role of economic materialism in wealth creation, rather than destruction. Although issues of predation may be indubitably important, they go beyond the focus and scope of this study.

human capital in regions where Protestantism prevailed. Since our modelling of productivity improvements is broad enough to encompass activities that promote human capital, our framework is consistent with what Becker and Woessmann (2009) propose in terms of the channel through which a process of cultural change – in this case, the prevalence of Protestantism in regions of Northwestern Europe – is instrumental to economic progress. However, the underlying mechanism we advance is different (albeit complementary, rather than competing) to theirs: Specifically, the early stages of our model’s transitional dynamics can approximate the circumstances where, by ingraining people with aspirations regarding their material circumstances – in turn, a by-product of dismissing the presumption of moral transgression in the pursuit of wealth – the Protestant Reformation instigated the cultural transmission of these aspirations throughout greater segments of the population. As a result, this process advanced the economic incentives that precipitated the engagement with productivity-improving activities (which include human capital formation), hence contributing to the take-off towards sustained growth.

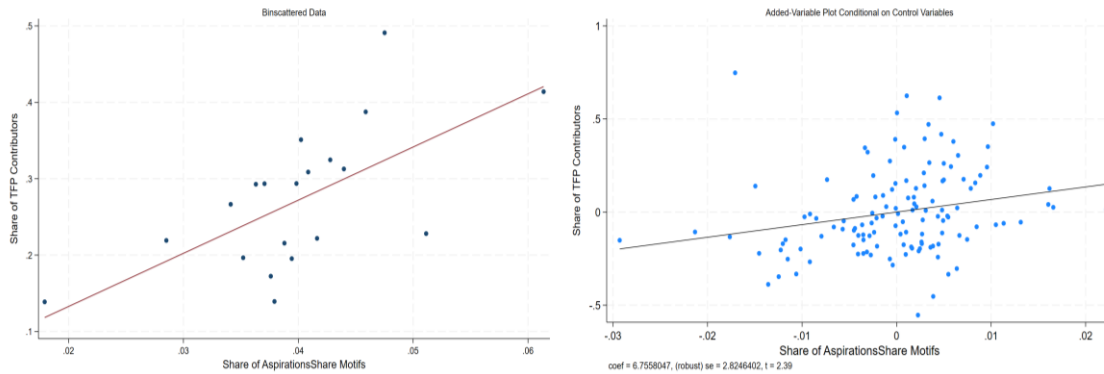


Figure 1. Correlation between the share of aspiration-related motifs in Michalopoulos and Xue (2021) with the share of notable people who are TFP contributors and corporate leaders in Laouenan et al. (2022). The left panel is a binscatter plot of the full panel dataset, ranging from 1500 to 1800 (31 decades) and 148 countries, with an unconditional fitted line. The right panel (average country-level data) shows the added variable plot, illustrating the partial effect of aspirations on the population share of those whose domain of influence relates to productivity improvements, conditional on the full set of controls (see the online Companion Appendix, Table A1b, Column 5).

As it will transpire later, a key feature of our model’s mechanism is that a cultural dissemination of materialistic aspirations is interlinked with productivity improvements undertaken by those who are inculcated with such attitudes. As a means of offering some underlying empirical motivation behind this mechanism, in Figure 1 we provide a correlation between the proxy for the culture of material aspirations with a

proxy for the population of those whose activities contribute to productivity improvements. With regard to the former, we utilise the folklore dataset from Michalopoulos and Xue (2021) who digitised a rich dataset of folklore stories around the globe and performed text analysis to generate measures of cultural traits at ethnic group-level and country-level. We use their measure of aspirations from that dataset, which is the share of aspiration-related motifs to the total number of motifs in their catalogue of folklore stories for each country. With regard to the latter, we use a recent database by Laouenan *et al.* (2022) who have compiled a list of historically notable individuals, according to their domain of influence. From this database, we extract those notable individuals in activities that, according to Laouenan *et al.* (2022), contribute mostly to (i) total factor productivity (e.g., scientists, engineers, inventors, pioneers) and (ii) corporate leadership (e.g., merchants, entrepreneurs etc), based on their year of birth during the sample period.⁴ We then measure their share over the whole sample of notable individuals in the database. As shown in Figure 1, we find a positive correlation between a culture of material aspirations and the share of individuals whose activities contribute to economic transformation.⁵ It should also be noted that the empirical studies of Uhlaner and Turik (2007) and Xu *et al.* (2019) offer further credence to this mechanism, as they employ recent data to show evidence that more widespread attitudes of economic materialism are associated with increased innovation.

Methodologically, our model divides the population into two groups that differ in their evaluation of consumption for their utilities. Materialists are those agents who have material aspirations, in the sense that they do not only care about their consumption *per se*; they also care about how their standards of living compare to those

⁴ The data for these individuals is based on their year of birth during 1500-1800. The other domains of influence in the Laouenan *et al.* (2022) database are general leadership (e.g., political, military, religious), culture/arts, and sports/games.

⁵ Although a full-fledged empirical analysis that investigates causality is beyond the scope of this study, in a Companion Appendix to our paper we show that this correlation is statistically significant and remains robust when controlling for population density (a proxy for pre-industrial economic development and technology; e.g., Ashraf and Galor, 2011), the share of Protestants (a proxy for literacy rates in Becker and Woessmann, 2009), predicted population diversity (encompassing various cultural traits such as trust; e.g., Ashraf and Galor, 2013), and other pre-industrial and geographical controls commonly used in the literature. This indicates that aspirations have a unique effect to the number of people investing in productivity improvements relative to other factors considered in the literature. Also, the share of Protestants plays an important role in this correlation (it reduces the effect of the coefficient; see Column 2/Table A1a and A1b of the online Companion Appendix), an outcome that is consistent with Becker and Woessmann (2009).

of their antecedents.⁶ Non-materialists, on the other hand, do not have similar aspirations. The distribution of preferences among the population is endogenous; it evolves through an intergenerational transmission of cultural traits *à la* Bisin and Verdier (2001).

We show the possibility that, as long as the return to productivity-enhancing activities is sufficiently high, only materialists find optimal to undertake them: Given their preferences, this choice offers them the income necessary to gratify their material aspirations. We show that a gradual process of cultural change, during which materialistic preferences are ingrained to an increasing share of the population, is instrumental in delivering a critical mass of materialists whose activities are essential for the economy's take-off from stagnation to productivity improvements. We also show that, once this happens, productivity growth induces further cultural change that causes a more widespread adherence to materialist values and attitudes. Thus, the economy follows a path where the mutually-reinforcing impact of productivity improvements and more widespread adoption of materialistic preferences, provides the foundation for sustained economic growth, and shapes long-run cultural outcomes as it determines the distribution of preferences in the population. Given the role of cultural change in shaping agents' material aspirations, our study contributes a novel mechanism to the general viewpoint about the role of endogenous preference formation for the take-off towards sustained growth (e.g., Strulik, 2012). We also present several extensions of the baseline version of the model to verify the robustness of our main results. These extensions include an alternative specification for differences in materialistic attitudes; endogenous thresholds; and an extension that highlights the role of consumption-focused institutional differences, e.g., differences in sumptuary laws, for the timing of the economic take-off.

These results and implications are corroborated by ideas and arguments that are solidly grounded on a plethora of both historical and more recent evidence. In addition to our earlier reference to Weber (1905) and McClelland (1961), we should note that several other historians have emphasised the role of the rising, and more widespread,

⁶ In this respect, the model evokes the ideas of Veblen (1899), as it captures circumstances where (some) agents have the innate desire to compare their material possessions against some reference level (e.g., Wendner, 2010; Dioikitopoulos *et al.*, 2020).

material objectives as both a cause and an effect of the economic take-off in Western Europe, during the 18th and 19th centuries. According to Perkin (1968) *“industrial innovation is of no consequence without the massively expansive consumer demand to call it forth and sustain its growth [...] key to the Industrial Revolution was the [...] demand for mass consumer goods. And the key to that demand was social emulation”* (Perkin, 1968; p.140). McKendrick *et al.* (1982) claimed that a more comprehensive understanding of the circumstances surrounding industrialisation in 18th century England, is possible only in conjunction with the emerging materialist culture in segments of the population around the same period. They argued that the process of industrialisation would not have been the same in the absence of those who wanted *“passionately to add to their worldly goods, to develop indeed the appetite of a consumer”* (McKendrick *et al.*, 1982; p.327). Stearns (1997) asserted that the economic transformation – manifested in increased manufacturing activity – during that period, ultimately enabled a culture of consumerism; he also alluded to the link between material aspirations and improvements in productivity, through the explicit reference to *“the relationship between new material expectations and the motivations for investment in new technologies”* (Stearns, 1997; p. 102). According to de Vries (1994), a cultural change towards more materialistic values, which occurred throughout Northwestern Europe, was a precursor to the onset of industrialisation: He claimed that *“changes in tastes [...] preceded and prepared the way for the Industrial Revolution. This industrious revolution, a change in household behavior with important demand-side features, began in advance of the Industrial Revolution”* (de Vries, 1994; p. 256). In a similar vein, Braudel (1992) also highlighted the role of increased demand for material goods as a significant force of economic evolution, arguing that *“if the door is to be opened to innovation, the source of all progress, there must be first some restlessness which may express itself in such trifles as dress, the shape of shoes and hairstyles”* (Braudel, 1992; p. 333).

Since our study also contributes to the literature that identifies the factors that are instrumental to an economy’s transition to sustained economic growth, we should mention the mechanisms that some influential studies have advanced on this issue. Galor and Weil (2000) propose a unified approach: Starting from a Malthusian state of stagnation, an increase in the population size induces a scale effect that promotes endogenous technological progress which, in turn, induces more education investment due to a higher return on skills. Subsistence constraints gradually dissipate as the

complementarity between technological progress and human capital accumulation allows the economy to sustain positive growth, whereas a quality-quantity trade-off leads to a reduction of population growth. The interplay between technological progress, human capital and demographic change is also a key element in Lagerlöf (2003) – who highlights endogenous mortality and the role of epidemic shocks – Strulik (2017) – who emphasises technological advancements in contraceptive methods – and d’Albis *et al.* (2018) – whose focus is on the role of delayed childbearing in promoting education investment.

None of these papers account for endogenous cultural change, whose significance for our theory is two-fold: Firstly, the culturally-induced assimilation of material aspirations by a wider share of the population is key in inducing the activities on which the economy’s take-off is rooted; secondly, we highlight a different type of complementarity as critical in the transition to sustained economic growth: This is a cultural-economic complementarity in the sense that a more widespread adoption of materialistic preferences and attitudes (i.e., the change in culture) and productivity growth (i.e., the change in economic activity) are mutually reinforcing.

The remainder of the study is organised as follows: Section 2 presents the set-up of the model economy, while Section 3 shows how different cultural traits affect optimal decisions on consumption and productivity-improving investment. In Section 4, we analyse the process through which different cultural traits are diffused in the population. Section 5 analyses the joint evolution of productivity growth and cultural change. In Section 6 we check the robustness of our results under a variety of different specifications. Section 7 concludes.

2 The Model

2.1 General Overview

The economy is populated by agents who are differentiated with regard to their aspirations on material goods. They allocate their (potentially) productive time between productivity improvements (e.g., human capital, technological advancements etc.) and

activities that are not productive but confer direct utility (e.g., leisure, religious practice etc.). They also socialise their children with the objective of inculcating them with their attitudes and beliefs regarding material aspirations. Socialisation can also take place outside the family environment (e.g., by role models, teachers, leaders etc.). In general, cultural indoctrination – within and outside the family environment – determines the evolution of the distribution of materialistic preferences among the population. This process of cultural change interacts with endogenous productivity improvements (as the population’s adherence to materialistic attitudes affects – and, at the same time, is affected by – economic activity), hence they jointly determine the economy’s transitional dynamics and long-term prospects.

2.2 The Economic Environment

An infinite horizon economy is populated by overlapping generations of agents who live for two periods – *childhood* and *adulthood*. Each adult agent rears a child, meaning that the economy’s population mass is constant over time. The demographic structure is simplified even further by assuming that each age cohort’s population mass is normalised to 1. As we will see shortly, agents are distinguished by a personality trait, indicated by j , which determines their aspirations and attitudes on material possessions.

Consider an agent who is born in period t and who, therefore, becomes an adult in $t+1$. In adulthood, the agent is endowed with the previous generation’s average level of productivity, denoted a_t , and with 2 units of time. One of these units is devoted inelastically in the production of goods. With regard to the remaining 1 unit of time, she has the choice to distribute it to different activities. She can spend time in activities that offer utility directly, such as religious and other spiritual practices, as well as recreation and leisure.⁷ She can also spend time in ventures that raise her productivity above what she is endowed with – activities such as innovation, learning and research – thus

⁷ Zolfagharian and Ulusoy (2017) find empirical support for the negative relation between religiosity and materialism. Recent evidence shows that religious activity retards innovation (Bénabou *et al.*, 2015) and economic growth (Campante and Yanagizawa-Drott, 2015). For evidence on the trade-off between leisure goods/time and income-generating activities, see Aguiar *et al.* (2021).

enabling her to increase the output she produces. Each unit of time devoted to such ventures raises her productivity by γ_{t+1} . Consequently, if she devotes $s_{j,t+1} \in [0,1]$ units of time to productivity-improving activities, her overall productivity will be

$$a_{j,t+1} = a_t(1 + \gamma_{t+1}s_{j,t+1}). \quad (1)$$

The term γ_{t+1} introduces an intragenerational externality in the process of productivity improvements. We consider the presence of learning spillovers according to which, as more agents engage with productivity-enhancing activities, a stock of knowledge is created and flows costlessly across the economy. This idea is corroborated by empirical evidence that supports the existence of such learning spillovers (e.g., Bahk and Gort, 1993; Irwin and Klenow, 1994). To capture this in the simplest possible manner, we denote e_{t+1} the number of those agents who actively invest time towards improvements in productivity, and assume that $\gamma_{t+1} = \gamma(e_{t+1})$ such that

$$\gamma(e_{t+1}) = \begin{cases} \underline{\gamma} & \text{if } e_{t+1} < \hat{e} \\ \bar{\gamma} & \text{if } e_{t+1} \geq \hat{e} \end{cases}, \quad (2)$$

where $\bar{\gamma} > \underline{\gamma} > 0$ and $0 < \hat{e} < 1$. Note that in Section 6 we analyse extensions where this threshold becomes endogenous.

Each agent will produce units of the economy's good and, therefore, earn income, $i_{j,t+1}$, according to

$$i_{j,t+1} = a_{j,t+1}. \quad (3)$$

She uses this income to finance her desired consumption expenditures, i.e.,

$$c_{j,t+1} = i_{j,t+1}. \quad (4)$$

This set-up reveals the potential utility benefit of productivity improvements, i.e., increased consumption. However, these improvements entail the cost of foregone utility from other activities. An agent's preferences with regard to these aspects are specified in

$$u_{j,t+1} = (1 - s_{j,t+1})^{1-\theta} [(1 - \Phi_j)c_{j,t+1} + \Phi_j(c_{j,t+1} - \tilde{c}_t)]^\theta, \quad (5)$$

where $0 < \theta < 1$, $0 < \Phi_j < 1$, and $\tilde{c}_t > 0$.

The utility function in (5) is indicative of aspirations in the acquisition of material goods, whereby an agent's utility may not only depend on her own material

consumption *per se*, but also on the difference between her own consumption and a reference point $\tilde{c}_t$. This reference point is the previous generation's average level of consumption. The idea we capture is that, in childhood and through their observation, agents form a benchmark about standards of living. When they reach adulthood, they may aspire to improve upon the material living standards of their antecedents. In other words, agents may care about how much their material conditions improve over and above what was customary when they were growing up.⁸ Note that, by virtue of (4), $\tilde{c}_t$ is related to the average income of the previous generation of adults, according to⁹

$$\tilde{c}_t = i_t. \quad (6)$$

In contrast to what is customary in models of this sort, the parameter that captures the strength of such aspirations, i.e., Φ_j is neither exogenous nor common to all agents. Instead, we are going to treat it as an endogenous cultural characteristic, which agents adopt through a process of cultural transmission. In doing so, we draw on the seminal work of Bisin and Verdier (2001). Before we delve into the details of cultural change, however, we will first present the solution of the problem faced by an agent who decides how to allocate her unit of time. Substituting (1), (3) and (4) in (5), the problem is to choose $s_{j,t+1}$ in order to maximise

$$u_{j,t+1} = (1 - s_{j,t+1})^{1-\theta} \left[a_t (1 + \gamma_{t+1} s_{j,t+1}) - \Phi_j \tilde{c}_t \right]^\theta. \quad (7)$$

Given the non-negativity of $s_{j,t+1}$, and taking account of $\gamma_{t+1} = \gamma(e_{t+1})$, it can be easily shown that the solution to the problem is

⁸ Another argument is that our current formulation captures preferences for status rather than aspirations. There are two possible counter-arguments in response to this point: (i) The idea of status would be more akin to a scenario where agents compare their consumption against that of their peers, i.e., other agents of the same generation. Formally, that would entail a term like $\Phi_j(c_{j,t+1} - \tilde{c}_{t+1})$ where $\tilde{c}_{t+1}$ is the average consumption among agents of the same generation. In our set-up, Type- M agents have the incentive to improve upon the average consumption of the previous generation – a generation that is not even alive at the time they make their decisions. In other words, their underlying motive is not restricted to status-induced demonstration; it is their aspiration to attain better material conditions compared to their antecedents. (ii) Several existing studies analyse status through the explicit distinction between 'normal/standard' goods and goods whose consumption aims specifically at conferring status (e.g., Cooper *et al.*, 2001; Moav and Neeman, 2010). Our framework does not consider such a distinction.

