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ORIGINAL PAPER

Cultural impact on regional development: application of a PLS-PM model to Greece

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Abstract This paper seeks to find evidence for the impact of local culture—living culture and cultural heritage—on regional socio-economic development in Greece. The main aim of the paper is to operationalize the culture-based development hypothesis for the existence of a cumulative causation process of cultural impact on Greek local development. To test this hypothesis empirically, we employ an original and uniquely compiled dataset of over 130 economic and social indicators about Greece on a NUTS3 level, assembled from various international and local sources. Employing a combined nonparametric partial-least squares path modelling approach, we find evidence that—in contrast to results from other European countries and the USA—in Greece, culture influences not only the human capital, but also the overall labour force structure. This appears to affect not only the economic productivity, but also the overall quality of life in the locality concerned. These results, based on nonparametric estimations, were confirmed through triangulation with parametric 3SLS and structural equation model tests. The latter use of parametric and nonparametric techniques in a mutually complementary manner is one of the novelties in this contribution.

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1 Introduction

The impact of culture on local development has for a long time intrigued economists and is still a largely underexplored issue (see Huggins and Thompson 2015 for a most recent overview). Research on this topic has varied widely through time. The first attempts in this field carried the signs of large social–philosophical attempts. Smith (1759) addressed the impact of values on choice and made a distinction between economically rational and moral (i.e. cultural attitudes biased) choice. Max Weber (1930) introduced the notion of cultural attitudes (sometimes narrowly interpreted as only religious values) on local productivity and entrepreneurship.

In more recent times, Jacobs (1961) in the USA delved further into the mechanism behind culture and local development by suggesting the idea of cultural diversity—the 'melting pot'—as the source of local productivity. Next, in France, Bourdieu (1973, 1977, 1986) proposed the notion of cultural capital. Cultural capital on an individual level was defined as cultural objects, values and cultural possessions of prestige (certificates and other institutional cultural markers). And this capital was suggested to be a source for social reproduction, social class mobility and economic prosperity of the individual.

From a different perspective, the seminal work of Myrdal (1957, 1989) focused on the impact of attitudes on the deepening of the divide in inequality. Using a process terminology, namely 'vicious circles' and 'self-fulfilled prophecy', this process was explained as follows. Economic outcomes are driven by the conviction that the inequality is a fact to be considered rather than a problem to be tackled and hence becomes a reason to replicate and augment inequality over time through multiple decisions. A rather extreme position was already adopted earlier in Marx (1859, 1867) proposition that culture is a totally endogenous product of local economic development. It is evident from the above that the theoretical paradigms for analysing culture in relation to the economy have taken different paths. Both individual and local-level interpretations touched on significantly different types of impact mechanism.

Recent approaches to cultural impact on development can be divided into theoretical and empirical studies. The atomic, predominantly empirical literature, suggests to totally strip culture from programmatic thinking. It focuses operationally on the detection of the statistical significance of any cultural variable at stake. This variable choice is only supposed to be motivated from an economic rationale, such as ethnic diversity (Ottaviano and Peri 2004, 2005, 2006; Tabellini 2010), cultural distance (Tadesse and White 2010a, b, 2011), trust (Knack and Keefer 1996; Glaeser et al. 2000) or occupational structure in the locality (Florida 2002a, b, 2005; Markusen 2010). These variables were often found to be statistically relevant.

Yet, we lack a theoretical backing of the explanation of how and why the economic relevance of culture is to be understood. On the opposite spectrum of modern explorations on the link between culture and development, the theoretical stream of literature seeks to delve in detail into the cultural bias in choice. This includes among others the internal order of preferences (Sen 1993), the role of distance and hedonic valuation mechanisms, especially for house pricing (Rosen 1974; Rose 1990), culture as a spatial sorting mechanism (Axelrod 1997), the classical Balassa–Samuelson effect on the cultural base in traded goods (Samuelson 1994), the wisdom of crowds' heterogeneity of ideas rationale suggested by Page and Toole (2010), the concept of risk taking and choice modelling (Arrow 1951) or more recent regional economics-oriented theoretical work such as Bucci et al. (2014). Clearly, most of this theoretically filigree work remains mostly empirically weak. Since empirical and theoretical work have both focused on different aspects of the question of cultural impact on development, an unambiguous scientific clarity on this relationship is still missing (see Tubadji et al. 2014a, b for more details on recent approaches to the economic analysis of cultural impact).

