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Smart Endogenous Growth:
Cultural Capital and the Creative Use of Skills

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ABSTRACT

We present an endogenous growth model that is based upon the interaction between human and cultural capital. We argue that the available endogenous growth models fail to take into account the full set of relevant factors that make endogenous growth possible, and that the missing entry is in fact cultural capital, through its effect on total factor productivity. We show that, within the context of the model, cultural investment has a positive impact on the growth rate and on income provided that the economy is sufficiently culture-intensive, and that this effect is further magnified the more total factor productivity is sensitive to the stock of cultural capital.

Key Words: Economic Growth; Cultural Capital; Total Factor Productivity; Skills.

JEL Classification: E22, O41; Z19.

1. Introduction

Since recently, the word "culture" was hard to find in the economic literature. In the rare positive occurrences, the interest toward culture as a purposeful productive activity (e.g. art, theatre, cinema, music, literature and so on) was practically almost absent, with notable though pretty isolated exceptions (e.g. the seminal and early contribution of Baumol and Bowen, 1966). More recently, interest in "cultural" themes has been rising, but however, once again, sticking to a very broad and generic idea of culture, that is being identified, in turn, with such diverse fields as "religion", "trust", or even "institutions".[1] This research trend reflects a sensitivity for the role of 'contextual' characteristics such as customs and religions, ethnicity, geography, genetic endowments in determining economic outcomes, and it is somewhat natural to group such a heterogeneous bunch of factors under the all-encompassing label of 'culture'. And indeed, one can find authoritative examples of highly influential analyses of how these kinds of 'cultural' factors have shaped up, and continue to shape, the social fabric of market capitalism (one for all, the notorious Weberian thesis on the role of the protestant ethic in the development of modern capitalism). Economically focused approaches of this kind abound, and cover many different issues of great interest (among others, Barro and McClearly, 2003; Guiso, Sapienza and Zingales, 2006; Spolaore and Wacziarg, 2009; Tabellini, 2010). But in all these examples, 'culture' is really little more than a shorthand for 'contextual social factors': Little attention, if any, is paid to less than generic meanings (or interpretations) of the term.

One can therefore wonder whether reference to culture in this very ample sense is ultimately appropriate rather than misleading, especially provided that, not only a small but growing group of theorists, but also policy makers at the national and local level, are indeed paying increasing attention to cultural activities in the strict sense: Visual and performing arts, heritage, or the cultural and creative industries (Towse, 2003). A number of studies have been carried out to demonstrate the potential of creative productions in terms of turnover, employment, and birth of new firms (e.g. KEA, 2006), and at the city planning level the new 'cultural wave' has become so pervasive that it is now almost commonsense to reason in terms of the 'cultural economy of cities' (Amin and Thrift, 2007). Accordingly, it has become customary to use the term "cultural economics" to indicate the subject that was previously acknowledged as the economics of the arts, since "the arts" stand for a more specific and narrow subject that the one spanned by cultural economics. The role of culture is becoming essential in the understanding of post-industrial development, and is likely to be even more so in the future to come.

[1] See Guiso, Sapienza and Zingales (2006) for an historical perspective on the debate on economics and culture.

On this basis, it is important to get a much better grasp of how these mechanisms actually work in building up value. Also, as the recent experiences of creative city development seem to suggest that culture might function as an auto-catalytic engine of growth, it becomes important to figure out whether, and to what extent, culture plays a complementary role with respect to education in the mechanics of endogenous growth models such as the ones put forward by the New Growth Theory, which are traditionally based on human capital investment (e.g. Aghion and Howitt, 1997). We feel that traditional endogenous growth models, by focusing exclusively on the educational side of the knowledge economy, might be missing something essential to capture the critical conditions that ultimately allow a local or national economy to experiment sustained growth driven by intangible assets accumulation. Our contention is that cultural production, and its socio-economic implications on a variety of non-market mediated aspects such as the informational and motivational spillovers on innovation, social and environmental sustainability, or the construction of a local identity that encourages foreign direct investment, may be an essential part of the picture upon which it is still necessary to shed some light. And even more so, the complementarities between educational and cultural assets are to be brought well under the spotlight: If on the one hand acquiring skills is important, it is equally important to be able to make a creative use of such skills – and there is room to believe that for this to be the case, living in a culturally stimulating environment may make a substantial difference. Thus, in a nutshell, we need to construct endogenous growth models where human and cultural capital are both concurrently accumulated, and optimised with respect to their strategic complementarity: A challenging task, but one that might be conducive to a new way of looking at culture as a key policy variable and not only as a nice and commendable way to spend one's free, leisure time.

The structure of the remainder of the paper is the following. Section 2 provides a discussion of why and how culture generates economic value, and introduces the notion of cultural capital. Section 3 analyzes how culture may be at the root of a specific engine of endogenous economic growth, and its possible relationship with more traditional endogenous growth engines such as education. Section 4 introduces the model and delivers the paper's results. Section 5 provides a final discussion of the results and briefly sketches some directions for future work.

2. How does cultural production matter in the economy?

The traditional economic view on cultural production refers to a pre-industrial conception of culture as a luxury good, accessible only by the wealthy, and mainly provided for by the State or by the politically and economically powerful to enhance their public image and social reputation – that is to say, a vision based upon public or private patronage. In such contexts, there was of

course a recognition of the positive effects of culture in terms of the circulation of ideas, of social and civil progress, of expression of fundamental human values, and so on, and for this reason it was felt that culture could be considered a merit good, deserving to be supported through public transfers. The debate was thus concentrating on whether or not culture should receive public money, and to what extent, but it was practically outside of question that culture could be considered a major *source* of economic value, and not simply one of the many ways to spend money – and this may explain why economists devoted so little attention to the issue for such a long time. A natural consequence of this view is that, however deserving, culture is a superfluous activity, i.e. something that the economy can afford mainly in phases of sustained economic growth. During slumps, on the contrary, cultural budgets are bound to be among the first to be cut, in that money spent on culture is not commonly thought to have a strong anti-cyclic impact on the level of economic activity.