⁹ In a related theme, Hori *et al.* (2015) apply different degrees of consumption externalities (habit formation) to a multi-sector model with an infinitely-lived, representative household. They show that the equilibrium outcomes can exhibit different sectoral growth rates, thus leading to a process of structural transformation that is consistent with the data, while still retaining a balanced growth path on aggregate.

$$s_{j,t+1}^* = \max \left\{ 0, \frac{\theta \gamma(e_{t+1}) a_t - (1-\theta)(a_t - \Phi_j \tilde{c}_t)}{\gamma(e_{t+1}) a_t} \right\}. \quad (8)$$

As long as $s_{j,t+1}^* > 0$, we see that an agent's investment towards productivity improvements is positively related to the importance of consumption aspirations for her utility ($\Phi_j \tilde{c}_t$). The positive impact of material aspirations on $s_{j,t+1}^*$ is attributed to the fact that the agent must invest in productivity improvements in order to gain the higher income that is necessary to guarantee that her material consumption will exceed the reference point. As expected, $s_{j,t+1}^*$ is also increasing in the relative weight of consumption for an agent's overall utility, i.e., θ , and on the term that captures the impact of intragenerational learning spillovers, i.e., $\gamma(e_{t+1})$. The intuition behind the latter effect is that a higher number of agents who invest in productivity improvements, increases the flow of learning spillovers that facilitate everyone in being more efficient when they invest in productivity-enhancing ventures.

Before we proceed to the next section of our analysis, note that, by virtue of (3), (4) and (6), it follows that

$$\tilde{c}_t = a_t. \quad (9)$$

We can substitute (9) in (8) to derive

$$s_{j,t+1}^* = \max \left\{ 0, \frac{\theta \gamma(e_{t+1}) - (1-\theta)(1-\Phi_j)}{\gamma(e_{t+1})} \right\}. \quad (10)$$

3 Cultural Values, Productivity, and Consumption

There are two cultural traits, determining the extent of an agent's aspirations on material outcomes (i.e., consumption). Formally,

$$\Phi_j = \begin{cases} \varphi & \text{if } j = M \\ 0 & \text{if } j = N \end{cases}, \quad 0 < \varphi < 1. \quad (11)$$

In other words, Type- M agents have a greater inclination towards actions that improve their material conditions, compared to Type- N ones, because they have aspirations that induce them to acquire more consumption goods. Henceforth, we shall be using

$m_{t+1} \in [0, 1]$ to denote the fraction of adults who have been inculcated with the M trait, meaning that the corresponding fraction n_{t+1} of those inculcated with the N trait is $n_{t+1} \equiv 1 - m_{t+1}$. Furthermore, from now on Type- M agents will also be referred to as *materialists*, whereas Type- N agents will also be referred to as *non-materialists*.

At this point, we will introduce a technical condition that facilitates the exposition and clarity of the subsequent analysis. Specifically, we impose the following:

Assumption 1. $\underline{\gamma} < \frac{(1-\theta)(1-\varphi)}{\theta} < \bar{\gamma} < \frac{1-\theta}{\theta}$.

One characteristic of our model is that there are circumstances where agents engage in a symmetric game in which their decisions are strategic complements. As it is well-known (e.g., Cooper and John, 1988) such circumstances can result in indeterminacy due to the emergence of multiple pure strategy Nash equilibria. Generally speaking, this sort of indeterminacy is problematic as it undermines the model's predictive power. For this reason, in Appendix A.1 we apply a further refinement concept to rule it out.¹⁰ Consequently, we can summarise the outcomes regarding the agents' optimal decisions through

Lemma 1. *Under Assumption 1, it is $e_{t+1} = m_{t+1}$ and*

$$s_{N,t+1}^* = 0, \quad (12)$$

$$s_{M,t+1}^* = \begin{cases} 0 & \text{if } m_{t+1} < \hat{e} \\ \frac{\theta\bar{\gamma} - (1-\theta)(1-\varphi)}{\bar{\gamma}} > 0 & \text{if } m_{t+1} \geq \hat{e} \end{cases} \quad (13)$$

¹⁰ We have to make a distinction between different types of equilibrium multiplicity here. What we rule out with our refinement concept is the multiplicity associated with indeterminacy. Still, equilibrium outcomes may involve some multiplicity in the sense that investment decisions depend on whether the population of Type- M agents is below or above a critical mass $\hat{e}$ (see Lemma 1). However, this does not involve indeterminacy as the solution for s_M^* is uniquely determined for given m . In other words, the multiple outcomes regarding s_M^* are associated with some sort of path-dependence. Note that path-dependence is not attributed to the critical mass $\hat{e}$ being exogenous or to the step function in (2). In Section 6.2 we show that the same path-dependent outcomes emerge when the critical mass $\hat{e}$ emerges endogenously under a continuous function for $\gamma(e_{t+1})$.

Proof. See Appendix A.1 $\square$

In terms of intuition, non-materialist (Type- N) agents will not invest any of their time towards productivity improvements. Even if they anticipate everyone else to invest, the benefits from learning spillovers are not sufficient to induce them to devote any effort to increase their productivity and, therefore, attain a higher level of consumption. Only materialist (Type- M) agents are those who may invest in productivity improvements. Nevertheless, this does not happen when the overall population of Type- M agents is relatively low, because the benefits from learning spillovers are not sufficient to induce any effort towards productivity-enhancing ventures. It happens when the overall population of Type- M agents exceeds the critical mass $\hat{e}$ though: The key aspect in this case is that material aspirations offer additional incentives so that, given sufficient learning spillovers, materialists are induced to undertake productivity-enhancing activities, as these are the means through which they can satisfy their predilection for material goods, rooted in their desire to improve upon the standards of living of their antecedents.

The results in Lemma 1 can be combined with (1)-(2) to determine the level of productivity under which each agent will produce goods. That is,

$$a_{j,t+1}^* = \begin{cases} a_t & \text{if } j = N \\ \begin{cases} a_t & \text{for } m_{t+1} < \hat{e} \\ a_t[\theta(\bar{\gamma} + 1 - \varphi) + \varphi] & \text{for } m_{t+1} \geq \hat{e} \end{cases} & \text{if } j = M \end{cases} \quad (14)$$

As we indicated previously, and can be verified by substituting the results of Lemma 1, together with (2) and (9), in (7), the indirect utility of a non-materialist is,

$$u_{N,t+1}^* = a_t^\theta, \quad (15)$$

whereas a materialist's indirect utility is

$$u_{M,t+1}^* = \begin{cases} [(1 - \varphi)a_t]^\theta & \text{if } m_{t+1} < \hat{e} \\ \frac{a_t^\theta (1 - \theta)^{1-\theta} \theta^\theta (\bar{\gamma} + 1 - \varphi)}{\bar{\gamma}^{1-\theta}} & \text{if } m_{t+1} \geq \hat{e} \end{cases} \quad (16)$$

At this point, we should note that situations in which the reach of a critical mass of people can generate distinct changes in an economy's long-term prospects is consistent with observed outcomes in the literature of comparative economic

development. For example, Brunt and García-Peñalosa (2022) show the importance of such population thresholds effects for urbanisation.

4 The Intergenerational Transmission of Cultural Values

Agents adopt their cultural values and attitudes in childhood, and carry them for their rest of their lives. Each agent's cultural type is endogenously determined through a process of cultural transmission. Parents undertake activities, such as cultural instruction and socialisation, with the purpose of instilling the values and attitudes that ultimately determine their offspring's preference parameter Φ_j . As it will become clear below, parents will have the desire to instil their own cultural trait in their children. This is because they are not altruistic in the pure sense of the word. Instead, they use their own preferences to assess the decisions of agents who belong to their own age group, and use this assessment as the benchmark to evaluate the decisions that will better serve their children in adulthood. Furthermore, they are also driven by a 'selfish' motive in the sense that having children who adopt the same values and attitudes as theirs, is also a source of utility. These ideas are consistent the application of cultural transmission in Bisin and Verdier (2001), Francois and Zabojnik (2010) and Klasing and Milionis (2014) among others.

Let us consider the parents of those agents on whom the analysis was focused so far, i.e., the parents of agents who reach adulthood in $t+1$. Put differently, let us consider agents who are adults in t and focus on their parental roles as cultural instructors. A Type- j parent will instil her own trait in her child with probability $p_{j,t}$, as long as she devotes $P(p_{j,t}) \geq 0$ units of effort towards her offspring's cultural instruction: This is the direct (or vertical) element of the cultural transmission process. The parent's effort is a source of disutility, which is characterised by a twice continuously differentiable function, such that $P(0)=0$ and $P'(p_{j,t}), P''(p_{j,t}) > 0$. If the parent is not successful in instilling her own trait, the child will form her cultural values and attitudes through socialisation and cultural instruction outside the family environment.

Specifically, she will adopt the cultural trait of a ‘role model’ (e.g., a teacher, a spiritual or political leader, a family acquaintance etc.) who she will pick out of the population of adults in t : This is the indirect (or oblique) element of the cultural transmission process.

Define the function $b(m_t) \in [0,1]$, where $b'(m_t) > 0$, $b(0) = 0$ and $b(1) = 1$, as the likelihood that a child born to a Type- j ($j = \{M, N\}$) parent, but who adopts her trait through the oblique transmission, picks a role model who adheres to the M trait. It follows that the probability that the child will adopt her parent’s cultural trait is

$$\pi_{M,t} = p_{M,t} + (1 - p_{M,t})b(m_t), \quad (17)$$

for children born to materialist parents, and

$$\pi_{N,t} = p_{N,t} + (1 - p_{N,t})[1 - b(m_t)], \quad (18)$$

for children born to non-materialist parents. By the law of large numbers, the population mass of adults who will uphold materialistic values in $t + 1$ is

$$m_{t+1} = \pi_{M,t}m_t + (1 - \pi_{N,t})(1 - m_t). \quad (19)$$

As we argued previously, parents use their own cultural values and attitudes, manifested in their preference characteristic Φ_j , and, given these values and attitudes, their corresponding assessment of the average utility of agents who belong to the same generation. These serve as the means of evaluating the implications of different choices for a person’s welfare. It is this process that helps parents to infer which choices will better serve their children in adulthood, and, therefore, to decide how much effort to devote in instilling the cultural trait that ensures that their children will eventually make these choices. Their efforts are also informed by their desire to have children who, as adults, will share their parents’ values and attitudes. Specifically, a Type- j parent will enjoy an additional payoff $f_j > 0$ if her offspring adopts the same cultural trait.

Let $\psi_{j,M,t}$ be the average utility of a time- t adult, whose time allocation decision is consistent with the j trait, but evaluated from the Type- M adult’s viewpoint, i.e., under $\Phi_M = \varphi$; this is also a Type- M parent’s additional perceived payoff from her offspring’s adoption of materialistic values (if $j = M$) or non-materialistic ones (if $j = N$). Similarly, let $\psi_{j,N,t}$ be the average utility of a time- t adult, whose time allocation decision is consistent with the j trait, but evaluated from the Type- N adult’s

viewpoint, i.e., under $\Phi_N = 0$; this is also a Type- N parent's additional perceived payoff from her offspring's adoption of non-materialistic values (if $j = N$) or materialistic ones (if $j = M$). It follows that materialist parents will choose $p_{M,t}$ to maximise their own expected payoff, depending on their children's adopted trait. That is,

$$\pi_{M,t}(\psi_{M,M,t} + f_M) + (1 - \pi_{M,t})\psi_{N,M,t} - P(p_{M,t}). \quad (20)$$

Similarly, non-materialist parents will choose $p_{N,t}$ to maximise their own expected payoff, depending on their children's adopted trait:

$$\pi_{N,t}(\psi_{N,N,t} + f_N) + (1 - \pi_{N,t})\psi_{M,N,t} - P(p_{N,t}). \quad (21)$$

To facilitate the exposition of the subsequent analysis, we follow others (e.g., Bisin and Verdier, 2001) in adopting a quadratic form for the convex effort cost of cultural instruction:

$$P(p_{j,t}) = K \frac{p_{j,t}^2}{2}, \quad K > 0. \quad (22)$$

Taking account of (17), (18), (22) and the non-negativity of $p_{j,t}$, the solutions to the problems of materialist and non-materialist parents are given by

$$p_{M,t}^* = \max \left\{ 0, \frac{[1 - b(m_t)](f_M + \psi_{M,M,t} - \psi_{N,M,t})}{K} \right\}, \quad (23)$$

$$p_{N,t}^* = \max \left\{ 0, \frac{b(m_t)(f_N + \psi_{N,N,t} - \psi_{M,N,t})}{K} \right\}. \quad (24)$$

Later, K will be assumed to be sufficiently large to ensure that $p_{M,t}^*, p_{N,t}^* \leq 1$, since both these variables are probabilities.

The solutions in (23)-(24) allow us to make the following observations: First, parents will undertake a more intense cultural instruction of their children when their perceived difference between the average utility from choices that are consistent with the cultural values to which they conform, and the average utility from choices that are incompatible with their own values, becomes larger. Second, the desire to have culturally similar children is also a factor that intensifies their efforts towards cultural instruction. Third, the size of the population who share the parents' cultural values is a substitute to parents' own efforts to instil these values in their children – formally,

$\frac{\partial p_{M,t}^*}{\partial m_t} < 0$ and $\frac{\partial p_{N,t}^*}{\partial m_t} > 0$. This is an outcome that Bisin and Verdier (2001, 2008) referred to as ‘cultural substitution’, and it is typical in models of this sort. It is quite intuitive as well: Parents will be less inclined to incur the effort cost for achieving an outcome that becomes more likely through cultural instruction that occurs outside the family environment.

Now, let us specify the terms $\psi_{M,M,t}$, $\psi_{N,M,t}$, $\psi_{N,N,t}$ and $\psi_{M,N,t}$. By virtue of (15) and a rearrangement of (16) we have

$$\psi_{M,M,t} = u_{M,t}^* = \begin{cases} [(1-\varphi)a_{t-1}]^\theta & \text{if } m_t < \hat{e} \\ [(1-\varphi)a_{t-1}]^\theta (1-\theta)^{1-\theta} \theta^\theta \left(1 + \frac{\bar{\gamma}}{1-\varphi}\right) \left(\frac{\bar{\gamma}}{1-\varphi}\right)^{-(1-\theta)} & \text{if } m_t \geq \hat{e} \end{cases} \quad (25)$$

and

$$\psi_{N,N,t} = u_{N,t}^* = a_{t-1}^\theta. \quad (26)$$

The term $\psi_{N,M,t}$ is the one that corresponds to the choice of $s_{N,t}^*$, but evaluated, in terms of utility, under $\Phi_M = \varphi$. Analogously, the term $\psi_{M,N,t}$ is the one that corresponds to the choice of $s_{M,t}^*$, but evaluated, in terms of utility, under $\Phi_N = 0$. Therefore, we can combine (7), (9), (12) and (13) as the guide to derive

$$\psi_{N,M,t} = [(1-\varphi)a_{t-1}]^\theta, \quad (27)$$

and

$$\psi_{M,N,t} = \begin{cases} a_{t-1}^\theta & \text{if } m_t < \hat{e} \\ [(1-\varphi)a_{t-1}]^\theta (1-\theta)^{1-\theta} \theta^\theta \left(1 + \frac{1-\varphi}{\bar{\gamma}}\right)^{1-\theta} \left[\frac{\varphi}{\theta(1-\varphi)} + 1 + \frac{\bar{\gamma}}{1-\varphi}\right]^\theta & \text{if } m_t \geq \hat{e} \end{cases} \quad (28)$$

Now, let us examine the implications for parental efforts towards their children’s cultural indoctrination. To ensure $p_{M,t}^*, p_{N,t}^* \leq 1$ in an environment where productivity will eventually grow at permanently positive rates, we will specify $K = K(a)$ such that $K'(a) > 0$. Specifically, we will adopt

$$K(a_{t-1}) = \kappa + a_{t-1}^\theta. \quad (29)$$

In terms of intuition, this captures the idea that a thriving economic environment also generates distractions and needs that make it increasingly difficult for parents to

socialise and indoctrinate their offspring. In essence, however, this is merely a technical device to bound $p_{M,t}^*$ and $p_{N,t}^*$ below 1 – a technical device that is innocuous, as later it will transpire that the term $K(a)$ has no effect whatsoever on the model's equilibrium and on the conditions that determine when the distribution of preference traits among the population shifts.