Against the background of the historical and modern literature on the issue of cultural impact on local development, the concept of culture-based development (CBD) has emerged in the past decade (Tubadji 2012, 2013; Tubadji and Nijkamp 2014, 2015; Tubadji et al. 2014a, b). Theoretically, the CBD concept aims to combine the added value from various classical and modern theoretical contributions. It seeks to enhance an understanding by suggesting a programmatic unifying structure for the interconnections among the contents of culture. Empirically, CBD seeks to synthesize promising established practices in the empirical research on culture (such as the use of Herfindahl indices of diversity, cultural distance etc.) (see Nijkamp and Poot 2015). Moreover, CBD suggests to ameliorate the existing measures by suggesting a latent variables quantification through the use of multivariate techniques. Finally, CBD suggests to identify and apply appropriate estimation techniques that are suitable for exploring the cultural impact on local development.

In short, the purpose of CBD is twofold: (1) to find interconnections between theoretical frameworks in order to design an operational approach that can trace in a structured manner the cumulative causation processes instigated by culture and (2) to empirically investigate this comprehensive structure by addressing culture as a composite latent variable, rather than a mono-dimensional, atomic variable. Put differently, as noted in Tubadji (2009), CBD tries theoretically and empirically to develop an integrated approach —‘see the forest, not only the trees’— to culture.

The aim of the current paper is now to apply the CBD concept to an interesting dataset for a case study on Greece. Greece is often seen as the cradle of European civilization. Its capital is the oldest city in Europe. The cultural heritage of Greece is outstanding in terms of both quantity and quality. Therefore, the relevance of cultural factors for local development in this specific context may be expected to be statistically significant as well. Thus far, however, both the established literature and newly emerging contributions such as CBD and alike (Tubadji and Nijkamp 2015; Huggins and Thompson 2015) have not paid attention at all to the possibly interesting case of Greece.

The most prominent economics- and sociology-related studies in the literature on culture and regional development have been conducted on the basis of case studies from the USA or Italy (especially in the context of conventional social capital-related research). In a broader context, Banfield (1958) and Putnam (1995) have both examined social capital in Italy to explain similar cultural impact phenomena. Markusen (2010), Currid (2007), Florida (2002a, b, 2005) and Ottaviano and Peri (2004, 2006) delve further into the culture and local development nexus using the USA as a case study.

Despite its enormous cultural significance for Europe, Greece is almost completely out of the focus of empirical investigations on the impact of culture on local development. The only exception are the various—highly sensitive to endogeneity issues—tourism-related studies. Moreover, the emerging theoretical CBD concept is accumulating a constantly growing body of empirical evidence for various aspects of its claims. This evidence is thus far predominantly based on case studies from the USA (Tubadji et al. 2014a, b), the EU (Tubadji and Nijkamp 2014) and Germany (Tubadji 2012; Tubadji and Pelzel 2015), but not yet from Greece. It should be noted that the data on Greece, especially with regard to human capital, is generally scant. The existing statistics are rarely readily available. For this reason, we have first collected a unique dataset on a NUTS3 level which has as many as 130 relevant indicators of culture and local development, obtained from international and national reliable sources. This synthetic database represents a unique opportunity for the exploration of cultural impacts on regional development in Greece.