But although in many social and economic environments this outdated idea of the social role of culture is still alive, scholars researching in cultural economics have been able to demonstrate how culture can indeed provide an important contribution to the generation of economic value – and the clearest illustration of the point is the increasing weight of the cultural and creative sector in national GDPs: Just to make an example, in spite of the substantial measurement problems that still affect the statistics of cultural sectors (van der Pol, 2007) – a fact that may have led to a systematic underestimation of the actual economic potential of cultural production (e.g. Markusen et al., 2008) – the already cited KEA report for EU estimated, as of 2005, a turnover for the cultural and creative sector at twice the order of magnitude of that of the automobile sector (KEA, 2006). To this 'direct' effect, moreover, one has to add the already cited spillover effects on dimensions like innovation (Bakshi and Throsby, 2009) or sustainability (Wang, 2010) – something that can be difficult to compute with precision, but that is likely to have a far from negligible macroeconomic effect (KEA, 2009). Moreover, in terms of employment, the labor-intensive cultural and creative industries are giving a significant contribution to the maintenance of the level of employment. In particular, it seems that occupation in such industries tends to be more stable across the economic cycle than in other, more capital intensive sectors (KEA, 2006), although much seems to depend on the actual definition of cultural industries that is adopted (Throsby and Zednik, 2007).

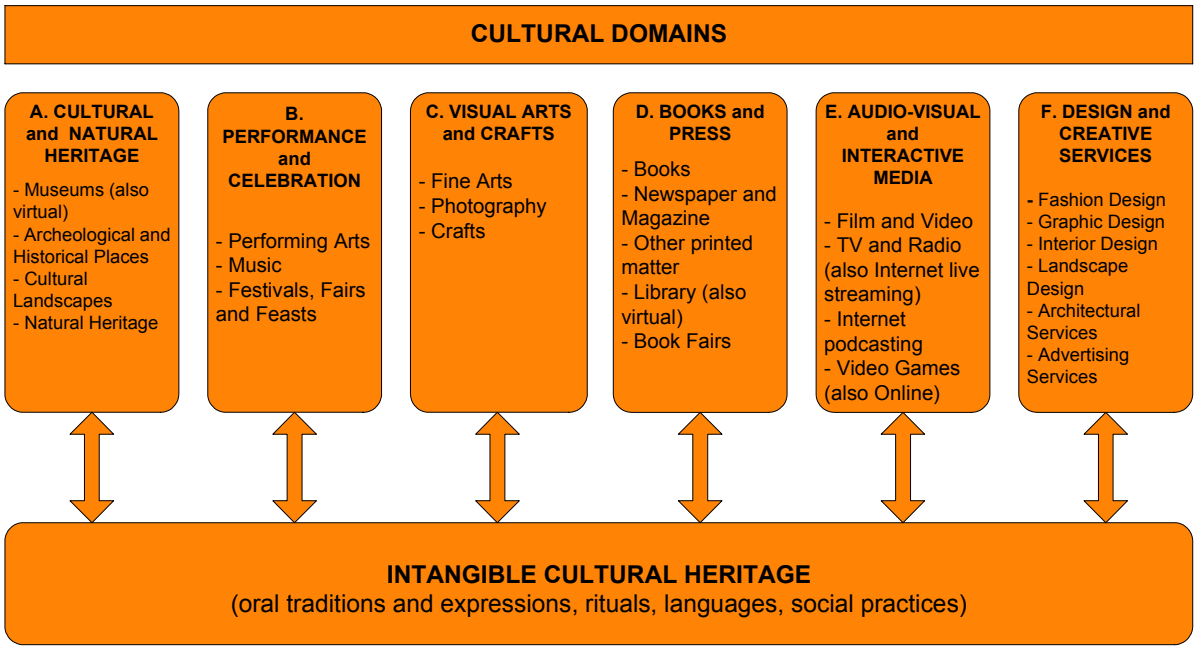
Following Cunningham *et al.* (2008), we can consider four models of the possible relationship between the cultural and the economic dimension. They can be labelled as follows: (1) the welfare model, (2) the competitive model, (3) the growth model, and (4) the innovation model. Traditionally, as already emphasized, the study of the cultural economy has been dominated by the welfare model, based on a market failure argument which claims that it is in general

impossible for a private firm to earn enough from cultural activities to cover costs, let alone to make profits. The only exception are the cultural industries, characterized by large and industrial-scale production, often controlled or directly managed by multinational enterprises. In this situation, the reasoning goes on to say, a market for cultural value exists, and the behaviour of profit maximizing firms would be similar to that of any other profit maximizing firm (the competitive model then applies to the movies, music and broadcasting sectors, and to some part of the publishing and print sector). Models (3) and (4) introduce in the analysis the role of creative industries, giving particular emphasis to the impact that they may have on the general level of economic activity. In the growth model, the turnover dynamics of creative industries is regarded as an important growth driver, because of the numerous spillovers which originate from the creative sectors into other productive sectors, such as from games to simulation and virtual reality training in aerospace, from cutting-edge design to quality manufacturing, and so on. More generally, the innovation model suggests that the economic value of the creative industries stems from their contribution to the production of new ideas or technologies, independently of whether cultural industries are a proper industrial sector or not, in that, irrespectively of this, they provide a stream of symbols and meanings that stimulates innovation and technological progress.

This paper examines the role of culture in a perspective that combines the growth and the innovation models. Specifically, we use the notion of cultural capital within the context of endogenous growth theory, where the accumulation of human capital is usually considered a primary driver of growth. In our view, what counts for economic growth is the *creative use of human capital* that is made possible by the presence of a relevant stock of cultural capital. Behind this statement there is the idea that creativity can only flourish in contexts where large sectors of the economy and of society take advantage of the mind-opening stimuli and attitudes brought about by the availability of rich cultural assets.

In order to capture the idea of cultural assets, we refer to the notion of *cultural capital*, which, following Throsby (2001), is defined as the stock of tangible and intangible cultural expressions. According to this view, the stock of tangible cultural capital consists of all kinds of buildings, structures, sites and locations endowed with cultural significance (heritage), and of artworks and artefacts existing as private goods such as paintings, sculptures, and other objects (see Figure 1). Intangible cultural capital, instead, comprises both artistic performances and celebrations (see section B of Figure 1) as well as ideas, practices, beliefs, traditions and values that derive from the six main cultural domains depicted in Figure 1, together with the stock of artworks existing in the public domain as public goods, such as certain instances of literature and music.