Given these, we combine the expressions in (25)-(29) and substitute them in (23) and (24) to get

$$p_{M,t}^* = \begin{cases} \frac{[1-b(m_t)]f_M}{\kappa + a_{t-1}^\theta} & \text{if } m_t < \hat{e} \\ \frac{[1-b(m_t)](f_M + a_{t-1}^\theta \mu)}{\kappa + a_{t-1}^\theta} & \text{if } m_t \geq \hat{e} \end{cases}, \quad (30)$$

and

$$p_{N,t}^* = \begin{cases} \frac{b(m_t)f_N}{\kappa + a_{t-1}^\theta} & \text{if } m_t < \hat{e} \\ \frac{b(m_t)(f_N + a_{t-1}^\theta \nu)}{\kappa + a_{t-1}^\theta} & \text{if } m_t \geq \hat{e} \end{cases}, \quad (31)$$

where μ and ν are the composite terms¹¹

$$\mu \equiv (1-\varphi)^\theta \left[(1-\theta)^{1-\theta} \theta^\theta \left(1 + \frac{\bar{r}}{1-\varphi} \right) \left(\frac{\bar{r}}{1-\varphi} \right)^{-(1-\theta)} - 1 \right] > 0, \quad (32)$$

$$\nu \equiv 1 - (1-\varphi)^\theta (1-\theta)^{1-\theta} \theta^\theta \left(1 + \frac{1-\varphi}{\bar{r}} \right)^{1-\theta} \left[\frac{\varphi}{\theta(1-\varphi)} + 1 + \frac{\bar{r}}{1-\varphi} \right]^\theta > 0. \quad (33)$$

At this point, we can specify the condition necessary to ensure that the expressions in (30) and (31) remain bounded below 1. We do this through

Assumption 2. $\mu, \nu \leq 1$ and $\kappa > \max \left\{ \frac{f_M}{\mu}, \frac{f_N}{\nu} \right\}$.

It follows that (30)-(31) lead to the result in

¹¹ In Appendix A.2 we offer a detailed proof that the composite terms in (32) and (33) are strictly positive numbers.

Lemma 2. For $m_t \geq \hat{e}$, it is $\frac{\partial p_{M,t}^*}{\partial a_{t-1}}, \frac{\partial p_{N,t}^*}{\partial a_{t-1}} > 0$.

Proof. It is straightforward to establish that $\frac{\partial p_{M,t}^*}{\partial a_{t-1}} = \frac{[1-b(m_t)]\theta a_{t-1}^{\theta-1}(\mu\kappa - f_M)}{(\kappa + a_{t-1}^\theta)^2} > 0$ and

$$\frac{\partial p_{N,t}^*}{\partial a_{t-1}} = \frac{b(m_t)\theta a_{t-1}^{\theta-1}(\nu\kappa - f_N)}{(\kappa + a_{t-1}^\theta)^2} > 0. \quad \square$$

When there is a lack of sufficient number of materialists, all adult parents make the same decisions when allocating their time between productivity-enhancing and non-productive activities (see Lemma 1 where $s_{N,t+1}^* = s_{M,t+1}^* = 0$ if $m_t < \hat{e}$): Irrespective of their different viewpoints, i.e., the different importance they attach to their material conditions, the return to productivity-enhancing investment is low enough to deter everyone (i.e., agents of both types) from undertaking it. Even Type- M agents find it optimal to compromise, thus accepting a relatively low level of consumption, exactly like Type- N agents do. Consequently, parents cannot perceive any differences in utility, which will induce them to intensify their children's indoctrination towards their own cultural values; the only reason why they devote any effort towards cultural indoctrination is simply because of their desire to have culturally similar children.¹² The outcomes differ, however, when the number of those who can potentially invest in productivity improvements (i.e., the materialists) is enough to induce sufficiently high benefits from learning spillovers. Now, different cultural values and attitudes are manifested in different decisions. Contrary to non-materialistic agents, materialists undertake ventures that will ultimately allow them to satisfy their greater desire for material goods. Therefore, there is a wedge in parents' perceptions of the different utilities associated with correspondingly different decisions – a wedge that unavoidably

¹² To clarify, the distinction is between economic decisions (captured by s_j) and decisions directed at the cultural indoctrination of one's offspring (captured by p_j). When $m_t < \hat{e}$, parents of both types make the same economic decisions. Their decisions regarding cultural indoctrination may still differ, however, due to (i) the different 'ego' rent associated with successfully instilling their desired trait in their offspring, and (ii) the presence of cultural substitution (which, in turn, emanates from the possibility of oblique transmission) that induces parents to determine their p_j according to what share of the population adhere to their preferred behavioural trait j .

leans in favour of the cultural trait that parents adhere to. Thus, they intensify their efforts to instil this trait in their children. Interestingly, higher productivity prompts parents of both types to intensify the cultural instruction of their offspring. This is an intuitive result however: No matter what a parent's cultural trait is, higher productivity and income amplify the gap between what she perceives as being optimal, from her point of view, and what she perceives as being the alternative.¹³

5 Productivity Growth and Cultural Change

In this section, we will present and analyse the joint evolution of productivity growth and cultural change, as well as the implications for the economy's long-term prospects. First, consider the dynamics of productivity. Using (1)-(2) and taking account that the number of those actively engaged in the process of productivity improvements (e_{t+1}) is either 0 or equal to the number of agents who uphold materialistic preferences, i.e., m_{t+1} , average productivity is $a_{t+1} = a_t$ if $m_{t+1} < \hat{e}$ and $a_{t+1} = a_t(1 + \gamma_{t+1}m_{t+1}s_{M,t+1}^*)$ if $m_{t+1} \geq \hat{e}$. For expositional purposes, let us define the transformed variable $m_{t+1} \equiv \tilde{m}_t$. Of course, $m \equiv \tilde{m}$ in the steady state, meaning that $\tilde{m}_t$ also measures the share of materialists in the population.¹⁴ Combining (13) and $m_{t+1} \equiv \tilde{m}_t$, it follows that average productivity evolves according to

$$a_{t+1} = \begin{cases} a_t & \text{if } \tilde{m}_t < \hat{e} \\ a_t \{1 + \tilde{m}_t [\bar{\gamma}\theta - (1 - \theta)(1 - \varphi)]\} & \text{if } \tilde{m}_t \geq \hat{e} \end{cases} \quad (34)$$

¹³ To elaborate on this point, denote $i \neq j$ and consider two of the outcomes from the preceding analysis. Firstly, from (25)-(28) and (32)-(33) it follows that $\psi_{j,j} - \psi_{i,j} > 0$. This makes sense as $\psi_{j,j}$ is the optimal utility for an agent of Type- j , whereas $\psi_{i,j}$ is the utility corresponding to making choices that are not perceived as optimal by the Type- j agent. This is in fact why parents wish to instil their own behavioural traits in their children. Secondly, the same expressions reveal that $\partial(\psi_{j,j} - \psi_{i,j}) / \partial a > 0$ irrespective of the agent's type. Put differently, even parents who do not possess strong material aspirations ($j = N$) will respond to higher productivity by intensifying their efforts to instil their own behavioural trait in their children, because they assess that higher productivity may lead their children to attain more consumption (through income-earning activities) and less leisure to what their parents deem optimal.

¹⁴ This transformation is of course not necessary for our mechanisms and results. Nevertheless, it facilitates the exposition as (i) it allows us to express the planar system of autonomous difference equations in a representation that is standard in the literature, that is $x_{t+1} = F(x_t, y_t)$ and $y_{t+1} = Z(x_t, y_t)$ (e.g., Azariadis, 1993; Galor, 2007); (ii) this representation will allow the construction of the phase diagram through which we demonstrate and discuss the economy's dynamics.

It will also be instructive to express (34) in terms of the growth rate of productivity

$g_{t+1} \equiv \frac{a_{t+1}}{a_t} - 1$. That is,

$$g_{t+1} = \begin{cases} 0 & \text{if } \tilde{m}_t < \hat{e} \\ \tilde{m}_t[\bar{\gamma}\theta - (1-\theta)(1-\varphi)] > 0 & \text{if } \tilde{m}_t \geq \hat{e} \end{cases} \quad (35)$$

The preceding analysis allows us to infer the critical role of cultural factors for the economy's prospects towards increased productivity. This is formally presented in

Proposition 1. *Economic transformation, occurring through the onset of productivity growth, is possible only if there is a critical mass of materialists, i.e., agents who attach high importance to their material conditions because of their aspirations.*

Proof. By virtue of Assumption 1, it is $\bar{\gamma}\theta - (1-\theta)(1-\varphi) > 0$. Consequently, the result follows from the expressions in (34) and (35). $\square$

This result is quite intuitive. The benefits offered by learning spillovers are sufficient to induce productivity-enhancing investments only to those agents whose decisions are partly driven by the strength of their consumption aspirations, captured by φ . In light of this outcome, productivity growth is a process driven by the activities of these agents, i.e., the materialists.

Now, consider the dynamics of cultural change. We begin by specifying the function $b(m_t)$, i.e., the likelihood that a child who adopts her trait through cultural instruction outside the family, picks a role model who adheres to the values of economic materialism. Particularly, we consider the following:

$$b(m_t) = m_t. \quad (36)$$

Indeed, the specification in (36) is what the majority of studies typically assume (e.g., Bisin and Verdier, 2001).

Combining (17)-(19) and (36), we can show that $m_{t+1} = m_t[1 + (1 - m_t)(p_{M,t}^* - p_{N,t}^*)]$. Furthermore, note the circumstances when $a_{t+1} = a_t$ in (34)-(35). Put differently, if a_0 represents the initial level of productivity, and as long as the initial distribution of traits satisfies $\tilde{m}_0 \leq \hat{e}$, it is $a_{t+1} = a_t = a_0$ when $\tilde{m}_t \leq \hat{e}$. We can combine these results with (30),

(31) and (36), and use the transformed variable $m_{t+1} \equiv \tilde{m}_t$ to express the dynamics of cultural change, captured by the evolution of materialistic preferences in the population. Formally,

$$\tilde{m}_{t+1} = \begin{cases} \tilde{m}_t \left[1 + (1 - \tilde{m}_t) \frac{(1 - \tilde{m}_t)f_M - \tilde{m}_t f_N}{\kappa + a_0^\theta} \right] & \text{if } \tilde{m}_t < \hat{e} \\ \tilde{m}_t \left[1 + (1 - \tilde{m}_t) \frac{(1 - \tilde{m}_t)(f_M + a_t^\theta \mu) - \tilde{m}_t(f_N + a_t^\theta \nu)}{\kappa + a_t^\theta} \right] & \text{if } \tilde{m}_t \geq \hat{e} \end{cases}. \quad (37)$$

It will be useful to express (37) in terms of the change in the number of materialists in the population, i.e., $\Delta \tilde{m}_{t+1} \equiv \tilde{m}_{t+1} - \tilde{m}_t$. That is

$$\Delta \tilde{m}_{t+1} = \begin{cases} \begin{cases} > 0 & \text{for } \tilde{m}_t < m^* \\ < 0 & \text{for } \tilde{m}_t > m^* \end{cases} & \text{if } \tilde{m}_t < \hat{e} \\ \begin{cases} > 0 & \text{for } \tilde{m}_t < \tilde{m}_t^{**} \\ < 0 & \text{for } \tilde{m}_t > \tilde{m}_t^{**} \end{cases} & \text{if } \tilde{m}_t \geq \hat{e} \end{cases}, \quad (38)$$

where

$$m^* \equiv \frac{f_M}{f_M + f_N}, \quad (39)$$

and

$$\tilde{m}_t^{**} \equiv \frac{f_M + a_t^\theta \mu}{f_M + f_N + a_t^\theta (\mu + \nu)}. \quad (40)$$

Before we proceed, we should clarify that m^* and $\tilde{m}_t^{**}$ are not thresholds; they are steady state solutions to which the distribution of preferences among the population converges, for given level of productivity.¹⁵ The reason why the cultural transmission process has the tendency to converge to an interior steady state is because the oblique transmission (i.e., indoctrination outside the family environment) is a substitute to parents' own efforts to indoctrinate their offspring – a point that we also discussed earlier. Given that a parent's effort to instil a desired trait in her offspring decreases when there is a wider adherence to this trait in the population, the forces of cultural substitution diverge away from corner solutions where one trait ultimately prevails (i.e.,

¹⁵ The fact that both of these are attracting points can be inferred from (i) the solutions in (39) and (40) which solve $\Delta \tilde{m}_{t+1} = 0$ ($\tilde{m}_{t+1} = \tilde{m}_t$) in (37), and (ii) the expression in (38) where $\Delta \tilde{m}_{t+1} < 0$ ($\Delta \tilde{m}_{t+1} > 0$) for values of $\tilde{m}_t$ that are above (below) these solutions.

$m=0$ or $m=1$); instead, they converge towards an equilibrium of cultural heterogeneity where both behavioural traits are observed in the population. This is an outcome that Bisin and Verdier (2001, 2008) pointed out in their seminal work on cultural transmission. Of course, the interior solution for the distribution of traits among the population is endogenous and depends on various characteristics of the model's environment that affect parental incentives. In the case of our model, we have already shown that, when the share of Type- M agents reaches and exceeds the critical mass $\hat{e}$, there is a distinct change in parents' efforts to socialise their children, for which economic activity – through productivity – becomes a more important factor (see Eq. 30, Eq. 31 and Lemma 2). Naturally, this shift is reflected in the dynamics presented in (38) and in the outcome where one of the attracting solutions (i.e., $\tilde{m}_i^{**}$) is affected by productivity. In fact, this outcome will have major implications for the overall transitional dynamics, as we demonstrate at a later point. It is also worth reemphasising our previous point that the term K (see Eq. 29) has no bearing whatsoever on the outcomes of (39)-(40), thus verifying that its use is simply a technical device with no other implication other than to ensure that the probability of successful direct transmission from parents to offspring is bounded below 1.

We will pursue the analysis under a scenario where, in terms of how Type- M parents perceive the benefits of their offspring's cultural instruction relative to Type- N ones, the relative utility differences that emanate from different levels of consumption exceed the relative 'payoffs' that emanate from nurturing children that are culturally similar to them. This is a reasonable scenario, as it means that, in the context of socialisation and cultural instruction, considerations that relate to their children's material circumstances are relatively more important for Type- M parents, compared to Type- N ones. This case is formalised through

Assumption 3. $\frac{f_M}{\mu} < \frac{f_N}{\nu}$.

Now we can infer the impact of productivity growth on the evolution of the distribution of cultural traits among the population. This is something we do in

Proposition 2. *Productivity growth promotes a cultural change that increases the population share of agents with material aspirations.*

Proof. It follows from $\frac{\partial \tilde{m}_t^{**}}{\partial a_t} > 0$ and $\tilde{m}_t^{**} > m^*$; see Appendix A.3. $\square$

Of course, this is an outcome that is intuitive, once we account for the preceding results and discussion. When the number of Type- M agents is below the critical threshold $\hat{e}$, no agent finds optimal to invest in productivity-enhancing activities, irrespective of her type, meaning that parents do not perceive any potential differences in their children's utility that will emanate from consumption. The only reason why they devote any effort in instilling their own cultural values in their offspring is simply because of their desire to raise children that will be culturally similar to them. Under such circumstances, and if $\tilde{m}_0 < m^* < \hat{e}$, the number of potential investors, i.e., the materialists, would never exceed the critical threshold necessary to induce productivity-enhancing efforts. The distribution of cultural values among the population would converge to a long-run equilibrium where the number of agents who adhere to materialistic values is m^* .¹⁶ If $m^* > \hat{e}$, however, the critical threshold can be exceeded, meaning that materialists will have sufficient incentives to invest towards productivity improvements. Type- M parents are more sensitive to perceived differences in their offspring's utility that emanate from differences in the level of material possessions that they can afford. Therefore, they intensify their efforts to inculcate their children with materialistic attitudes; this is the reason why higher productivity and income lead to a higher fraction of materialists in the population, i.e., $\tilde{m}_t^{**} > m^*$.¹⁷

¹⁶ As it is evident from (39), the only factors that affect the equilibrium m^* are the 'ego rents' that parents enjoy if their children assimilate the same preferences and attitudes. This is because convergence to this equilibrium occurs only if the economy never escapes stagnation which, in turn, happens when $m^* < \hat{e}$.