FIGURE 1. *A definition of cultural domains for cultural capital*



Source: Adapted from Unesco (2009)

Delimiting the field of cultural production is far from easy. There is for instance a current of thought that basically identifies culture with highbrow productions, whereas others (and this is by now the reference position) not only include all forms of high-, medium- or lowbrow production, but claim that such a classification is itself practically devoid of meaning in the contemporary context of cultural production practices, characterized by massive crossover of contents, genres, and media. Also, the spectrum of fields that fall within the cultural realm is constantly expanding, ranging from traditional ones such as arts, heritage, museums, theatre and live performance, to the cultural industries, and even to the creative industries and the new online digital content platforms.

The issue is further complicated by the often complex mingling of material and intangible aspects in the definition of what a cultural production is – a good, a service, an experience, a nexus of meaning, and so on. And in fact, even outside the cultural realm in its proper sense (however broad), there is an increasing tendency that causes consumer (and sometimes even intermediate) goods and services to incorporate an intangible added value deriving from design, aesthetics, symbolic and identity values (e.g. Verganti, 2009), whereas, at the same time, an increasing fraction of the economic system consists of the production and circulation of information goods (Shapiro and Varian, 1999).

If we want to appreciate how culture fits into the general picture of growth determinants, we thus have to understand how this heterogeneous complex of objects and meanings may become a main ingredient of a successful factor mix in the current, highly competitive and transient global scenario.

3. What counts for growth is the creative use of the educational capital

State-of-the-art analyses of economic growth tend to identify the accumulation of human capital as one of the main growth drivers. However, despite a practically unanimous theoretical support, empirical evidence that increases in educational attainments matter for growth is unexpectedly not so clear-cut.[2] There are many different attempts at explanation of this puzzle, mainly based on data or estimation techniques arguments.[3] All of them, however, take for granted that the right proxy to measure human capital is the so-called "*educational capital*" (i.e the number of years of schooling), but we claim that this is not the case, since economic growth depends not only on the level of formal education but also on the level of cultural capital existing in a society. An important role is played by the complementarity between cultural capital and educational capital accumulation.

Educational career and attainments are certainly useful on the labor market as a signal of one's acquired abilities, and most likely they also give information about the personal endowment of knowledge and skills assets, but certainly they are not a crucial test as to the actual potential for successful professional or entrepreneurial accomplishment, as clearly exemplified by the biographies of many successful tycoons or businessmen. Likewise, Scott (2000) argues that the presence of skilled workers is not a sufficient condition for successful and continued economic development of a regional system, as what matters indeed is vast social salience of qualities such as cultural insight, imagination, and originality. Creative people react more promptly to any change. Creativity stimulates Schumpeterian entrepreneurs in establishing new firms, but it also makes labor-force more productive, both in young, dynamic start-ups and in established, mature companies. Highly educated and creative people have higher incomes and participate more in

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[2] Empirical results on this topic still remain largely controversial depending on: 1) the methodological approach being used, whether *cross-country growth accounting* (Benhabib and Spiegel, 1994; Krueger and Lindahl, 2001; Pritchett, 2001 and Caselli, 2005, among others) or *cross-country growth regressions* (Barro, 1999; Easterly and Levine, 1997; Islam, 1995); 2) the measure of human capital employed. Wößmann (2003) provides a detailed survey of all the main measures of human capital used to date by empirical studies on growth (in particular adult literacy rates, school enrollment ratios and average years of schooling of the working-age population), and analyzes the pros and cons of each of them; 3) the type of data employed. Studies using cross-section data, unlike those based on panel data, generally find that human capital accumulation has a positive effect on the rate of growth of real per-capita income. Islam (1995) summarizes this finding by observing that: *"...whenever researchers have attempted to incorporate the temporal dimension of human capital variables into growth regressions, outcomes of either statistical insignificance or negative sign have surfaced"*. See also Topel (1999) and Mathur (1999) for reviews.

[3] See, among others, Temple (1999; 2001), Benhabib and Spiegel (2005), Bassanini and Scarpetta (2001).

community activities and have a higher marginal propensity to consume local services, thus sustaining the local economy more effectively. A positive externality effect can also be envisaged, as human capital may be more productive where more creative people are working and living together – and this concentration effect is at the root of some of the most successful explanations given in the past few years as to the competitive potential of cities (Glaeser et al., 1992, Glaeser and Resseger, 2010). Florida (2002, 2005) introduces the idea that economic growth is facilitated by the presence of the creative class, that is composed of creative and innovative - and *therefore* highly productive – workers; and although his model has been severely criticized (e.g. Peck, 2005) and even refuted on a statistical basis (e.g. Hoyman and Faricy, 2009), the main tenet of the effect of density on city growth seems to stand even if the general framework doesn't (e.g. Knudsen et al., 2008). When competition cannot take place through costs cutting, product innovation represents the distinctive successful factor for the economic system of either a region or a country (e.g. Porter, 2003), and therefore the spillover effect brought about by a socially salient creative attitude becomes all the more relevant in explaining growth success – and possibly failure.

The positive effects of creativity are greater and deeper when the cultural dimension plays a relevant role in the economic system according to what briefly discussed in Section 2. This pattern of development benefits from the widening of the borders of cultural and creative industries as productive sectors.[4] Not incidentally, several of the most recent examples of successful global companies have to do with the creation of socially networked platforms for creative content. The increased cultural orientation brought about by the expansion of size and scope of the creative industries stimulates the production of new ideas and new technologies, so that we can properly reason in terms of culturally and creatively generated spill-over effects that contaminate other productive sectors to an increasing extent, both in industrialized and emerging countries, as the latter are getting into the new global creativity game at earlier and earlier stages of their development trajectory. As the UNESCO Universal Declaration on Cultural Diversity states, "*as source of exchange, innovation and creativity, cultural diversity is as necessary for humankind as biodiversity is for nature*" – and probably it is equally necessary in terms of successful environmental adaptation, where of course the 'environment' of cultural diversity is the current social and economic global scenario.

[4] In the literature, no clear agreement exists as to which industries should or should not be included in the cultural sector of the economy, and defining the cultural or creative industries is a matter of some debate (Throsby, 2008).