¹⁷ When circumstances allow an eventual escape from stagnation (i.e., when $m^* > \hat{e}$), the equilibrium that applies is not m^* but $\tilde{m}_t^{**}$. As it is evident from (40) this equilibrium is also affected by productivity and by the factors that determine parents' perceived differences in utility relating to their offspring adopting either the M or the N trait (captured by the composite terms μ and ν in Eq. 32 and 33 respectively).

The previous arguments can direct us to the following result, which will be essential in our understanding of the model's implications. We present it through

Proposition 3. *There is a cultural-economic complementarity, in the sense that the culturally-induced increase of materialists in the population and productivity growth are mutually reinforcing.*

Proof. It follows from the preceding analysis and discussion. $\square$

Now we can turn our attention to the economy's transition from an initial stage of development towards its long-term outcomes. With the previous discussion in mind, it is meaningful to do this under

Assumption 4. $m^* > \hat{e} \Leftrightarrow \frac{f_M}{f_M + f_N} > \hat{e}.$

Given a pair of initial values a_0 and $\tilde{m}_0$, the dynamic equilibrium is a sequence for $\{a_t\}_{t=1}^\infty$ and $\{\tilde{m}_t\}_{t=1}^\infty$ that satisfies the system of difference equations in (34) and (37). Below, we present the economy's long-term equilibrium outcomes:

Proposition 4. *Under Assumption 4, the sequences $\{\tilde{m}_t\}_{t=1}^\infty$ and $\{a_t\}_{t=1}^\infty$ will converge monotonically to a long-run equilibrium where the distribution of preferences among the population reaches a stationary value $m^{**} = \frac{\mu}{\mu + \nu}$, whereas productivity sustains a positive*

$$\text{growth rate } g^* = \frac{\Delta a}{a} = \frac{\mu}{\mu + \nu} [\bar{\gamma}\theta - (1 - \theta)(1 - \phi)] > 0.$$

Proof. See Appendix A.4. $\square$

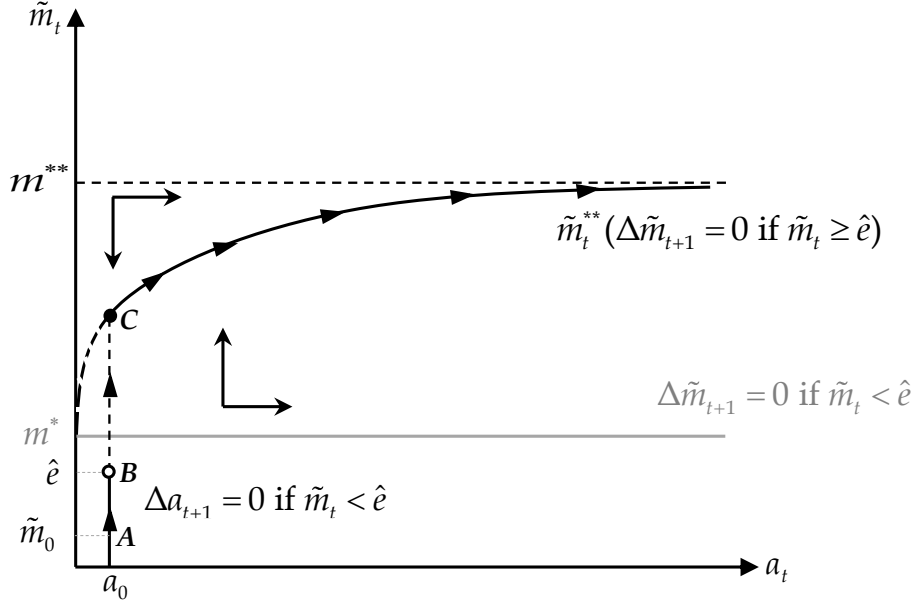


Figure 2. The phase diagram.

The dynamics are illustrated on the phase diagram of Figure 2, where the example drawn considers a pair of initial values at point A: These are a_0 for productivity, and $\tilde{m}_0 < \hat{e}$ for the share of materialist (Type- M) agents in the population. At the initial stages, the economy remains stagnant as the level of productivity is constant at a_0 . Indeed, (34) indicates that $\Delta a_{t+1} = 0$ for $\tilde{m}_t < \hat{e}$. This is because there is no critical mass of agents whose activities can contribute to widespread gains in knowledge; consequently, no agent finds optimal to devote any effort towards productivity-enhancing ventures (see Lemma 1). At the same time, however, the dynamics of cultural transmission cause a gradual rise of the share of materialists in the population. This can be verified from (38) where we can see that $\Delta \tilde{m}_{t+1} > 0$ for $\tilde{m}_t < \hat{e}$. While productivity remains constant at a_0 , the share of materialists $\tilde{m}_t$ gradually increases from point A, towards the steady state m^* , i.e., the solution in (39) (drawn in grey colour in Figure 2). In technical terms, the rise of $\tilde{m}_t$ in these early stages is attributed to the fact that its initial value is lower than its potential steady state. In terms of intuition, this rise is attributed to the idea of cultural substitution (Bisin and Verdier 2001, 2008) to which we also alluded at an earlier part of our analysis: Given the initially low population share of agents with material aspirations, Type- M parents intensify their efforts to instil such aspirations in their children because this is less likely to occur

through the oblique transmission (i.e., outside the family environment). As this happens, however, the gradual rise in the mass of Type- M agents also increases the likelihood of indoctrination towards more materialistic preferences through the oblique transmission as well – a factor that also contributes to the rise of the population share of agents with material aspirations during this stage.

We can think of this process as an additional mechanism through which the cultural flux triggered by the Protestant Reformation gradually paved the way for economic prosperity. This mechanism is complementary to Becker and Woessmann (2009), whose thesis is that Luther's support for schooling, as a means of enabling individuals to read the Bible by themselves, was key in triggering the widespread improvements in human capital that promoted economic progress. The mechanism that our model proposes is founded on the fact that the gradual advancement of Protestantism also dispelled the presumption of moral transgression in the pursuit of wealth, thus ingraining people with aspirations regarding their material circumstances (e.g., McClelland, 1961). The gradual diffusion of these attitudes throughout greater segments of the population precipitated the engagement with productivity-improving activities (including human capital formation) that boosted economic activity.

Indeed, the period of stagnation lasts for as long as it takes $\tilde{m}_t$ to increase from A to B in Figure 2, i.e., the point where agents with material aspirations reach the critical mass $\hat{e}$. Once this happens, the economy experiences a 'take-off': In terms of Figure 2, $\tilde{m}_t$ will exceed $\hat{e}$ and m^* , and keep growing together with productivity a_t along the curve beginning at point C. In the long-run, the share of agents with material aspirations will converge to the steady state value m^{**} , whereas productivity and income sustain positive growth (as a_t increases over time) which eventually converges to g^* (see Proposition 4). Indeed, we can use the preceding analysis to verify that, for $\tilde{m}_t \geq \hat{e}$, (35) implies that $g_{t+1} > 0 \Leftrightarrow \Delta a_{t+1} > 0$ while (38) and (40) show that $\Delta \tilde{m}_{t+1} > 0$ towards $\tilde{m}_t^{**}$ which satisfies $\partial \tilde{m}_t^{**} / \partial a_t > 0$ and $\lim_{a_t \rightarrow \infty} \tilde{m}_t^{**} = m^{**}$. The intuition behind these dynamics mainly rests with the underlying cultural-economic complementarity that we alluded to earlier. When Type- M agents reach the critical mass $\hat{e}$, and in light of the potential learning spillovers, those who possess material aspirations have enough incentives to

devote resources towards productivity improvements (see Lemma 1). Consequently, average productivity and income begin growing at positive rates. This highlights the significance of the culture of economic materialism for the economy's take-off. Nevertheless, this culture is not impervious to the onset of growth in economic activity. As we have shown and discussed in Proposition 2, productivity growth promotes the assimilation of materialistic attitudes by a gradually increasing share of the population. Hereafter, the mutually-reinforcing (i.e., two-way causal) relation between culturally-induced material aspirations and economic activity is what drives the economy's dynamics: As a result of economic growth, the rising share of agents with material aspirations remains high enough to ensure sufficient engagement with productivity-enhancing activities which, in turn, foster the sustained rise of average income.

Given the preceding discussion, we highlight the upshot of our model's analysis through the following¹⁸

Corollary. *The complementarity between the culturally-induced assimilation of material aspirations and productivity improvements facilitates the process of economic transformation. It allows the economy to escape stagnation and to sustain a path of income expansion.*

6 Discussion and Alternative Specifications

Before we proceed to model modifications that aim at highlighting the robustness of our results, we should elaborate on some aspects of the mechanisms and implications of our model after reemphasising that our study's objective is to formalise the role of the evolution of values and attitudes akin to material aspirations in contributing to (i) the take-off from stagnation, and (ii) the perpetuation of differences in productivity and

¹⁸ It should be noted that the dynamics drawn in Figure 2, and discussed throughout, obviously abide by Assumption 4. If this assumption is violated, and instead $m^* < \hat{e}$ applies, the model's outcomes would be quite different. Specifically, the economy would be unlikely to escape stagnation under an initial condition $m_0 < \hat{e}$ because the share of Type- M agents would be attracted to a steady state solution (m^*) that is less than the critical population mass necessary to induce productivity-enhancing investment. Sustained growth in this case would be achieved only under an initial condition where $m_0 > \hat{e}$: In that case, the economy would not even experience stagnation, but sustain positive growth from the outset. We view both these outcomes as being of limited interest, as Assumption 4 can facilitate richer outcomes that entail a take-off from stagnation to sustained economic growth.

income beyond this take-off. Let us begin with the context and mechanisms of the pre-takeoff (stagnation) stage. We are motivated by – and seek to provide mechanisms consistent with – the broad historical context and ideas that are aptly reflected in, among others, the work of Mokyr (2016) and de Vries (2008). Mokyr’s (2016) thesis is that changes in values, beliefs and attitudes that occurred between 1500 and 1700 represented a cultural breakthrough that was responsible for eventually triggering the economic decisions associated with the Industrial Revolution. Put differently, he advances the idea that pre-takeoff phase was one of cultural flux despite its economic impasse. Further arguments by de Vries (2008) offer support to the specific mechanisms that our theory advances, as he places the emerging culture of material aspirations at the forefront of the historical context from which the Industrial Revolution ensued.

When restricting focus on the outcomes ahead of the take-off, our model’s dynamics are consistent with the aforementioned context. From a technical point of view, these dynamics are characterised by the evolution of two variables, an economic and a cultural one, the former of which remains constant in the periods that precede the take-off. This is the very essence of economic stagnation after all, i.e., a situation where income per capita is not growing. In this respect, the fact that only one variable evolves in the pre-takeoff stage is a core element of the ideas that our theory advances. Still, however, the economic impasse in our model’s early transition stages could be misconstrued as lacking sufficient economic context. In response, we should bear in mind that the lack of investment in productivity improvements, i.e., the very reason for such economic impasse, is the outcome of agents’ optimal decisions in a micro-founded framework. Indeed, the corner solutions $s_j^* = 0$ for both types of agents, i.e., even Type- M ones when their population share is not high enough (see Lemma 1), represent optimal economic decisions. Furthermore, these economic decisions that ultimately keep the economy in a state of stagnation are largely informed by the prevailing culture, i.e., the limited importance of material aspirations among the population, in the early phases of our model’s dynamics. In this respect, culture is not just a technical device that merely induces a delay in the timing of the take-off. On the contrary, this culture (or lack thereof) explains the economic context that is governing this delay after all. Although the lack of economic changes that can promote growth, at the same time when there are

changes in the distribution of different cultural traits among the population, may appear as a limitation, we do not regard it as such in light of the broad context that our framework seeks to formalise. Our economic variables are variables that govern the process of economic growth. Had they responded significantly to cultural change in the periods ahead of the take-off, as they actually do in our model's later stages of the dynamics, then there would not be any notable distinction between pre- and post-takeoff stages in the first place. The model would be one where, from the get go, the interplay between cultural change and economic decision-making sustains a dynamic path where positive growth and an increasing adherence to materialistic attitudes occur simultaneously – as they do in what is the post-takeoff stage in our set-up. Since our framework is one where growth-promoting actions and the underlying process of cultural change are two-way causal, such an environment would blur cause and effect, thus being at odds with the previously mentioned broad context and arguments by researchers who claim that a long-process of gradual cultural change was among the causal factors of the economic take-off – exactly what happens in our model. Rather than suggesting that the economic environment is impervious to cultural change, our model's implications about the period ahead of the take-off should be interpreted differently: The change in cultural attitudes has to become sufficiently widespread among the population in order to unleash the economic responses that enact the take-off from stagnation to positive growth.

A natural follow-up question could be the following: Why is there a cultural flux, in which the distribution of preference traits among the population change, despite stagnant economic conditions? As detailed in Section 4, to induce the evolution of the population share of agents with material aspirations we follow an approach that unfolds intergenerationally, i.e., personality traits are optimally ingrained from earlier to subsequent generations. This approach emanates from the influential work of Bisin and Verdier (2001), thus it adopts their endogenous process of intergenerational transmission: This is a theory where agents are inculcated with their personality traits as part of their upbringing by their progenitors, who wish for their descendants to be similar to them, personality-wise, thus they devote effort to maximise the chances that their offspring, and those for whom they can act as cultural instructors, adopt their

values, beliefs and attitudes. The reasons they find this optimal rest with the combination of their paternalistic altruism and ego considerations of wishing for their descendants to share the same values, beliefs and attitudes as they do – see Bisin and Verdier (2001, 2008) for a more detailed discussion on the behavioural foundations of this approach. Their cultural indoctrination efforts can be partially informed by prevailing economic conditions (as it is, in fact, the case in our model beyond the economy’s take-off) but the underlying motives for wishing to instil specific personality traits are wider and exist even under the economic impasse of stagnation, hence why there is cultural change in the model’s phase ahead of the take-off. At this point, it is worth reminding that the seemingly simple technical nature of the resulting dynamic process whereby $\tilde{m}_t$ increases if its temporal value lies below its steady state, is the ultimate outcome of an underlying micro-founded and optimising framework where agents make decisions on how to socialise and indoctrinate their offspring. It is also worth emphasising that, because of the application of intergenerational cultural transmission, the cultural variable in our model (i.e., the share of agents with material aspirations) is a state variable. In other words, the characterisation of its dynamics requires a given initial condition $\tilde{m}_0$. This $\tilde{m}_0$ may reflect the fact that the Reformation dispelled the perceived moral conflict between religious beliefs and material aspirations from a share of the population. Alternatively, the presence of this $\tilde{m}_0$ may generally reflect any deep-rooted traits that generate an *ex ante* cultural heterogeneity in the population, as in Galor and Özak (2016). For the purposes of our model, that would be the given initial value for our cultural variable and this is where the story and the dynamics of our model begin. This differs from other approaches in which agents shape their personalities themselves as a result of their own choice of the type of cognitive reasoning they find optimal to apply – see for example Strulik (2016) for an application in the choice between secular and religious activities. While we acknowledge the potential value and validity of frameworks where, in the course of their lifetime, individuals themselves adapt by changing their existing values and by espousing new ones, this is not what our study is about. Instead, we follow others (e.g., Bisin and Verdier, 2001; Francois and Zabojnik, 2010; Klasing and Milionis, 2014; Galor and Özak, 2016) in viewing culture as a collection of traits, attitudes and beliefs that evolve from

one generation to another. In this respect, the methodological choice of intergenerational transmission seems better suited to our study's purpose. It is also important to note that existing research offers credence and empirical relevance to our methodological choice. For example, Bisin *et al.* (2004) present empirical estimates in support of the behavioural foundations of intergenerational transmission, i.e., that parents have strong preferences for their children to abide by their own beliefs, and that they take costly actions to ensure this.

Retaining the focus on the model's dynamics ahead of the take-off, the preceding analysis and arguments indicate that our approach is to treat stagnation as a transitional state and concentrate on the evolution of cultural traits that will eventually foster an economy's escape from it. A different approach, similar to the one in Strulik (2016) for example, would be to consider the stagnation (or low income in general) phase as a stable equilibrium and show how a permanent exogenous shock to one of the model's parameters can position this 'original' steady state above a threshold, thus generating dynamics towards a new stable equilibrium with different cultural characteristics that are conducive to higher income. In this respect, our dynamic implications are closer to the spirit of Galor and Weil (2000), in the sense that the transition from the phase of stagnation to the phase of sustained economic growth occurs deterministically, without the push from some sort of exogenous, permanent shift in one of the parameters. In Galor and Weil (2000), it is a slow but gradual, scale-induced change in the state of technology during the stagnation phase that eventually leads to the economy's transition to sustained growth. Our model advances the role of a micro-founded increase in the cultural diffusion of material aspirations, through the application of the well-established paradigm of intergenerational transmission from Bisin and Verdier (2001) to the context of long-run economic growth. Nevertheless, the current version of our model can generate circumstances and implications similar to the alternative approach, without any change to the mechanisms, intuition and ideas of the dynamics we presented previously. For example, let us relax Assumption 4 and assume instead that $m^* < \hat{e}$ holds. By virtue of (38) and as long as the initial condition satisfies $\tilde{m}_0 < \hat{e}$, a stagnation phase where $a_{t+1} = a_t = a_0$ and $\tilde{m}_{t+1} = \tilde{m}_t = m^*$, where $m^* = f_M / (f_M + f_N)$ from (39), is a stable steady state equilibrium in this case. Now consider an economy currently

in this stable steady state of stagnation, in which an exogenous event causes a behavioural shift in the sense that Type- M agents now assess that it is even more justified and desirable to instil aspiration-inducing traits in their descendants – formally an increase from f_M to $f_{M,+}$. From a conceptual point of view, this event may be associated with the Protestant Reformation as it dispelled notions of moral transgression and guilt in the pursuit of material goals, thus intensifying the urge of aspirations-driven people to encourage similar behavioural traits in their descendants. As long as this shift is enough to be consistent with $\hat{e} < f_{M,+} / (f_{M,+} + f_N)$, the original steady state m^* becomes the initial condition of a new dynamic process where, due to cultural transmission, the share of Type- M agents will gradually exceed the threshold above which the economy sustains positive growth due to the interplay between a wider adherence to materialistic attitudes and productivity-improving investments. Note, however, that once the exogenous event initiates this dynamic process, the mechanisms of the model's dynamics, as well as their intuition, are identical to our existing model.¹⁹

Now, let us introduce the (post-takeoff) stage of sustained economic growth into the frame of this discussion about the context and implications of our framework. The model's dynamics from stagnation to sustained growth, combined with the outcome in Proposition 4, may give the impression that circumstances that either delay or expedite the economic take-off have no implications for long-term outcomes. In Sections 6.2 and 6.3, we will present extensions of the model in which the critical mass of agents with material aspirations, necessary for the economy's take-off and, therefore, its timing, is endogenous and depends on parameters that also determine economic performance following the transition to sustained growth. In other words, structural characteristics that promote an earlier take-off, are also characteristics that promote improved growth performance post-transition. Even in the context of the current version of the model, however, the earlier impression may be somehow misleading if it overlooks the distinction between growth and level effects. For example, imagine two economies that are identical in every respect, apart from the initial share of agents with material aspirations $\tilde{m}_0$. Both economies will experience a cultural transition (due to

¹⁹ In Appendix A.6, we also sketch the analysis and discuss the implications of a modified version of the model, designed to induce an unstable steady state that acts as a natural threshold in the dynamics of cultural transmission.

intergenerational transmission) towards the threshold that will induce the take-off and, once this happens, the long-run equilibrium growth rate of these economies will be the same. It is exactly for this reason, however, that the economy with a higher $\tilde{m}_0$, and therefore the earlier timing of the take-off, will have a permanently higher level of output following the take-off. In Figure 3 we present a numerical example of this scenario, clearly showing that the circumstances surrounding the timing towards the transition can induce permanent differences in income per capita following this transition. If anything, this is an outcome that is consistent with research work and ideas according to which early divergence, due to differences in the timing of the take-off, is a significant determinant of late divergence (e.g., Galor, 2005).

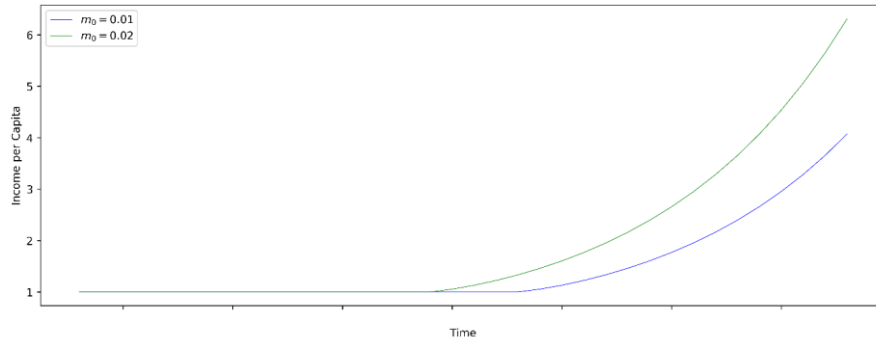


Figure 3. *Cultural differences, timing of take-off and long-term divergence (see Section 6.3 for the parameters used in this numerical example).*

Throughout our paper, we made a choice of specific functional forms in order to facilitate the exposition of our analysis. Some of these specifications were chosen based on relevance, as we assessed that they are better suited in capturing key concepts of our analysis; others were adopted mainly for reasons of analytical tractability. The purpose of this section is to show that our main results and implications are robust to changes in these specifications, as well as to broaden the implications that emanate from our framework.

6.1 A Different Approach to Materialistic Preferences

Our model formalises the idea of materialistic preferences by assuming that Type-*M* agents aspire to improve upon the material living standards of their antecedents – an

idea captured by the term $\Phi_j(c_{j,t+1} - \tilde{c}_t)$ in (5). Although this specification resembles the one adopted in models of external habit formation, this does not invalidate its conceptual suitability for the circumstances we seek to capture. In our overlapping generations framework, the ‘previous period’s’ consumption is the average consumption of the preceding generation; hence, our current specification seems particularly fitting to an environment where (some) agents of the current generation aspire to achieve better material conditions compared to the previous generation.

It should be noted, however, that our results and implications do not depend critically on the adoption of consumption aspirations as a means of capturing materialistic preferences. An alternative scenario involves differences in the parameter that quantifies the relative importance of consumption on agents’ preferences. Formally, let us consider an environment where $\Phi_j = 0 \ \forall j = \{M, N\}$; instead, what differentiates agents’ preferences is captured by

$$\theta_j = \begin{cases} \theta_M & \text{if } j = M \\ \theta_N & \text{if } j = N \end{cases}, \quad \theta_M > \theta_N. \quad (41)$$

The utility function in (5) is replaced by

$$u_{j,t+1} = (1 - s_{j,t+1})^{1-\theta_j} c_{j,t+1}^{\theta_j}, \quad (42)$$

while everything else in the model’s set-up remains the same as in the original version. Obviously, the ‘materialists’ in this case are those agents who attach a greater weight to the utility from the consumption of material goods. Given this set-up, it is straightforward to establish that the optimal solution for investment in productivity improvements is

$$s_{j,t+1}^* = \max \left\{ 0, \frac{\theta_j \gamma(e_{t+1}) - (1 - \theta_j)}{\gamma(e_{t+1})} \right\}. \quad (43)$$

Replacing Assumption 1 with $\underline{\gamma} < (1 - \theta_M) / \theta_M < \bar{\gamma} < (1 - \theta_N) / \theta_N$, and taking account of (43), means that the solutions of Lemma 1 are replaced by

$$s_{N,t+1}^* = 0, \quad (44)$$

$$s_{M,t+1}^* = \begin{cases} 0 & \text{if } m_{t+1} < \hat{e} \\ \frac{\theta_M \bar{\gamma} - (1 - \theta_M)}{\bar{\gamma}} > 0 & \text{if } m_{t+1} \geq \hat{e} \end{cases}. \quad (45)$$

Clearly, these solutions indicate that the model's outcomes regarding investments in productivity improvements by different types of agents – and, hence, the dynamics of productivity for given distribution of preferences among the population – remain qualitatively identical to our original version. The only difference involves the intuition: Rather than material aspirations, it is now the greater relative weight on material goods' consumption that motivates Type- M agents to pursue such investments, in contrast to Type- N agents who attach a greater importance to non-productive activities, such as leisure for example. The similarity also carries to the dynamics of cultural transmission, since all the expressions from (37) to (40) – hence, all the results that follow them – remain identical to the original version. The only change is in the composite terms originally in (32) and (33), which in this case they are expressed as follows:

$$\mu \equiv (1 - \theta_M)^{1 - \theta_M} \theta_M^{\theta_M} (1 + \bar{\gamma}) \left(\frac{1}{\bar{\gamma}} \right)^{1 - \theta_M} - 1, \quad (46)$$

$$\nu \equiv 1 - (1 - \theta_M)^{1 - \theta_N} \theta_M^{\theta_N} (1 + \bar{\gamma}) \left(\frac{1}{\bar{\gamma}} \right)^{1 - \theta_N}. \quad (47)$$

Despite the similarities in outcomes, we view our original specification as being better suited to our objective, which is to highlight the role of material aspirations and the cultural evolution of such materialistic attitudes for economic transformation. This is because it involves a term that has a clear interpretation as a culturally-induced consumption goal that agents aspire to achieve. The same perhaps cannot be said about cultural differences in the parameter θ for which the interpretation could be vague: Rather than materialistic attitudes, it may capture different preferences for leisure or, in a wider setting, differences in time preference etc.

6.2 Endogenous Threshold

In the original version of the model, the threshold that determined the critical mass of agents necessary to induce productivity-improving activities was an exogenous $\hat{e}$, as introduced in (2). This type of threshold externality is a useful technical device to generate circumstances where the economy experiences a transition between two

distinct regimes, without any excessive complication that undermines the model's analytical tractability. It should also be noted that the use of exogenous parameters as a means to generate threshold effects – and a transition between different regimes – is not without precedent in the literature. Galor and Tsiddon (1997) consider an exogenous human capital threshold to generate a shift in the rate of technological progress. An exogenous subsistence parameter is responsible for the emergence of a critical threshold in Galor and Weil (2000), while Galor and Moav (2004) generate a threshold by means of an exogenous lower bound in the marginal utility from parental bequests.

Our objective here is to show that the main outcomes of our baseline model remain the same, even if the threshold $\hat{e}$ is not exogenous but emerges endogenously from the model's outcomes. To do so, we replace (2) with a continuous function $\gamma(e_{t+1})$ such that $\gamma'(e_{t+1}) > 0$ and $\gamma(0) = \underline{\gamma} < \bar{\gamma} = \gamma(1)$. Everything else in the model's set-up remains the same.

By virtue of (10), (11) and Assumption 1, it is straightforward to verify that $s_{N,t+1}^* = 0$, exactly as in (12). Furthermore, $s_{M,t+1}^* > 0$ as long as e_{t+1} exceeds the (now, endogenous) threshold defined by $\theta\gamma(\hat{e}) = (1-\theta)(1-\varphi)$; that is,

$$\hat{e} = \gamma^{-1}\left(\frac{(1-\theta)(1-\varphi)}{\theta}\right). \quad (48)$$

It also follows that, as in the original version of our model, only Type- M agents may undertake any productivity-enhancing investments, i.e., $e_{t+1} = m_{t+1}$. This means that the original result in (13) will now be replaced by

$$s_{M,t+1}^* = \begin{cases} 0 & \text{if } m_{t+1} \leq \hat{e} \\ \frac{\theta\gamma(m_{t+1}) - (1-\theta)(1-\varphi)}{\gamma(m_{t+1})} > 0 & \text{if } m_{t+1} > \hat{e} \end{cases} \quad (49)$$

which we can combine with (1) and the transformed variable $m_{t+1} = \tilde{m}_t$ to express the dynamics of productivity and growth (originally in Eq. 34 and 35) according to

$$a_{t+1} = \begin{cases} a_t & \text{if } \tilde{m}_t \leq \hat{e} \\ a_t \{1 + \tilde{m}_t [\gamma(\tilde{m}_t)\theta - (1-\theta)(1-\varphi)]\} & \text{if } \tilde{m}_t > \hat{e} \end{cases} \quad (50)$$

and

$$g_{t+1} = \begin{cases} 0 & \text{if } \tilde{m}_t \leq \hat{e} \\ \tilde{m}_t [\gamma(\tilde{m}_t)\theta - (1-\theta)(1-\varphi)] > 0 & \text{if } \tilde{m}_t > \hat{e} \end{cases} \quad (51)$$

As we can see, the modification of this section has not altered the main implications of the original model with regard to the role of culturally-induced material aspirations for the economy's take-off and for productivity growth. Once more, the take-off from stagnation to sustained growth requires a cultural environment where the population of agents with materialistic preferences exceeds the critical mass $\hat{e}$. In this case, the critical mass is endogenously determined by the characteristics presented in (48): *Ceteris paribus*, the threshold will be lower (and, hence, the take-off from stagnation to growth will occur earlier) if (i) all agents attach a greater weight in the utility from consumption (i.e., higher θ), or (ii) Type- M agents have stronger material aspirations (i.e., higher φ). One additional outcome of this section's extension is that, once the take-off occurs, investment activities will be continuously increasing in the population share of materialists – an outcome that actually strengthens the positive impact of the culturally-induced rise of economic materialism on productivity growth.²⁰

Nevertheless, the fact that s_M^* becomes a continuous function of m will severely undermine the analytical tractability of the cultural transmission dynamics that are originally presented in (37)-(40). The key outcome of the baseline version will remain intact – that is, the positive impact of economic activity a_t on the wider adoption of materialistic preferences among the population. In addition to cultural substitution, however, there will be yet another channel through which the share of Type- M agents will affect parents' decisions on the socialisation of their children. This will complicate the dynamics of (37) to such an extent that it would be impossible to obtain closed-form solutions for the steady states in (39)-(40). Given that the informational added value we get from the endogenous threshold in (48) does not change the main message of our study, we believe that the cost of its loss is far outweighed by the benefits of tractability and clarity. Nevertheless, later on we will use the idea of an endogenous threshold, together with the extension of Section 6.3 below, to assess the dynamics, relevance and implications of a more general, but numerically simulated, version of the model.

²⁰ The result in (49) shows that $\frac{\partial s_M^*}{\partial m} = \frac{\partial s_M^*}{\partial \gamma(m)} \gamma'(m) > 0$. Furthermore, the presence of $\gamma(m)$ in (51) is an additional channel through which $\frac{\partial g}{\partial m} > 0$.

6.3 A 'Luxury' Consumption Tax

Although issues that involve the explicit distinction between normal and luxury consumption goods go beyond the scope of this paper, it is still possible to approximate the impact of a 'luxury' consumption tax on the behaviour of agents with material aspirations and on the overall outcomes of our model. A technical device to achieve this in the simplest possible manner is as follows: Suppose that for each agent of the current generation, the excess over the average consumption of her peers, denoted $c_{t+1}^{average}$, is subject to a proportional consumption tax τ . It follows that they pay $\tau(c_{j,t+1} - c_{t+1}^{average})$ such that

$$\tau \begin{cases} = 0 & \text{if } c_{j,t+1} \leq c_{t+1}^{average} \\ > 0 & \text{if } c_{j,t+1} > c_{t+1}^{average} \end{cases} . \quad (52)$$

In order to focus solely on the effect of this tax on agents' decisions, with minimal complication to other aspects of the model, we also assume that each tax payer receives a transfer T_{t+1} : Although agents take this transfer as given when they make decisions, in equilibrium the revenues from taxation will be transferred back equally among those agents who paid consumption taxes.

Given this modification, in Appendix A.5 we show that the solution of Eq. (10) in the baseline version of the model changes to

$$s_{j,t+1}^* = \max \left\{ 0, \frac{\theta \gamma(e_{t+1}) - (1-\theta)(1+\tau)(1-\Phi_j)}{\gamma(e_{t+1})[1+(1-\theta)\tau]} \right\} . \quad (53)$$

Interesting implications emerge if we combine this outcome with the set-up of Section 6.2. Modifying Assumption 1 to $\underline{\gamma} < (1-\theta)(1+\tau)(1-\varphi)/\theta < \bar{\gamma} < (1-\theta)/\theta$, we can use (53) to show that $s_{N,t+1}^* = 0$ and $e_{t+1} = m_{t+1}$, while (49) is replaced by

$$s_{M,t+1}^* = \begin{cases} 0 & \text{if } m_{t+1} \leq \hat{e} \\ \frac{\theta \gamma(m_{t+1}) - (1-\theta)(1+\tau)(1-\varphi)}{\gamma(m_{t+1})[1+(1-\theta)\tau]} > 0 & \text{if } m_{t+1} > \hat{e} \end{cases} \quad (54)$$

where

$$\hat{e} = \gamma^{-1} \left(\frac{(1-\theta)(1+\tau)(1-\varphi)}{\theta} \right), \quad (55)$$

is the threshold that replaces the one in (48).

As expected, $\partial s_{M,t+1}^* / \partial \tau \leq 0$ meaning that a lower consumption tax increases the overall utility return of consumption, thus motivating agents with material aspirations to bolster their productivity and income which, in turn, allow them to afford more goods. Interestingly enough, the same outcome is responsible for decreasing the critical mass of materialists necessary to induce productivity improvements, as (55) indicates that $\partial \hat{e} / \partial \tau > 0$.