4. An endogenous growth model for cultural capital

As highlighted by Sacco and Segre (2009), despite the growing literature aimed at explaining how cultural and artistic production actually feeds long-term economic growth, it is generally the case that in such analyses all important factors are grouped together, so that the causal relationships and interplays between them are not investigated in depth. In the attempt of filling this gap, the present paper examines the role of cultural capital in fostering economic growth within the framework traced by the *New Growth Theory*, and according to the lines set up in the previous discussion. At this regard – building upon Bucci and Segre (2011) – we present a theoretical model that describes how economic growth can be driven by the combination of the investments in human and cultural capital. Investments in human capital usually refer to the sole educational capital and are therefore measured in terms of the number of years of schooling; investments in cultural capital refer to the stock of a composite mix of assets corresponding to the six cultural domains presented in Figure 1 above. In the model we postulate that the growth of human capital is itself induced by the growth of cultural capital (in a sense that will be made more apparent in a moment).[5]

In more detail, consider a closed economy in which final output (GDP), Y, is used as the *numeraire good* ($P_Y = 1$) and employed in part for consumption purposes and in part for investment in cultural capital. The hypothesis that the economy is closed comes from the fact that cultural expression originates and grows in a particular place. Culture is of course universal and global, but at the same time it is very "local", since every cultural expression is based on the "*genius loci*" characterising a particular place. In each of the the six cultural domains displayed in Figure 1, the idiosyncratic dimension of culture can be envisaged. This is clear in the case of cultural and natural heritage (domain A), that are physically located in a precise place and are typically not internationally mobile (such as are museums, monuments, archeological and historical sites, cultural landscapes, etc.), but it also applies to the others domains and especially to their intangible dimension. Toursim - and in particular cultural tourism - is the main result of this. Due to the different cultural atmosphere, any good or service is unique when produced and consumed in a particular place.[6]

Production of final output takes place competitively (the sector producing the homogeneous good Y is populated by a very large number of small, price-taking, atomistic, and structurally-

[5] Unlike the paper by Ottaviano and Peri (2005) - where culture is intended as a private good relevant to households consumption - following the literature briefly illustrated in section 2 and 3, our model treats culture as an input in production, so emphasizing the importance of cultural capital as a factor-input in production activities.

[6] Most of the cultural products and services have at the same time also a universal value and therefore a global international market. This aspect is, however, behind the scope of the present paper.

identical firms). Hence, we can focus on the behaviour of a single representative firm employing the following Cobb-Douglas technology:

$$Y_t = \Omega A_t^{1-\alpha} H_t^{\alpha}, \qquad \Omega > 0, \qquad \alpha \in (0;1). \tag{1}$$

In Eq. (1) H_t and A_t are, respectively, the aggregate stocks of human and cultural capital available in the economy at time *t*. $\Omega > 0$ is a technological parameter representing the (constant) aggregate TFP (*Total Factor Productivity*). With cultural capital viewed as the stock of tangible and intangible cultural expressions (Throsby, 2001) and, therefore, having a productive use per se (Throsby, 2008), we can think of the total stock of human capital (H) as the number of workers, L, times the average level of quality (namely, the number of years of schooling) of each worker, h. We postulate that each individual in the population works and supplies inelastically one unit of labor-services per unit of time.[7] Hence, population size coincides with the number of workers (the labor-force). Because we are not interested in modelling population dynamics and its effects on long-run growth, we assume that L is constant and, for the sake of simplicity, normalize this variable to one ($L_t = L_0 \equiv 1, \ \forall t \geq 0$). Under these assumptions, we clearly have $H_t = h_t$. The specification of the aggregate production function (Eq. 1) implies that it has constant returns to scale to A and H taken together. In the same equation, α and $(1-\alpha)$ denote respectively, for given Ω, the human and cultural capital shares in aggregate GDP.

Because the representative firm producing consumption goods is small enough with respect to the size of the whole economy, it takes A_t and H_t as given. Moreover, we postulate that TFP depends on some function of the *"relative intensity"* of cultural capital at the economy-wide level (the ratio of the aggregate cultural to human capital stocks, $\Delta \equiv A_t / H_t$) and assume that the function linking aggregate TFP (Ω) to this ratio (Δ) takes the form:

$$\Omega \equiv \left(\frac{A_t}{H_t} \right)^{\eta} \equiv \Delta^{\eta}, \qquad \eta \neq 0. \tag{1'}$$

Since each single firm takes A_t and H_t as given, it also takes TFP (Ω) as given. The ratio $\Delta \equiv A_t / H_t$ can be interpreted as a measure of the economy's *average cultural capital* (cultural capital per unit of human capital). This ratio reflects the importance that a balanced combination of arts exposures and formal education would be present in the economic system. As recalled in

[7] This amounts to assuming that there is no endogenous choice between work and leisure time at the individual level.

Sacco and Segre (2009), throughout the history, science, math and technology have flourished only where and when all the arts have flourished, and nearly all of the most important great inventors were also musicians, artists, writers or poets. It has also been demonstrated that exposure to and participation in the arts strengthens children's educational performance. With Ω constant and taken as given, and $\eta \neq 0$ human and cultural capital need to grow at the same rate, a rate which will be endogenous and time-invariant along the balanced growth path (BGP, henceforth) equilibrium. In a moment we shall give a more formal definition of this model's BGP equilibrium.[8] Given Ω, we observe that the stock of human capital, H_t, equals:

$$H_t = \frac{A_t}{\Delta} = \frac{A_t}{\Omega^{1/\eta}}.$$

Therefore, as already mentioned, in this model the growth of H is itself induced by the accumulation of cultural capital. In order to have the most general possible model, at the moment we do not impose any further constraint on the parameter η, except that it is to be different from zero.[9] This parameter (η), measuring the sign and the magnitude of the effect (an externality-effect) of a change in the economy's *average cultural capital* on aggregate TFP,[10] is going to play a relevant role in the model.