The latter outcome is particularly interesting as it raises the possibility that consumption-focused institutional and policy reforms may have partially contributed to an earlier timing of the economic take-off in countries that implemented them. From a historical point of view, the gradual abolition of sumptuary legislation in some European countries during the 17th and 18th centuries is a particularly relevant scenario. Sumptuary ordinances were adopted throughout the course of human history, imposing restrictions on the type of luxury goods (e.g., furniture and, especially, clothing) by social classes that were perceived as subordinate. Existing research has attributed sumptuary laws to various factors, such as the religious views on the moral contemptibility of extravagant spending, the protection of local economies from foreign trade in luxury goods and fabrics, as well as the further affirmation of hierarchical ranking among social classes (e.g., Kirtio, 2011). There is also a literature that makes a connection to issues pertaining to the non-pecuniary, aspirational motivations of consumption. However, this literature is ambiguous on how these cultural aspects of consumer behaviour may have ultimately affected the extent of sumptuary legislation. On the one hand, some researchers argue that the pursue of social status was a significant motive behind the ruling classes' support for restrictions via sumptuary ordinances (e.g., Desierto and Koyama, 2024). On the other hand, there are researchers who argue that the emerging consumption aspirations among 'inferior' social classes, and their desire to ratify them, restricted the practical enforcement of sumptuary laws and contributed to their gradual abolition (e.g., de Vries, 2008).

There is a common undertone in these arguments, in that they view the underlying cultural aspects of consumer behaviour as determinants of the extent of sumptuary legislation. Our model showcases the possibility of a reverse causal effect, whereby the relaxation of institutionally-imposed restrictions on consumption

expenditures can be a determinant of the prevailing culture among consumers. Although the added complexity does not allow us to offer an analytical description of the economy's dynamics in this version of our model (due to the issues discussed in the previous section), here we will elaborate in a numerically simulated version of this model. In particular, we will simulate the model's outcomes with regard to the dynamics of income per capita under different values of the tax parameter τ , and compare them to actual income per capita dynamics using data for England and France over the time period from 1530 to 1850, extracted from Maddison (2006). The idea is that differences in the 'luxury' consumption tax represent a proxy for differences in sumptuary legislation, i.e., an institutional factor that, by restricting consumption, may have instigated a change in the diffusion of aspirations-related character traits which, in turn, should have affected the dynamics of income per capita according to the model.

The choice of these two countries reflects their differences in the number of sumptuary laws and the timing of their abolition. Desierto and Koyama (2024) present data (see Figure 4) showing that, over the whole period where sumptuary legislation was active, France consistently enacted a larger number of sumptuary laws compared to England. Furthermore, the complete abolition of sumptuary legislation took place much earlier in England (late 1600s) compared to France (early 1800s). One interesting thing to note is that gradual relaxation of sumptuary legislation coincides (more or less) with each of these countries' timing of their per capita income take-off – an observation consistent with the corresponding results in Eq. (54)-(55) in the extended version of our model.

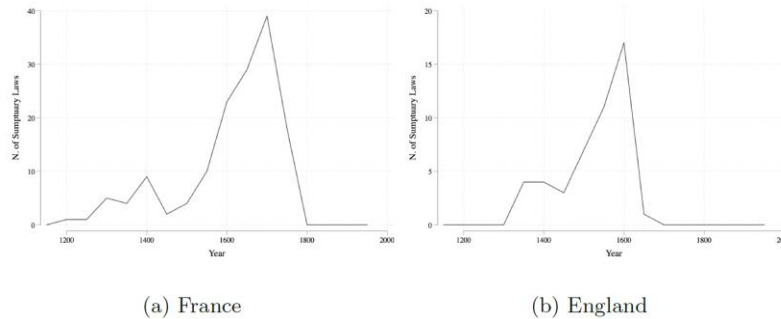


Figure 4. Years of active sumptuary legislation and number of sumptuary laws in France and England. These graphs are extracted from Desierto and Koyama (2024).

The simulation strategy is the following. We substitute the solution in (54), together with the transformed variable $m_{t+1} = \tilde{m}_t$, in (14) to express the dynamics of average productivity and income as

$$a_{t+1} = \begin{cases} a_t & \text{if } \tilde{m}_t \leq \hat{e} \\ a_t \left\{ 1 + \tilde{m}_t \left[\frac{\gamma(\tilde{m}_t)\theta - (1-\theta)(1+\tau)(1-\varphi)}{1 + (1-\theta)\tau} \right] \right\} & \text{if } \tilde{m}_t > \hat{e} \end{cases} \quad (56)$$

The dynamics of $\tilde{m}_t$ are still given in (37), but the composite terms μ and ν change to the following:

$$\mu(\tilde{m}_t) = (1-\varphi)^\theta \left[(1-\theta)^{1-\theta} \theta^\theta \frac{(1+\tau)^{1-\theta}}{1 + (1-\theta)\tau} \left(1 + \frac{\gamma(\tilde{m}_t)}{1-\varphi} \right) \left(\frac{\gamma(\tilde{m}_t)}{1-\varphi} \right)^{-(1-\theta)} - 1 \right], \quad (57)$$

$$\nu(\tilde{m}_t) = 1 - [(1-\varphi)\theta]^\theta \frac{\{(1-\theta)(1+\tau)[\gamma(\tilde{m}_t) + 1 - \varphi]\}^{1-\theta}}{[1 + (1-\theta)\tau]\gamma(\tilde{m}_t)} \left\{ \frac{\varphi[1 + (1-\theta)\tau]}{\theta(1-\varphi)} + 1 + \frac{\gamma(\tilde{m}_t)}{1-\varphi} \right\}^\theta \quad (58)$$

Obviously, the numerical simulation requires an explicit functional form for the continuous function γ . We adopt

$$\gamma(\tilde{m}_t) = \underline{\gamma} + (\bar{\gamma} - \underline{\gamma})\tilde{m}_t, \quad (59)$$

which means that the threshold in (55) can be written explicitly as

$$\hat{e} = \frac{1}{\bar{\gamma} - \underline{\gamma}} \left[\frac{(1-\theta)(1+\tau)(1-\varphi)}{\theta} - \underline{\gamma} \right]. \quad (60)$$

In selecting numerical values, we choose them to ensure consistent take-off timings and to impose discipline by selecting the values that minimise simulation errors between the model and the data since formal parameter values for that era do not exist. To do this, we first determine all parametric values that minimise the sum of squared differences for one of the two countries. Then, using these parameters, we compute the ‘luxury’ consumption tax that minimises the errors between the model and the data for the other country. In terms of the actual numerical values, we normalise England’s 1530 income per capita to 1 – that is, we divide by 1,755 which is England’s per capita income in Maddison (2006) – thus setting the initial condition $a_0 = 1$ for England. The initial condition for the cultural variable is set arbitrarily at $\tilde{m}_0 = 0.02$. To maintain consistency, for France we use the same $\tilde{m}_0$ and we apply the same factor to get its initial value a_0 – that is, we divide France’s 1530 per capita income in Maddison (2006) by 1,755.

Subsequently, we choose the values of the model's parameters as follows: Following a guess on an initial set of these values, consistent with the model's parametric restrictions, we eventually determine and choose the ones that minimise the sum of squares of the difference between France's income per capita from the data and the model's simulated income per capita. This set of parameter values turns out to be $f_M = f_N = 0.399$, $\kappa = 0.9002$, $\theta = 0.709$, $\varphi = 0.739$, $\bar{\gamma} = 0.4$, $\underline{\gamma} = 0.01$ and $\tau = 0.5006$. For the model's simulation of England's dynamics, we keep the same parameter values, except for the 'luxury' consumption tax which is set to minimise the sum of squares of the difference between England's income per capita from the data and the model's simulated income per capita. This parameter value for England is lower at $\tau = 0.19$ compared to France's, an outcome that is consistent with the model's mechanisms and (since this tax is a proxy for sumptuary laws) also aligned with data that shows the average number of sumptuary laws in England being significantly lower to the corresponding number in France over the sample period.

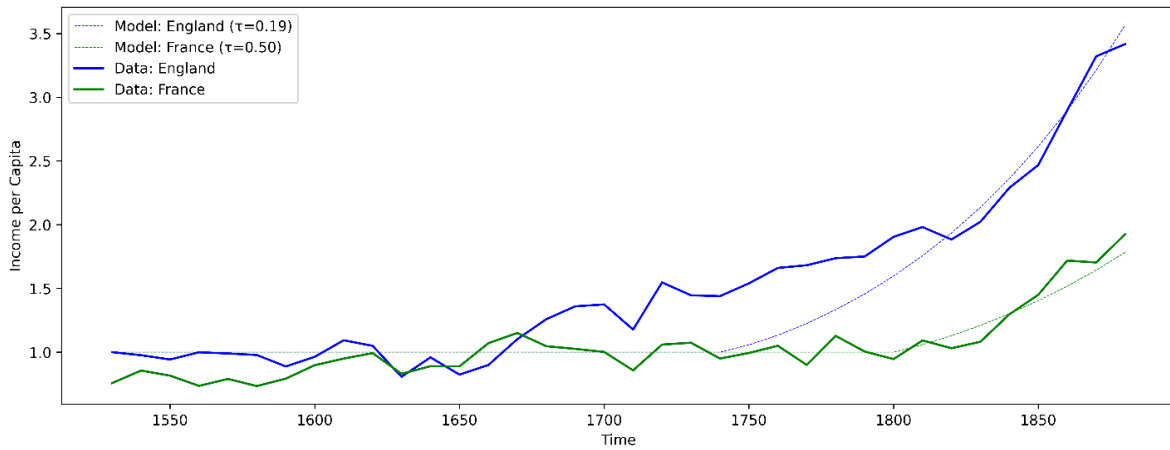


Figure 5. Comparison of simulated income per capita dynamics with actual data

The comparison between the model's simulated dynamics and the actual data for both England and France is presented in Figure 5. As we can see, both countries experienced a period of stagnation that is followed by a period of sustained growth – observations with which the model's analytical results are consistent. It is possible for our model to capture enough of the actual variation of income per capita in England and France. A higher τ induces a later timing of take-off of France's income per capita,

relative to England's – an outcome that is also consistent with the empirical data. As explained previously, the model attributes this outcome to the idea that 'luxury' consumption taxation (a proxy for sumptuary legislation) represents an institutional obstacle that affects the cultural diffusion of materialistic attitudes and aspirations, as well as productivity-improving activities. For this reason, differences in this institutional factor allow the numerically simulated model to explain the different time paths of per capita income in England and France.

Even though we focused on two countries to offer a quantitative comparison of the model's dynamics, the implications about the negative relation between sumptuary laws and economic performance may be wider. For example, in Figure 6 we present a binscatter of the data, and an added variable plot fitting an OLS model conditional on country fixed effects, between the number of sumptuary laws and income per capita for 9 countries during 5 centuries (1500-1900).²¹ While observations and degrees of freedom are not sufficient for a full-fledged empirical exercise, the correlation is consistent with the model's prediction on the matter; hence, we believe that our theoretical model provides a vehicle for further empirical research directions.

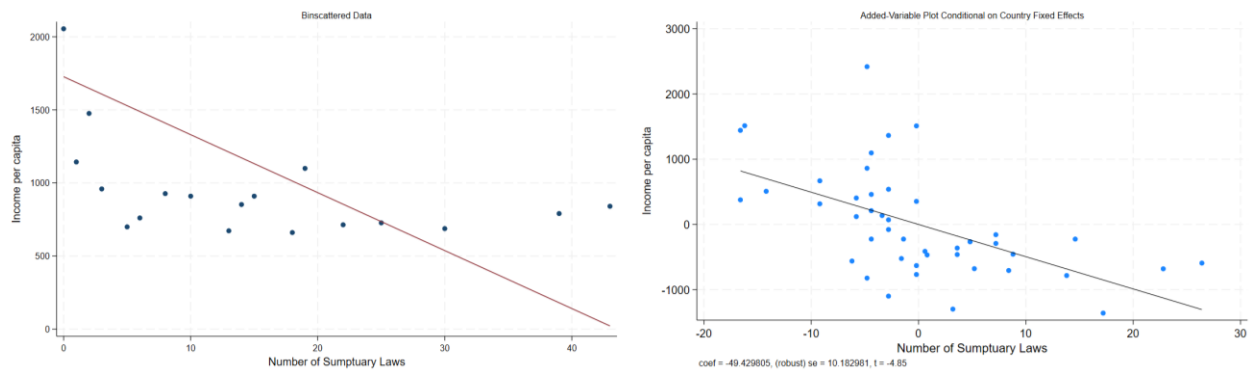


Figure 6. *Income per capita (Maddison, 2006) and number of sumptuary laws (Desierto and Koyama, 2024) during the period 1500-1900. The left panel presents a binscatter plot of the data, while the right panel presents the added variable plot that shows the partial effect of sumptuary laws on income per capita, controlling for country fixed effects (Details in the online Companion Appendix, Table A2, Column 3).*

²¹ We thank Desiree Desierto for sharing data on the number of sumptuary laws for this exercise. The estimated coefficients are presented in the online Companion Appendix.

7 Conclusion

This paper aimed at contributing to the burgeoning literature of studies that offer a cultural dimension to comparative economic development. We presented a framework which demonstrated that a cultural change towards more widespread adherence to materialistic values is both the cause and the effect of productivity improvements and, therefore, sustained economic growth. The model's mechanisms suggest that the gradual establishment of material aspirations among the population can instigate a transition from stagnation to economic growth.

Our results and implications formalise ideas that are deeply rooted in several researchers' views concerning the historical circumstances surrounding the Industrial Revolution and beyond. We have already highlighted several concurring views by economists and economic historians on the broad role of culture, in general, and its manifestation on personality traits that govern material aspirations, in particular. Equally supportive to our implications is the study of Gorodnichenko and Roland (2017), who employ an econometric analysis to show that the deeply rooted cultural traits concerning the non-pecuniary rewards associated with a sense of achievement have a significant effect on innovation and economic growth. Such evidence offers even more credence to our point about aspirational concerns, and their underlying culture, being a notable feature of historical circumstances that have not only contributed to the economic take-off, but are also instrumental in perpetuating more current differences in income per capita among nations, since our cultural variable of material aspirations co-evolves with productivity improvements once the model's dynamics transit from stagnation to sustained economic growth. As always, we do not make a claim in offering a complete account of the circumstances and mechanisms surrounding the economic take-off in Northwestern Europe. For example, Becker and Woessmann (2009) emphasised the Reformation-induced improvement in literacy rates that preceded the take-off. Admittedly, our framework does not include the elements to capture this outcome explicitly. We should bear in mind, however, that our study is equally about the co-evolution of culture and productivity improvements beyond the take-off, as it is about the cultural underpinning of the periods preceding it. In this respect, the improvements in basic literacy can be thought as a foundational force, whereas our

implications are also about the unleashing of these foundational forces and their manifestation in terms of progress towards the take-off and beyond.

One possible criticism to our framework and its main point, is that they seem inconsistent with the role of (physical) capital accumulation for the take-off to sustained growth, when the existing capital stock is low and, therefore, the rate of return to investment high. The apparent inconsistency rests with the idea that strong material (or consumption) aspirations may not bode well with the saving behaviour necessary to support the processes of investment and capital formation. Although our model refrains from an explicit process of physical capital accumulation through savings, we do not concur with the view that the consideration of physical capital formation necessarily undermines or main message and implications. One reason is because existing studies have shown that aspirations-driven externalities, similar to the one in our model, can actually promote saving behaviour and physical capital accumulation (e.g., Alonso-Carrera *et al.* 2005), contrary to what conventional wisdom suggests. The reason is that, in a multiperiod setting, agents' aspirations affect their preference profile intertemporally; hence, aspirations may promote saving behaviour if they increase an agent's willingness to shift her consumption expenditures from the present to the future. Another reason has to do with issues pertaining to the role of saving as a means of supporting the material conditions of one's progeny. Ray (1998) offers a compelling argument of how this idea can support a positive relation between aspirations and saving; He writes: *"individuals and families whose behaviors are molded by their aspirations to a better economic life. More often than not, these aspirations are unselfishly long term: the people in this group are building the lives of their children and grandchildren. Such individuals typically save large fractions of their income, both on average and at the margin."* (Ray, 1998; p.214).

Another point we should emphasise is that it is certainly not our intention to advance a framework that competes with the body of work known as 'unified growth theory'. The ideas and mechanisms we propose are complementary, as there is no reason why the focus of unified growth theory and our model's focus on cultural change, in general, and the evolution of material aspirations, in particular, are mutually exclusive. In this respect, our choice to refrain from the analysis of demographic change should not

be misconstrued as an intention to downgrade the significance of the quality-quantity trade-off for human capital, but rather as an attempt to avoid cluttering our model with additional moving parts that could undermine its tractability and obscure its main message. In any case, unified growth models have already accentuated the combined role of demographic factors and human capital for issues pertaining to the transition from stagnation to sustained growth. Our objective is to direct attention to a complementary (albeit different) factor which relates to the change of culture, attitudes and preferences in the process of economic development.

We strongly believe that our framework offers a large scope for future research on related themes. A worth-pursuing avenue for such research could extend and elaborate on the issues analysed in Section 6.3. For example, it is worth enriching the version of the model presented in that section with an institutional rule through which the luxury consumption tax is determined endogenously. This approach could offer an interesting interplay with significant implications for the analysis of issues pertaining to the relation between culture and institutions. Another interesting direction for future research could involve a formalisation along the lines of the empirical observation by Becker and Woessmann (2009): The model can be extended to include two measures of human capital – a ‘foundational’ one, such as basic literacy, which is also an input to an ‘advanced’ one, such as production-supporting skills and expertise – and investigate how the early stages of a two-way causal interplay between basic literacy and change in agents’ aspirations can eventually lead to a take-off of sustained growth in production and income.

Appendix

A.1 Proof of Lemma 1

Combining Assumption 1 with (2), (7), (10) and (11), it is straightforward to establish that (i) $s_{N,t+1}^* = 0 \quad \forall e_{t+1}$ therefore $u_{N,t+1}^* = a_t^\theta$; (ii) $s_{M,t+1}^* = 0$ and $u_{M,t+1}^* = [(1-\varphi)a_t]^\theta$ for $e_{t+1} < \hat{e}$, whereas $s_{M,t+1}^* = \frac{\theta\bar{\gamma} - (1-\theta)(1-\varphi)}{\bar{\gamma}} > 0$ and $u_{M,t+1}^* = \frac{a_t^\theta(1-\theta)^{1-\theta}\theta^\theta(\bar{\gamma}+1-\varphi)}{\bar{\gamma}^{1-\theta}}$ for

$e_{t+1} \geq \hat{e}$. It follows that $m_{t+1} = e_{t+1}$ as only Type- M agents may undertake positive investments. These outcomes have strategic implications in the case where $m_{t+1} \geq \hat{e}$: On the one hand, if each Type- M agent anticipates that none of the other Type- M agents will invest in productivity improvements, then $e_{t+1} = 0 < \hat{e}$, meaning that $s_{M,t+1}^* = 0$. On the other hand, however, if each Type- M agent expects that all other Type- M agents will invest in productivity improvements, then $e_{t+1} = m_{t+1} \geq \hat{e}$ and, therefore, $s_{M,t+1}^* > 0$. When $m_{t+1} \geq \hat{e}$, Type- M agents engage in a symmetric game in which their decisions are strategic complements and may result in multiple pure strategy Nash equilibria. For this reason, we will apply a further refinement concept to ensure that a unique equilibrium will prevail in each repetition of this game by successive generations of Type- M agents. This refinement concept has to do with the fact that, when multiple Nash equilibria emerge under $m_{t+1} \geq \hat{e}$, they can be Pareto ranked. Indeed, it is straightforward to establish that $\frac{a_t^\theta (1-\theta)^{1-\theta} \theta^\theta (\bar{\gamma} + 1 - \varphi)}{\bar{\gamma}^{1-\theta}} > [(1-\varphi)a_t]^\theta$ for $\bar{\gamma} > \frac{(1-\theta)(1-\varphi)}{\theta}$, which holds by virtue of Assumption 1. This also means that the choice of investment towards increased productivity is efficient as it maximises the sum of Type- M agents' payoffs. Furthermore, the decision to invest in productivity improvements has the characteristics of a weakly dominant strategy: On the one hand, if an agent anticipates that everyone else chooses $s_{M,t+1}^* > 0$, she will clearly be better-off doing the same; on the other hand, and in light of the non-negativity constraint on $s_{M,t+1}$, if she anticipates that everyone else chooses $s_{M,t+1}^* = 0$, the agent will not experience any difference in utility by considering either to invest or not. Even if she considers such investment, the low productivity of her project will induce her to abandon it. Type- M agents are rational enough to assess that it will be to everyone's benefit to pursue productivity-enhancing ventures, and that all her peers think similarly; hence, all Type- M agents will choose $s_{M,t+1}^* > 0$ when $m_{t+1} \geq \hat{e}$. $\square$

A.2 Proof that $\mu, \nu > 0$

By virtue of Assumption 1, the minimum possible value for $\bar{\gamma}$ is $\bar{\gamma}_{\min} = \frac{(1-\theta)(1-\varphi)}{\theta}$.

Using Eq. (32), it is straightforward to establish that $\mu = 0$ for $\bar{\gamma} = \bar{\gamma}_{\min}$, and that the sign of the derivative $\frac{\partial \mu}{\partial \bar{\gamma}}$ depends on the sign of the expression

$$\frac{\bar{\gamma}^{-(1-\theta)}}{1-\varphi} \left[1 - (1-\theta) \left(\frac{1-\varphi}{\bar{\gamma}} + 1 \right) \right]. \quad (\text{A1})$$

The expression in (A1) is strictly positive under Assumption 1, thus verifying that $\mu > 0$.

Next, we can substitute $\bar{\gamma} = \bar{\gamma}_{\min}$ in Eq. (33) to verify that $\nu = 0$. Subsequently, it is straightforward to show that the sign of the derivative $\frac{\partial \nu}{\partial \bar{\gamma}}$ depends on the sign of the expression

$$\xi(\bar{\gamma}) \equiv \frac{\varphi(1-\theta)}{\theta} - [\bar{\gamma}\theta - (1-\varphi)(1-\theta)] \left(1 + \frac{\bar{\gamma}}{1-\varphi} \right). \quad (\text{A2})$$

From (A2), we can see that $\xi(\bar{\gamma}_{\min}) = 0$ and $\xi'(\bar{\gamma}) < 0$. Furthermore, the maximum possible value for $\bar{\gamma}$ under Assumption 1 is $\bar{\gamma}_{\max} = \frac{1-\theta}{\theta}$. Substituting this in (A2) yields

$$\xi(\bar{\gamma}_{\max}) = \frac{-[\varphi(1-\theta)]^2}{\theta(1-\varphi)} < 0, \text{ thus revealing that there exists } \bar{\gamma}^* \in (\bar{\gamma}_{\min}, \bar{\gamma}_{\max}) \text{ such that}$$

$$\frac{\partial \nu}{\partial \bar{\gamma}} > 0 \text{ if } \bar{\gamma} < \bar{\gamma}^* \text{ and } \frac{\partial \nu}{\partial \bar{\gamma}} < 0 \text{ if } \bar{\gamma} > \bar{\gamma}^*. \text{ It follows that for } \nu > 0 \forall \bar{\gamma}, \text{ it is sufficient to show}$$

that $\nu \geq 0$ when evaluated at $\bar{\gamma}_{\max}$. Substitution in (33) yields

$$\nu(\bar{\gamma}_{\max}) = 1 - (1-\varphi\theta)^{1-\theta} [1 + \varphi(1-\theta)]^\theta, \quad (\text{A3})$$

from which we can note that, when evaluated at $\varphi = 0$, (A3) yields $\nu(\bar{\gamma}_{\max}; \varphi = 0) = 0$.

Therefore, it is sufficient to show that $\frac{\partial \nu(\bar{\gamma}_{\max})}{\partial \varphi} > 0$. Indeed, using (A3) we can establish that

$$\frac{\partial \nu(\bar{\gamma}_{\max})}{\partial \varphi} = (1-\theta)\theta\varphi(1-\varphi+\theta)(1-\varphi\theta)^{-\theta} [1 + \varphi(1-\theta)]^{\theta-1} > 0, \quad (\text{A4})$$

thus completing the proof. $\square$

A.3 Proof of Proposition 2

Differentiate Eq. (40) to get

$$\frac{\partial \tilde{m}_t^{**}}{\partial a_t} = \theta a_t^{\theta-1} \frac{\mu[f_M + f_N + a_t^\theta(\mu + \nu)] - (\mu + \nu)(f_M + a_t^\theta \mu)}{[f_M + f_N + a_t^\theta(\mu + \nu)]^2}. \quad (\text{A5})$$

Obviously, for (A5) to be positive the following has to hold:

$$\mu[f_M + f_N + a_t^\theta(\mu + \nu)] > (\mu + \nu)(f_M + a_t^\theta \mu) \Rightarrow$$

$$\mu f_N > \nu f_M \Rightarrow$$

$$\frac{\mu}{f_M} > \frac{\nu}{f_N},$$

which is true by virtue of Assumption 3. Now, compare (39) and (40) see that

$$\tilde{m}_t^{**}(a_t = 0) = m^*. \text{ Since } \frac{\partial \tilde{m}_t^{**}}{\partial a_t} > 0, \text{ it follows that } \tilde{m}_t^{**} > m^*. \quad \square$$

A.4 Proof of Proposition 4

Given Assumption 4 and $\tilde{m}_t^{**} > m^*$ (see Proposition 2), the share of agents who uphold materialistic values will eventually exceed $\hat{e}$. When this happens, the variable a_t will be growing at a positive rate over time (see Eq. 35), meaning that $\lim_{t \rightarrow +\infty} a_t \rightarrow +\infty$. Combining (33) and (40), it follows that

$$m^{**} = \lim_{a_t \rightarrow +\infty} \frac{f_M + a_t^\theta \mu}{f_M + f_N + a_t^\theta(\mu + \nu)} = \frac{\mu}{\mu + \nu}. \quad (\text{A6})$$

Substituting (A6) in (35), and denoting the long-run growth rate by g^* , yields

$$g^* = \frac{\mu}{\mu + \nu} [\bar{\gamma}\theta - (1 - \theta)(1 - \varphi)]. \quad \square$$

A.5 Derivation of Eq. (53)

The budget constraint in this case is $c_{j,t+1} = i_{j,t+1} - \tau(c_{j,t+1} - c_{t+1}^{average}) + T_{t+1}$, which can be rearranged to

$$c_{j,t+1} = \frac{i_{j,t+1} + T_{t+1} + \tau c_{t+1}^{average}}{1 + \tau}. \quad (A7)$$

Following the substitution of (1), (3) and (A7) in (7), the utility function can be written as follows:

$$u_{j,t+1} = (1 - s_{j,t+1})^{1-\theta} \left[\frac{a_t(1 + \gamma_{t+1}s_{j,t+1}) + T_{t+1} + \tau c_{t+1}^{average}}{1 + \tau} - \Phi_j \tilde{c}_t \right]^\theta. \quad (A8)$$

The objective of the agent is to choose $s_{j,t+1}$ in order to maximise (A8) while taking $\tilde{c}_t$, $c_{t+1}^{average}$ and T_{t+1} as given. Differentiating (A8) yields:

$$\begin{aligned} \frac{\partial u_{j,t+1}}{\partial s_{j,t+1}} &= -(1-\theta)(1-s_{j,t+1})^{-\theta} \left[\frac{a_t(1 + \gamma_{t+1}s_{j,t+1}) + T_{t+1} + \tau c_{t+1}^{average}}{1 + \tau} - \Phi_j \tilde{c}_t \right]^\theta + \\ &\quad (1-s_{j,t+1})^{1-\theta} \theta \left[\frac{a_t(1 + \gamma_{t+1}s_{j,t+1}) + T_{t+1} + \tau c_{t+1}^{average}}{1 + \tau} - \Phi_j \tilde{c}_t \right]^{\theta-1} \frac{a_t \gamma_{t+1}}{1 + \tau} \Rightarrow \\ \frac{\partial u_{j,t+1}}{\partial s_{j,t+1}} &= (1-s_{j,t+1})^{-\theta} \left[\frac{a_t(1 + \gamma_{t+1}s_{j,t+1}) + T_{t+1} + \tau c_{t+1}^{average}}{1 + \tau} - \Phi_j \tilde{c}_t \right]^{\theta-1} \times \Omega, \end{aligned}$$

where

$$\Omega = -(1-\theta) \left[\frac{a_t(1 + \gamma_{t+1}s_{j,t+1}) + T_{t+1} + \tau c_{t+1}^{average}}{1 + \tau} - \Phi_j \tilde{c}_t \right] + \theta(1-s_{j,t+1}) \frac{a_t \gamma_{t+1}}{1 + \tau}. \quad (A9)$$

Obviously, the sign of the derivative depends on the sign of the composite term Ω in (A9). Now, note that although there is heterogeneity across agents of different types j , the decisions of agents within a specific type are symmetrical. In general, if we consider two groups j and j' with respective population shares $x_{j,t+1}$ and $x_{j',t+1}$ such that $x_{j,t+1} + x_{j',t+1} = 1$, then $c_{t+1}^{average} = x_{j,t+1}c_{j,t+1} + x_{j',t+1}c_{j',t+1}$: Only agents in one of these groups may have consumption expenditures above the average, hence being liable to taxation. If these are the agents in group j , for example, then $c_{j,t+1} > c_{t+1}^{average}$ will make them liable to taxation, but also recipients of the transfer T_{t+1} . It follows that

$$T_{t+1} = \frac{x_{j,t+1}\tau(c_{j,t+1} - c_{t+1}^{average})}{x_{j,t+1}} = \tau(c_{j,t+1} - c_{t+1}^{average}). \text{ By virtue of (A7), it follows that } c_{j,t+1} = i_{j,t+1}$$

and $\tilde{c}_t = i_t = a_t$, exactly as in (6) and (9) of the baseline version. We can substitute these, together with $\gamma_{t+1} = \gamma(e_{t+1})$, (1) and (3) in (A9), and rearrange to get

$$\Omega = \frac{a_t}{1+\tau} \{-s_{j,t+1}\gamma(e_{t+1})[1+\tau(1-\theta)] + \theta\gamma(e_{t+1}) - (1-\theta)(1+\tau)(1-\Phi_j)\}. \quad (\text{A10})$$

Given (A10) we can establish that when $\theta\gamma(e_{t+1}) < (1-\theta)(1+\tau)(1-\Phi_j)$ it is $\Omega < 0 \forall s_{j,t+1}$, whereas in the case of $\theta\gamma(e_{t+1}) > (1-\theta)(1+\tau)(1-\Phi_j)$ there is a unique interior solution $s_{j,t+1}^* > 0$ that solves $\Omega = 0$. Therefore, the overall solution for $s_{j,t+1}$ is

$$s_{j,t+1}^* = \max \left\{ 0, \frac{\theta\gamma(e_{t+1}) - (1-\theta)(1+\tau)(1-\Phi_j)}{\gamma(e_{t+1})[1+(1-\theta)\tau]} \right\},$$

which is the result in (53). $\square$

A.6 A Natural Threshold in the Dynamics of Cultural Transmission

We shall demonstrate the results and implications of our model under two modifications. The first one disregards the threshold $\hat{e}$ in (2) and replaces $\gamma(e_{t+1})$ with the constant parameter $\bar{\gamma} > 0$. With regard to the value of $\bar{\gamma}$, Assumption 1 still holds, meaning that the optimal investments in productivity improvements are $s_{N,t}^* = 0$ for Type- N agents and $s_{M,t}^* = [\theta\bar{\gamma} - (1-\theta)(1-\varphi)] / \bar{\gamma} > 0$ for Type- M agents. Combining these results with the technology in (1) and the transformed variable $m_{t+1} = \tilde{m}_t$, it follows that average productivity evolves according to

$$a_{t+1} = \begin{cases} a_t & \text{for } \tilde{m}_t = 0 \\ a_t \{1 + \tilde{m}_t[\bar{\gamma}\theta - (1-\theta)(1-\varphi)]\} & \forall \tilde{m}_t > 0 \end{cases}. \quad (\text{A11})$$

As expected, the economy's growth rate is increasing in the share of materialists because these are the agents who find optimal to devote resources towards productivity improvements.

The second modification applies to the cultural transmission setting of Section 4. Our objective is to induce a threshold (with respect to the population of agents with material aspirations) that emerges naturally as an unstable steady state that separates

two stable steady state equilibria, within the context of the intergenerational transmission paradigm. In fact, in their seminal paper Bisin and Verdier (2001) demonstrated how the standard intergenerational transmission framework can be modified to account for such an outcome. We adopt the same modification in our model. Specifically, the only difference involves the probabilities of direct socialisation towards the parents' traits, which for Type- M and Type- N households now become

$$q_{M,t} = p_{M,t} m_t, \quad (\text{A12})$$

$$q_{N,t} = p_{N,t} (1 - m_t), \quad (\text{A13})$$

respectively. As Bisin and Verdier (2001) argue, the formulation in (A12)-(A13) captures a scenario where the offspring is initially exposed simultaneously to the trait of her parent and of a role model with whom she is randomly matched. She will be inculcated with this trait, if parent and role model are culturally identical. Otherwise, there will be a subsequent round of random matching with a role model who will determine the offspring's trait. Given these, Eq. (17)-(18) change to

$$\pi_{M,t} = q_{M,t} + (1 - q_{M,t}) m_t, \quad (\text{A14})$$

$$\pi_{N,t} = q_{N,t} + (1 - q_{N,t}) (1 - m_t), \quad (\text{A15})$$

where $b(m_t) = m_t$ is adopted, as in (36). It is straightforward to show that, after substituting (A14), (A15), (22) and (29) in (20) and (21) and solving the corresponding problems, the optimal parental efforts on offspring's cultural instruction are

$$p_{M,t}^* = \frac{m_t (1 - m_t) (f_M + a_{t-1}^\theta \mu)}{\bar{\kappa} + a_{t-1}^\theta}, \quad (\text{A16})$$

and

$$p_{N,t}^* = \frac{m_t (1 - m_t) (f_N + a_{t-1}^\theta \nu)}{\kappa + a_{t-1}^\theta}, \quad (\text{A17})$$

where the composite terms μ, ν are the same as in (32)-(33). Although we see the absence of the threshold $\hat{e}$, the most significant difference compared to the original results in (30) and (31) is that the homogeneity of the cultural traits of parents and role models, in the first round of the cultural transmission process, introduces some sort of cultural complementarity. Indeed, there is a range of m_t for which the parents' efforts to

instil their own behavioural traits into their children are actually increasing in the share of the population who also possess the same behavioural traits.