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[8] The constancy of Ω is indeed explained by the constancy of the ratio A/H. In turn, the constancy of this ratio arises from the fact that another way (alternative to the traditional *formal schooling* and *training-on-the-job arguments*) for a country to increase its own available stock of human capital is to increase its own stock of cultural capital (in other words, investment in a country's cultural capital can itself contribute to rise the aggregate amount of human capital of its inhabitants). Since in this paper we are interested in emphasizing the role of cultural capital as engine of endogenous growth, we make the extreme hypothesis that there exists a *one-to-one* relationship between the growth rate of A and the growth rate of H (this is the implicit assumption behind postulating the constancy of A/H). Using a two-sector growth framework, in a companion paper Bucci and Segre (2011) have already analyzed the predictions of a model in which the process of human capital accumulation takes place as in Uzawa (1965) and Lucas (1988), and where the ratio A/H remains invariant over time along the BGP (as in the present contribution). Unlike the present paper, however, in Bucci and Segre (2011) economic growth is driven by human capital accumulation, and not cultural capital investment.

[9] With $\eta = 0$, Ω would equal 1 (for each A_t and H_t different from zero). In this case we would lose the *average cultural capital* effect in the economy. At a later stage, constraints on the (relationship between) feasible values of some exogenous parameters of the model (including η) will be imposed, in order to guarantee that the model's endogenous variables are strictly positive (see Proposition 1).

[10] More formally, we see that $\frac{\partial \Omega}{\partial \Delta} = \eta \Delta^{\eta-1}$. Therefore, with A_t and H_t both positive at each $t \geq 0$: (1) An increase in $\Delta \equiv A_t / H_t$ increases total factor productivity (Ω) when $\eta > 0$. In this case the externality (that is the effect on aggregate TFP) taking place from a rise of the *average cultural capital* would be positive (it is an increase in A, relative to H, that increases Ω); (2) A rise of $\Delta \equiv A_t / H_t$ decreases total factor productivity (Ω) when $\eta < 0$. In this case, instead, the externality (the effect on aggregate TFP) coming from a rise of the *average cultural capital* in the economy would be negative (it is an increase in H, relative to A, that increases *TFP*). All in all, imposing $\eta \neq 0$ amounts to recognizing that we do not know *a priori* whether it is an increase in A relative to H, or instead an increase in H relative to A, that in the end contributes to increase *TFP*. Accordingly, we prefer to leave our analysis as much general as possible, and set $\eta \neq 0$. With $\eta \neq 0$, what (1) and (1') together suggest is that *Total Factor Productivity* (Ω) is somehow influenced by the ratio of the two types of capital stocks (cultural and human capital).

At this stage two remarks are in order. The first is that in our model cultural and human capital do play an important role in GDP-formation (*i.e.*, the production of total output, Y) both directly (since they represent two types of capital that enter the aggregate production function as factor-inputs), and indirectly (since they are also able to influence total factor productivity).

By combining (1) and (1'), and using the definition of Δ, the aggregate technology for goods production can be finally recast as:

$$Y_t = \frac{1}{\Delta^{\alpha-\eta}} A_t, \qquad \alpha \in (0;1), \qquad \eta \neq 0. \tag{1"}$$

Thus, according to Eq. (1"), the second remark concerns the fact that we are analyzing the predictions of a generalized *"AK"*-type (one-sector) endogenous growth model in which physical capital is replaced by cultural capital. So, it is capable of generating positive and endogenous growth in the long-run. After describing the production side of the economy, we can now analyze the consumers' behavior.

4.1 CONSUMERS

There is a continuum (of total mass equal to one) of identical households. Thus, we can focus on a representative infinitely-lived dynasty with perfect foresight, whose size coincides with the size of the entire population. However, since population size has been normalized to one, we are assuming that in this economy there exists only one agent who lives forever. This agent uses all the income s/he does not consume for investment in cultural capital. Therefore, the aggregate budget constraint reads as:

$$\dot{A}_t = Y_t - C_t - \delta_A A_t, \qquad 0 \leq \delta_A < 1, \qquad A(0) > 0, \tag{2}$$

where $\dot{A}$ is (net) investment in cultural capital, C denotes (aggregate/per-capita) consumption and δ_A is the constant, instantaneous depreciation rate of cultural capital.[11] The above equation says that savings $(Y - C)$ are used to accumulate (gross) cultural capital, $\dot{A} + \delta_A A$.

In what follows we analyze the choices of a benevolent social planner who seeks to maximize intertemporally the discounted instantaneous utility attained from the consumption of the

[11] It is well known that cultural heritage and artistic works need continuous conservation and maintenance expenditures. These are captured by δ_A, which may also be equal to zero in the model without changing the main results.

homogeneous final good by an infinitely-lived representative worker/consumer. The problem of the social planner is:

$$\underset{\{C_t, A_t\}_{t=0}^{t=+\infty}}{Max} \; U \equiv \int_0^{+\infty} u(C_t) e^{-\rho t} dt, \qquad u(C_t) = \frac{C_t^{1-\theta} - 1}{1-\theta}, \qquad \rho > 0; \qquad \theta > 1 \tag{3}$$

$$s.t.: \qquad \dot{A}_t = Y_t - C_t - \delta_A A_t = \underbrace{\Delta^{\eta-\alpha} A_t}_{=Y_t} - C_t - \delta_A A_t, \qquad 0 \leq \delta_A < 1$$

$$A(0) > 0.$$

In solving this problem, the social planner internalizes the external effect of a change in the average cultural capital in the economy on TFP.[12]

Symbols used above have the following meaning: U and $u(C)$ are, respectively, the agent's intertemporal utility function and her/his instantaneous isoelastic utility function. We denote by ρ the pure rate of time-preference and by $1/\theta$ the constant intertemporal elasticity of substitution in consumption. While the hypothesis $\rho > 0$ ensures that U is bounded away from infinity if C remains constant over time, we have convincing evidence that $\theta > 1$.[13] We are now able to move to a formal characterization of the BGP equilibrium of this model.

4.2 BGP EQUILIBRIUM

According to what briefly discussed in Section 2, the positive effects of creativity on the development of the economic system are expected to be greater and deeper when the cultural dimension plays a relevant role. In order to give a coherent theoretical representation of this idea following the model just depicted, we introduce a formal definition of BGP equilibrium.

DEFINITION: Balanced Growth Path (BGP) Equilibrium

A BGP equilibrium in this economy is a long-run equilibrium where all variables depending on time grow at constant exponential (possibly positive) rates.