This outcome has implications for cultural dynamics. Combining (A14)-(A17), (19) and the transformed variable $m_{t+1} = \tilde{m}_t$ can eventually reveal that the share of Type-M agents in the population evolves according to

$$\tilde{m}_{t+1} = \tilde{m}_t \left[1 + (1 - \tilde{m}_t) \frac{\tilde{m}_t^2 (1 - \tilde{m}_t) (f_M + a_t^\theta \mu) - (1 - \tilde{m}_t)^2 \tilde{m}_t (f_N + a_t^\theta \nu)}{\kappa + a_t^\theta} \right]. \quad (\text{A18})$$

Defining $\Delta \tilde{m}_{t+1} \equiv \tilde{m}_{t+1} - \tilde{m}_t$, it follows that (A18) is consistent with the following:

$$\Delta \tilde{m}_{t+1} = \begin{cases} < 0 & \text{for } \tilde{m}_t < \tilde{m}_t^{**} \\ > 0 & \text{for } \tilde{m}_t > \tilde{m}_t^{**} \end{cases}, \quad (\text{A19})$$

where

$$\tilde{m}_t^{**} \equiv \frac{f_N + a_t^\theta \nu}{f_M + f_N + a_t^\theta (\mu + \nu)}. \quad (\text{A20})$$

As (A19) reveals, $\tilde{m}_t^{**}$ is now an unstable equilibrium, i.e., an endogenous threshold that separates two distinct, stable equilibrium pairs for culture and growth performance. If $\tilde{m}_0 < \tilde{m}_t^{**}$, the gradual decline of the population share of materialists will undermine productivity growth. By virtue of Assumption 3 and (A20), note that now $\partial \tilde{m}_t^{**} / \partial a_t < 0$, meaning that lower productivity and income increase the threshold. In other words, as long as the reduction in growth performance keeps the level of productivity low enough so that the threshold $\tilde{m}_t^{**}$ in (A20) is still above the temporal value of $\tilde{m}_t$, the joint decline in growth rate and population share of materialists will continue until the economy settles to a long-run equilibrium where $\tilde{m} = 0$ (cultural homogeneity where no agent has material aspirations – check that $\tilde{m} = 0$ is a stable equilibrium in A18) and stagnation (as productivity and income per capita are constant for $\tilde{m} = 0$ – see A11). If the dynamics are initiated from an initial condition $\tilde{m}_0 > \tilde{m}_t^{**}$, then the positive effect of an increasing share of materialists on growth performance will direct the economy to a long-run equilibrium where $\tilde{m} = 1$ (cultural homogeneity where all agents have material aspirations – check that $\tilde{m} = 1$ is a stable equilibrium in A18) and the long-run growth rate is positive and equal to $\bar{\gamma}\theta - (1 - \theta)(1 - \varphi)$.

Now, consider a situation where the economy is in the stable stagnation equilibrium with a culturally homogeneous population of $\tilde{m}=0$. In this state, there are no finite values for the factors that affect the threshold in (A20) that can reduce it to such a level so that the economy can escape this equilibrium. Put differently, it is impossible to apply a permanent shift in any of the model's parameters that will position this steady state above the natural threshold simply because the threshold is a positive number, thus always greater than $\tilde{m}=0$ no matter what permanent shock to the parameters of (A20) one considers. Of course, one could consider a take-off away from stagnation by means of an exogenous event or 'shock' that causes a direct jump of the cultural variable $\tilde{m}_t$ above the threshold. Once this happens, the economy moves directly to the phase of sustained growth in which an increasing share of materialists promotes growth performance.

Although we presented this modified version for reasons of completeness and to demonstrate that the general ideas we advance have a wider applicability, we believe that the original modelling set-up that we adopted in the main body of this paper is perhaps better suited in addressing the culture-driven escape from stagnation to sustained growth. The first reason has to do with the empirical relevance of the cultural dynamics and equilibrium. As we showed previously, and as Bisin and Verdier (2001) had already demonstrated, unstable equilibria that act as natural thresholds can emerge within the intergenerational transmission paradigm only under equilibrium conditions of cultural complementarity. In other words, they emerge in frameworks where cultural 'majorities' may devote greater effort to indoctrinate their descendants compared to cultural 'minorities'. As Bisin and Verdier (2001, 2008) argued, what we mostly observe in real world settings is that cultural 'minorities' are the ones who more intensively try ensure that their attitudes and beliefs survive to younger generations – an outcome akin to cultural substitution. Furthermore, in circumstances where the intergenerational transmission process generates a natural threshold in the form of an unstable steady state, the two stable equilibria this threshold separates are the bounds of the distribution of cultural traits in the population, something we also demonstrate here. Put differently, the long-run equilibrium is one of corner solutions with cultural homogeneity – one of the two behavioural traits will ultimately dominate in the entire population. As Bisin

and Verdier (2001, 2008) rightly point out, such homogeneity in behavioural traits is something we rarely observe in the real world. The second reason has to do with the fact that this framework does not really offer any explanatory advantage on the issues that our study seeks to formalise. It may give explicit conditions on why an economy may be permanently trapped in a state of stagnation, but this is not our objective in the first place. Instead, our aim was to formalise the culturally-driven process that underlies the gradual and deterministic transition from stagnation to positive economic growth and beyond – an issue on which the framework presented here is perhaps less informative compared to the one we presented in the main body of our paper.

References

1. Aguiar, M., Bils, M., Charles, K.K., and Hurst, E. 2021. "Leisure luxuries and the labor supply of young men," *Journal of Political Economy*, 129, 337-382.
2. Alesina, A., and Giuliano, P. 2015. "Culture and institutions," *Journal of Economic Literature*, 53, 898-944.
3. Alonso-Carrera, J., and Bouché, S., 2022. "Intergenerational transmission of preferences and the operativeness of bequest motive," *Journal of Money, Credit and Banking* (forthcoming).
4. Alonso-Carrera, J., Caballé, J., and Raurich, X. 2005. "Growth, habit formation, and catching-up with the Joneses," *European Economic Review*, 49, 1665-1691.
5. Ashraf, Q., and Galor, O. 2011. "Dynamics and stagnation in the Malthusian epoch," *American Economic Review*, 101, 2003-2041.
6. Ashraf, Q., and Galor, O. 2013. "The "Out of Africa" hypothesis, human genetic diversity, and comparative economic development," *American Economic Review*, 103, 1-46.
7. Azariadis, C. 1993. *Intertemporal Macroeconomics*, Blackwell, Oxford.
8. Bahk, B.H., and Gort, M. 1993. "Decomposing learning-by-doing in new plants," *Journal of Political Economy*, 101, 561-583.

9. Becker, S.O., and Woessmann, L. 2009. "Was Weber wrong? A human capital theory of Protestant economic history," *Quarterly Journal of Economics*, 124, 531-596.
10. Bénabou, R., Ticchi, D., and Vindigni, A. 2015. "Religion and innovation," *American Economic Review: Papers and Proceedings*, 105, 346-351.
11. Bisin, A., and Verdier, T. 2001. "The economics of cultural transmission and the dynamics of preferences," *Journal of Economic Theory*, 97, 298-319.
12. Bisin, A., and Verdier, T. 2008. "Cultural transmission," in Durlauf, S.N., and Blume, L.E. (eds): *The New Palgrave Dictionary of Economics*, 2nd edition, Palgrave Macmillan, New York (NY).
13. Bisin, A., and Verdier, T. 2024. "On the joint dynamics of culture and political institutions: Elites and civil society," *Journal of Political Economy*, 132, 1485-1564.
14. Bisin, A., Topa, G., and Verdier, T. 2004. "Religious intermarriage and socialization in the United States," *Journal of Political Economy*, 112, pp.615-664.
15. Braudel, F. 1992. *Civilization and Capitalism 15th-18th Century*, Vol. 1: *The Structure of Everyday Life*, University of California Press, Berkeley (CA).
16. Brunt, L., and García-Peñalosa, C. 2022. "Urbanisation and the onset of modern economic growth," *Economic Journal*, 132, 512-545.
17. Campante, F., and Yanagizawa-Drott, D. 2015. "Does religion affect economic growth and happiness? Evidence from Ramadan," *Quarterly Journal of Economics*, 130, 615-658.
18. Chakraborty, S., Thompson, J.C., and Yehoue E.B. 2016. "The culture of entrepreneurship," *Journal of Economic Theory*, 163, 288-317.
19. Cooper, B., Garcia-Peñalosa, C., and Funk, P. 2001. "Status effects and negative utility growth," *Economic Journal*, 111, 642-665.
20. Cooper, R., and John, A. 1988. "Coordinating coordination failures in Keynesian models," *Quarterly Journal of Economics*, 103, 441-463.
21. Corneo, G., and Jeanne, O. 2010. "Symbolic values, occupational choice, and economic development," *European Economic Review*, 54, 237-251.

22. d'Albis, H., Greulich, A. and Ponthière, G., 2018. "Development, fertility and childbearing age: A unified growth theory," *Journal of Economic Theory*, 177, 461-494.
23. de Vries, J. 1994. "The Industrial Revolution and the Industrious Revolution," *Journal of Economic History*, 54, 249-270.
24. de Vries, J. 2008. *The Industrious Revolution: Consumer Behavior and the Household Economy, 1650 to the Present*, Cambridge University Press, Cambridge.
25. Desierto, D.A., and Koyama, M. 2024. "The political economy of status competition: Sumptuary laws in preindustrial Europe," *Journal of Economic History*, 84, 479-516.
26. Dioikitopoulos, E., Turnovsky, S.J., and Wendner, R. 2020. "Dynamic status effects, savings, and income inequality," *International Economic Review*, 61, 361-382.
27. Doepke, M., and Zilibotti, F. 2008. "Occupational choice and the spirit of capitalism," *Quarterly Journal of Economics*, 123, 747-793.
28. Francois, P., and Zabojnik, J. 2010. "Trust, social capital, and economic development," *Journal of the European Economic Association*, 3, 51-94.
29. Galor, O., 2005. "From stagnation to growth: Unified growth theory," in Aghion, P., and Durlauf, S.N. (eds): *Handbook of Economic Growth, Vol.1A*, North-Holland, Amsterdam.
30. Galor, O. 2007. *Discrete Dynamical Systems*, Springer, Berlin.
31. Galor, O. 2011. *Unified Growth Theory*, Princeton University Press, Princeton (NJ).
32. Galor, O., and Moav, O. 2004. "From physical to human capital accumulation: Inequality and the process of development," *Review of Economic Studies*, 71, 1001-1026.
33. Galor, O., and Özak, Ö. 2016. "The agricultural origins of time preference," *American Economic Review*, 106, 3064-3103.
34. Galor, O., and Tsiddon, D. 1997. "The distribution of human capital and economic growth," *Journal of Economic Growth*, 2, 93-124.

35. Galor, O., and Weil, D.N. 2000. "Population, technology, and growth: From Malthusian stagnation to the demographic transition and beyond," *American Economic Review*, 90, 806-828.
36. Gorodnichenko, Y., and Roland, G. 2017. "Culture, institutions, and the wealth of nations," *Review of Economics and Statistics*, 99, 402-416.
37. Guiso, L., Sapienza, S., and Zingales, L. 2006. "Does culture affect economic outcomes?" *Journal of Economic Perspectives*, 20, 23-48.
38. Hauk, E., and Sáez-Martí, M. 2002. "On the cultural transmission of corruption," *Journal of Economic Theory*, 107, 311-335.
39. Hori, T., Ikefuji, M. and Mino, K. 2015. "Conformism and structural change," *International Economic Review*, 56, 939-961.
40. Inglehart, R., and Baker, W.E. 2000. "Modernization, cultural change, and the persistence of traditional values," *American Sociological Review*, 65, 19-51.
41. Irwin, D.A., and Klenow, P.J. 1994. "Learning-by-doing spillovers in the semiconductor industry," *Journal of Political Economy*, 102, 1200-1227.
42. Kirtio, L. 2011. "The inordinate excess in apparel," *Constellations*, 3, 17-29.
43. Klasing, M.J., and Milionis, P. 2014. "Cultural constraints on innovation-based growth," *Economic Inquiry*, 52, 796-810.
44. Knack, S., and Keefer, P. 1997. "Does social capital have an economic payoff? A cross-country investigation," *Quarterly Journal of Economics*, 112, 1251-1288.
45. Lagerlöf, N.P. 2003. "From Malthus to modern growth: Can epidemics explain the three regimes?" *International Economic Review*, 44, 755-777.
46. Laouenan, M., Bhargava, P., Eyméoud, J.B., Gergaud, O., Plique, G., and Wasmer, E. 2022. "A cross-verified database of notable people, 3500BC-2018AD," *Nature Scientific Data*, 9, no. 290.
47. Maddison, A. 2006. *The World Economy, Vol. 1: A Millennial Perspective*, Development Centre Studies, OECD Publishing, Paris.
48. McClelland, D.C. 1961. *The Achieving Society*, Free Press, New York.
49. McKendrick, N., Brewer, J., and Plumb, J. 1982. *The Birth of a Consumer Society: The Commercialization of Eighteenth-Century England*, Indiana University Press, Bloomington (IN).

50. Michalopoulos, S., and Xue, M.M. 2021. "Folklore", *Quarterly Journal of Economics*, 36, 1993-2046.
51. Moav, O., and Neeman, Z. 2010. "Status and poverty," *Journal of the European Economic Association*, 8, 413-420.
52. Mokyr, J. 2016. *A Culture of Growth: The Origins of the Modern Economy*, Princeton University Press, Princeton (NJ).
53. Perkin, H.J. 1968. "The social causes of the British industrial revolution," *Transactions of the Royal Historical Society*, 18, 123-143.
54. Ray, D. 1998. *Development Economics*, Princeton University Press, Princeton (NJ).
55. Stearns, P.N. 1997. "Stages of consumerism: Recent work on the issues of periodization," *Journal of Modern History*, 69, 102-117.
56. Stearns, P.N. 2001. *Consumerism in World History: The Global Transformation of Desire*, Routledge, London.
57. Strulik, H. 2016. "An economic theory of religious belief," *Journal of Economic Behavior and Organization*, 128, 35-46.
58. Strulik, H. 2017. "Contraception and development: A unified growth theory," *International Economic Review*, 58, 561-584.
59. Strulik, H., 2012. "Patience and prosperity," *Journal of Economic Theory*, 147, 336-352.
60. Tabellini, G. 2010. "Culture and institutions: Economic development in the regions of Europe," *Journal of the European Economic Association*, 8, 677-716.
61. Uhlaner, L., and Thurik, R. 2007. "Postmaterialism influencing total entrepreneurial activity across nations," *Journal of Evolutionary Economics*, 17, 161-185.
62. Varvarigos, D. 2020. "Cultural transmission, education-promoting attitudes, and economic development," *Review of Economic Dynamics*, 37, 173-194.
63. Varvarigos, D. 2021. "Upstream intergenerational transfers in economic development: The role of family ties and their cultural transmission," *Journal of Mathematical Economics*, 96, 102514.
64. Varvarigos, D. 2023. "Cultural persistence in corruption, economic growth, and the environment," *Journal of Economic Dynamics and Control*, 147, 104590.

65. Veblen, T. 1899 [1953]. *The Theory of the Leisure Class: An Economic Study of Institutions*, MacMillan, New York.
66. Weber, M. 1905 [1992]. *The Protestant Ethic and the Spirit of Capitalism*, Routledge, London.
67. Wendner, R. 2010. "Growth and keeping up with the Joneses," *Macroeconomic Dynamics*, 14 (Supplement 2), 176-199.
68. Xu, L., Earl, P., and Rao, D.S.P. 2019. "Materialism and economic progress," Discussion paper no. 604, University of Queensland, School of Economics.
69. Zolfagharian, M., and Ulusoy, E. 2017. "Inter-Generational Pendula (IGP): Toward a theory of immigrant identity, materialism and religiosity," *International Journal of Research in Marketing*, 34, 678-693.