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[12] In other words, since A is a state-variable, the social planner sets explicitly $\Delta \equiv A_t / H_t$ when taking the (necessary) first order conditions of the problem stated in Eq. (3).

[13] See the short but comprehensive survey on the empirical estimates of the intertemporal elasticity of substitution in consumption contained in Okubo (2011). In particular, using Japanese aggregate data, the author shows that the point-estimate of $1/\theta$ for Japan is around 0.2 - 0.4, a value not significantly different from the one that can be found for the US. This implies that θ is clearly larger than one (as already maintained by Hall, 1988).

It is possible to show that the following results do hold along the BGP equilibrium of this model economy.[14] Eq. (4) gives the common BGP-equilibrium growth rate of the economy's income (Y), stock of cultural capital (A), stock of human capital (H), and consumption (C). Eq. (5), provides the BGP level of aggregate/per capita real income, Y, as a (linear) function of the stock of cultural capital. Finally Eq. (6) represents the optimal cultural to human capital ratio along the BGP equilibrium.

$$\gamma_Y = \gamma_A = \gamma_H = \gamma_C \equiv \gamma = \frac{1}{\theta}\left[\left(1+\eta-\alpha\right)^{1+\eta-\alpha}\left(\alpha-\eta\right)^{\alpha-\eta} - \delta_A - \rho\right] \tag{4}$$

$$Y_t = \left(1+\eta-\alpha\right)^{\eta-\alpha}\left(\alpha-\eta\right)^{\alpha-\eta} A_t \tag{5}$$

$$\Delta \equiv \frac{A_t}{H_t} = \left(\frac{1+\eta-\alpha}{\alpha-\eta}\right). \tag{6}$$

Note that η, measuring the sign and the magnitude of the impact of a change in the *average cultural capital* on TFP, directly affects not only the level (Y) and the growth rate (γ) of GDP, but also the ratio Δ itself. These results are obtained under the specific assumption that the ratio of cultural to human capital ($\Delta \equiv A_t / H_t$) is constant, implying that $\gamma_A \equiv \frac{\overset{g}{A}_t}{A_t} = \frac{\overset{g}{H}_t}{H_t} \equiv \gamma_H$.

To ensure that the three main endogenous variables of the model take economically meaningful values (i.e. positive values) along the BGP, we introduce Proposition 1, which is then merely a technical proposition.

PROPOSITION 1

Assume $A_t > 0$ *and* $H_t > 0$ *at each time* $t \geq 0$. *With* $\theta > 1$, *the following restrictions on the model's parameter values:*

$$\left(1+\eta-\alpha\right)^{1+\eta-\alpha}\left(\alpha-\eta\right)^{\alpha-\eta} - \delta_A > \rho \tag{7}$$

$$0 < \left(\alpha-\eta\right) < 1, \tag{8}$$

ensure that along the BGP: $\gamma > 0$; $\Delta > 0$ and $Y_t > 0$.

Proof: Follows immediately from Eqs. (4)-(6). It is possible to notice that along the BGP equilibrium the social planner observes: $p_{At} \equiv \frac{\partial Y_t}{\partial A_t} = \left(1+\eta-\alpha\right)\Delta^{\eta-\alpha} = \left(1+\eta-\alpha\right)^{1+\eta-\alpha}\left(\alpha-\eta\right)^{\alpha-\eta}$,

[14] Mathematical derivation of these results is available in an appendix that can be obtained from the authors upon request.

where p_A is the rental price paid by competitive firms for the use of cultural capital, A.[15] Therefore, Eq. (7) above requires the net rental price of cultural capital ($p_{At} - \delta_A$) to be larger than the pure time preference rate (ρ), a positive constant. In the Appendix (obtainable from the authors upon request), we also show that for the transversality condition to be checked it is sufficient that the net rental price of cultural capital is positive. Therefore, if the inequality written in (7) is satisfied, the transversality condition is also simultaneously satisfied.[16] ■

The next two propositions (along with the corresponding lemmas) summarize the main results of the paper concerning, respectively, the effect of a change in the GDP share of cultural capital on optimal growth (γ) and on the level of per-capita/aggregate real income (Y).

PROPOSITION 2: THE EFFECT OF A CHANGE IN THE GDP SHARE OF CULTURAL CAPITAL ON OPTIMAL ECONOMIC GROWTH, γ

Define by $s \equiv (1-\alpha)$ *the share of cultural capital in GDP. Along the BGP equilibrium, with* $\theta > 1$ *and* $0 < (\alpha - \eta) < 1$*:*

- *An increase in* s *leads to a rise of the optimal growth rate* γ *if* $\Delta > 1$*;*
- *An increase in* s *leaves the optimal growth rate* γ *unaffected if* $\Delta = 1$*;*
- *An increase in* s *leads to a fall of the optimal growth rate* γ *if* $\Delta < 1$.

Proof: Using Eq. (4), we have:

$$\frac{\partial \gamma}{\partial s} = \frac{1}{\theta}\underbrace{\left[1-(\alpha-\eta)\right]^{1-(\alpha-\eta)}(\alpha-\eta)^{\alpha-\eta}}_{\equiv Z}(\ln \Delta), \qquad \Delta \equiv \frac{A_t}{H_t} = \left(\frac{1-\alpha+\eta}{\alpha-\eta}\right) > 0.$$

With $\theta > 1$ and $0 < (\alpha - \eta) < 1$, Z is certainly positive. Therefore, the sign of the derivative crucially depends on whether $\Delta \lessgtr 1$. ■

[15] More precisely, defining by p_A and p_H the rental prices paid by competitive firms producing the homogeneous good Y for the use of the two types of capital (cultural capital, A, and human capital, H, respectively), the profit of a generic, atomistic, competitive firm producing final output (Y) is: $\pi_Y = P_Y Y - p_A A - p_H H = Y - p_A A - p_H H$, where $P_Y \equiv 1$. Profit maximization implies that the marginal product of each input equals its own rental price, *i.e.* $\frac{\partial Y}{\partial A} = p_A$ and $\frac{\partial Y}{\partial H} = p_H$. These rental prices go to the owners of each type of capital.

[16] If η were equal to zero, inequality (8) would be trivially checked since $\alpha \in (0;1)$. We rule out this case from our analysis.

Proposition 2 reveals two important results. The first is that the effect of the cultural capital share in GDP on the rate of (optimal) economic growth is highly non-monotonic and crucially depends on the relative size of Δ, the ratio of cultural to human capital.

The second suggests that increasing the share of cultural capital in GDP would yield in the long-run a rise of the optimal growth rate only in those countries where the existing stock of cultural capital (relative to the stock of human capital) is sufficiently large, that is $\Delta > 1$.

LEMMA 1: WHEN THE SHARE OF CULTURAL CAPITAL IN GDP GIVES MAJOR EFFECTS ON ECONOMIC GROWTH

Along the BGP equilibrium:

- *An increase in* s *leads to a rise of the optimal growth rate* γ *if* $0 < (\alpha - \eta) < \frac{1}{2}$;
- *An increase in* s *leaves the optimal growth rate* γ *unaffected if* $(\alpha - \eta) = \frac{1}{2}$;
- *An increase in* s *leads to a fall of the optimal growth rate* γ *if* $\frac{1}{2} < (\alpha - \eta) < 1$.

Proof: Immediate from Proposition 2, the definition of $\Delta = \left(\frac{1-\alpha+\eta}{\alpha-\eta}\right)$, and the fact that $0 < (\alpha - \eta) < 1$ (Eq. 8). ■

According to Lemma 1, for given α, the bigger η (hence, the smaller $\alpha - \eta$), the more positive the impact of a further increase in s on the optimal growth rate of the economy. In words this means that, for given share of human capital in GDP, in economies where the externality-effect induced at the aggregate TFP level by an expansion of the *average cultural capital* is more sizeable, it should be more rewarding (in terms of optimal growth) to increase the share of cultural capital in GDP.

PROPOSITION 3: THE EFFECT OF A CHANGE IN THE GDP SHARE OF CULTURAL CAPITAL ON THE LEVEL OF INCOME

Define by $s \equiv (1-\alpha)$ *the share of cultural capital in GDP. Along the BGP equilibrium, with* $A_t > 0$ *and* $0 < (\alpha - \eta) < 1$*:*

- *An increase in* s *leads to a rise of the level of income* Y_t *if* $\Delta(\ln\Delta) > \Delta + 1$*;*
- *An increase in* s *leaves the level of income* Y_t *unaffected if* $\Delta(\ln\Delta) = \Delta + 1$*;*
- *An increase in* s *leads to a fall of the level of income* Y_t *if* $\Delta(\ln\Delta) < \Delta + 1$.

Proof: Using Eq. (5), it is possible to compute:

$$\frac{\partial Y_t}{\partial s} = \underbrace{\left[1-(\alpha-\eta)\right]^{-(\alpha-\eta)}(\alpha-\eta)^{\alpha-\eta}}_{\equiv\Psi}\left[\ln\Delta - \frac{1}{\Delta(\alpha-\eta)}\right]A_t, \qquad \Delta \equiv \frac{A_t}{H_t} = \left(\frac{1-\alpha+\eta}{\alpha-\eta}\right) > 0.$$

Since $0 < (\alpha-\eta) < 1$, Ψ is certainly positive. With $A_t > 0$, the sign of the derivative crucially depends on the sign of $\left[\ln\Delta - \frac{1}{\Delta(\alpha-\eta)}\right]$. Manipulation of this expression, in conjunction with the fact that $\left(\frac{1}{\alpha-\eta}\right) = \Delta + 1$, delivers the results stated in the Proposition. ■

In order to have an intuition of Proposition 3, Figure 2 plots both $\Delta + 1$ – the linear function – and $\Delta(\ln\Delta)$ – the non linear function – in terms of Δ.

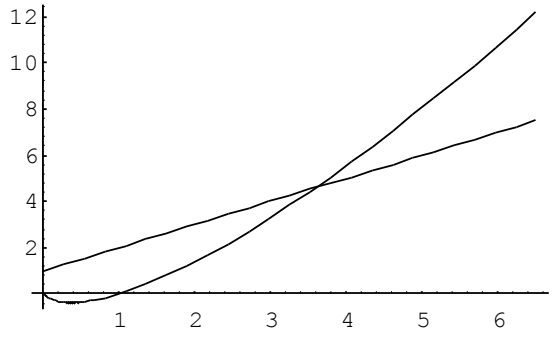

FIGURE 2. *The plot of* $\Delta(\ln\Delta)$ *and* $\Delta + 1$ *as functions of* $\Delta \equiv A_t / H_t$.

Hence, we observe that:

- $\frac{\partial Y_t}{\partial s} > 0 \qquad \forall\ \Delta \equiv \frac{A_t}{H_t} > \bar{\Delta} \cong 3.591122$;
- $\frac{\partial Y_t}{\partial s} = 0 \qquad$ for $\Delta \equiv \frac{A_t}{H_t} = \bar{\Delta} \cong 3.591122$;
- $\frac{\partial Y_t}{\partial s} < 0 \qquad \forall\ \Delta \equiv \frac{A_t}{H_t} < \bar{\Delta} \cong 3.591122$.

In other words, in countries where cultural capital is largely more abundant than human capital we should observe in theory a positive impact of an increase in the share of cultural capital in GDP on the level of per capita real income.

Using the definition of $\Delta \equiv \frac{A_t}{H_t} = \left(\frac{1-\alpha+\eta}{\alpha-\eta} \right) > 0$, we can state the following Lemma.

LEMMA 2: WHEN THE SHARE OF CULTURAL CAPITAL IN GDP GIVES MAJOR EFFECTS ON THE LEVEL OF INCOME

Along the BGP equilibrium:

- *An increase in* s *leads to a rise of the level of income* Y_t *if* $0 < (\alpha - \eta) < \frac{1}{4,591122} \cong 0.22$*;*
- *An increase in* s *leaves the level of income* Y_t *unaffected if* $(\alpha - \eta) = \frac{1}{4,591122} \cong 0.22$*;*
- *An increase in* s *leads to a fall of the level of income* Y_t *if* $0.22 \cong \frac{1}{4.591122} < (\alpha - \eta) < 1$.

This Lemma says that, for given share of human capital in GDP (α), in countries where η is bigger (*i.e.*, the externality-effect induced at the aggregate TFP level by an expansion of the *average cultural capital* is more sizeable), it should be more likely to observe a positive impact of an increase in $s \equiv (1-\alpha)$ on the level of real per capita income. Putting together Lemma 1 and Lemma 2 yields:

LEMMA 3: THE EFFECT OF A CHANGE IN η ON THE RELATION AMONG THE GDP SHARE OF CULTURAL CAPITAL, THE OPTIMAL GROWTH, AND THE LEVEL OF INCOME

Along the BGP equilibrium, for given α*, the higher* η *(therefore, the smaller* $\alpha - \eta$*), the more positive the simultaneous impact of an increase in* $s \equiv (1-\alpha)$ *on the level and the optimal growth rate of real per capita income.*

So, *ceteris paribus*, increasing the share of cultural capital in GDP would lead in the long-run to a better pay-off (higher level and growth rate of per capita income) in those countries in which *average cultural capital* plays significant externality-effects in terms of aggregate TFP.

5. Discussion and conclusions

Our theoretical model suggests that, in order to have a culture-driven endogenous growth model, the underlying economy must be a *culture-intensive* one: If $\Delta > 1$, *i.e.* if the stock of cultural capital exceeds that of human capital, then, as shown in Proposition 2, a rise of the share of cultural capital in GDP increases the optimal growth rate, whereas, in a human capital-intensive economy ($\Delta < 1$), it has the reverse effect. In other words, culture becomes a real engine of growth only when its presence in the economy is pervasive enough. Likewise, Proposition 3 states that an increase in the share of cultural capital in GDP has a positive effect on per capita income only in a highly culture-intensive economy (as shown in the numerical example, the value of Δ that would allow to reach this result may well be largely over unity – in the example, for instance, it lies between 3 and 4).

Together, Propositions 2 and 3 allow us concluding that, for an increase in the GDP share of cultural capital to have simultaneously a positive effect on the optimal growth rate and the level of per capita income, an economy's ratio of cultural to human capital ($\Delta \equiv A/H$) should be sufficiently large. This result seems to point to (and, therefore, might be explained by) the existence of important *"critical mass"*, or *"network"*, or else *threshold-effects* in the long run relationship between GDP growth/level and the share of cultural capital in aggregate income. In this respect, one testable prediction of our analysis would be that a rise of the cultural capital share in GDP can yield a positive impact on economic growth/level of per-capita and aggregate income solely beyond a certain threshold of this share.

Ceteris paribus, it is also worth remarking the economic role of the parameter η: in an economy in which cultural capital intensity truly has a strong and positive bearing (external positive effect) on aggregate TFP, we expect that investing in culture becomes an effective engine of growth.

The results of the model seem to suggest an explanation as to why certain industrialized economies are more willing to invest in cultural capital than others. It is only when, due to past circumstances, a large level of cultural capital has been accumulated, that culture is able to display its positive effects on the economy's growth and income potential. On the contrary, when the existing cultural stock is poor, culture is actually jeopardizing the economy's performance. In industrialized countries focusing their economic development on traditional industrial assets and considering culture only as marginal "luxury goods" or "merit goods", economic growth can be at risk. This being the case, we can figure out the possibility of a *cultural poverty trap* as the cause of poor growth performance of some economies in the current post-industrial scenario where production processes increasingly depend on cultural inputs. Culturally poor economies, according to our model, tend to grow slowly because their total factor productivity is too small, and the cause of this poor total factor productivity is that lack of cultural exposure makes the

available human capital, all other conditions being equal, too 'dumb', i.e., weakly inclined to be used in innovative, flexible ways.

When applied to developing countries, another explanation of the results of our model arises. If there are options of substitution with other production factors, until a certain threshold the profitability of the substitution would lead to concentrate the investment on other factors more productive than culture. For developing countries, the existence of basic endowments and infrastructures, such as roads, hospitals and schools, are necessary conditions for economic growth. Before this necessary conditions are meet, economic growth can not be driven by cultural investment, that are competing with other fundamental public expenditures.

The model also suggests that the divide between culturally intensive and culturally poor economies could widen up through time, as the result of different growth performances, and that, on the contrary, a sudden accumulation of cultural capital due to external factors – e.g. a non market mediated accumulation due to the concurrence of exceptional historical and environmental factors, such as an exceptional episode of 'cultural renaissance' due to an high concentration of innate creative talent and/or to the sudden availability of a large inherited stock of cultural assets, as it happened for instance in the Italian Renaissance with the re-discovery of the Greek-Roman classics made possible by the patient work of preservation and copying carried out by the Medieval monks – could be conducive to sudden, explosive growth.

These findings are, of course, open to empirical scrutiny, and we look forward to further research – up to now totally missing – aimed at testing the model on suitable time series data.[17] In particular, it will be interesting to check not only the economy's growth performance as depending on the available (relative) stock of cultural capital, but also its effect on total factor productivity. So far, the notion of total factor productivity has kept a singular status in the literature – that of a 'residual' concept, namely, a magnitude that, rather than reflecting some specific and well-understood force, stood for all those productivity effects that were not traceable back to any specific traditional production factor and should have therefore been capturing some *joint* effects of all of the factors at work. What our model suggests is that such a 'mysterious' effect could indeed capture the role of culture as a differential factor that allows a smarter, more open-minded and creative use of the available factors and resources – an intuition that seems to be confirmed from the preliminary evidence that indeed cultural access seems to be correlated so many diverse aspects of human life (Howkins, 2001; Grossi et al., 2011).

[17] See Bucci and Segre (2011) for a discussion about the few and insufficient actual possible measures of cultural capital.

We are aware that a substantial amount of further research is needed to check whether these conclusions are granted. But it is interesting to point out that, should this be the case, it would be needed to rethink cultural policy as a key entry of the overall policy menu, rather than as a minor, sectorial policy as it is often commonly meant now. And this would mean in turn that the economy has found an engine of growth that not only does not bring about any sort of adverse environmental effect, but one that generally has a strongly positive effect on individual well-being, social cohesion, and human development. For once, we could think of growth as a win-win game. We look forward to this exciting prospect.

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