In our attempt to maximize the information content extracted from this interesting dataset, we explore it first with a nonparametric partial-least squares path modelling (PLS-PM) approach which is able to exploit the advantages of a large number of observations in order to best quantify a model with latent variables (such as culture according to the CBD definition). Next, we cross-check the reliability of our nonparametric estimations by conducting two parametric estimations serving as a triangulation of results, i.e. a sort of 'robustness' test for our results. The expectation being that, given the specific characteristics of our dataset, the parametric and nonparametric estimation results should be largely consistent.

Consequently, the structure of the paper is as follows. Section 2 briefly discusses the CBD model of culture as the determining factor for a deeper understanding of the resources for local productivity. Section 3 presents our database and the estimation strategy used. Section 4 presents and analyses the econometric results, while Sect. 5 offers concluding remarks.

2 Culture and other factor inputs for productivity: CBD

2.1 Theoretical framework of culture-based development

The concept of culture-based development (CBD) is devised as a comprehensive and structured matching point between existing valuable notions and paradigms on spatial development. The idea is the following: Any locality has a path-dependently shaped—and through the course of history set—collection of predominant socio-historical phenomena, attitudes and preferences, called *culture*. CBD defines *local culture* as the proto-institution that shapes all such formal and informal institutions and ramifications in a locality; its potential to do so is termed cultural capital (for more details see Tubadji 2012, 2013). The potential of culture to influence human capital is termed local cultural capital by CBD. Given that human capital is the driving force of economically relevant decision-making, cultural capital affects the whole pallet of rational choices in a locality.

But it is challenging to define the unit measure of this potential of culture. The CBD definition departs from Bourdieu's cultural capital notion, which is created for the individual level and regards mainly personal characteristics. CBD, however, transcends the individual basis and reconstructs the cultural capital notion for the local aggregate level. *Cultural capital* is a composition of cultural characteristics and belongings that also generate prestige, but the spatial entity characterized by them is the locality.

Next, CBD distinguishes between material and immaterial cultural capital. The *material* cultural capital comprises the works of art and historical monuments as well as all other objectified forms of culture in the locality. The local attitudes, beliefs, values, traditions, oral folklore, etc., form the *immaterial* local cultural capital.

Moreover, for CBD, the existence of a temporal divide, which groups the material and immaterial living culture into living culture and cultural heritage, is essential. The *living culture* is the currently (contemporaneously) created material and immaterial culture. The *cultural heritage* is the immaterial and material culture that was created in the locality in the past, e.g. more than 50 years ago.

Living culture is the source of uncertainty of current choice under the same given conditions in different localities (see Abdellaoui et al. 2011; Baillon et al. 2012). Cultural heritage is the source of cultural persistence over time (see Hicks 1969; Dell 2010). The local living culture is expected to create the current local cultural milieu and to be endogenous to current economic performance (in the manner suggested by the tunnel vision (Levine 1980) related literature or in recent institutions-related work by Acemoglu and Robinson 2010). Yet, it is also strongly dependent on the cultural heritage of the locality in a path-dependent manner, where cultural heritage is setting the initial conditions for modern economic development and is the essentially exogenous to current economic performance.

The latter two forms of local cultural capital interact between each other as well as jointly with the local context, such as the degree of cultural heterogeneity of the local population. The above-mentioned concepts of cultural distance and cultural milieu are both derived from the two forms of local cultural capital of the sending and recipient locality of migrants, respectively (see Tubadji and Nijkamp 2014, 2015 for more details).

Clearly, any local interaction and choice is a function of the local cultural bias and its moderation through the cultural diversity in the locality. It is noteworthy that the classical suggestion of Weber (1905) was centred on the educational specialization which leads to occupational differences between culturally different backgrounds (such as Protestants and Catholics).

The CBD suggests a more extensive understanding of this cultural impact on choice, where virtually any type of expectations and decisions in a locality are subject to culturally driven uncertainty that is locally specific due to the cultural persistence created by the local cultural heritage. In this choice process, CBD includes the emoting with their feet which has been re-emerging in the recent economics literature (Tiebout 1956; Florida 2002a, b, 2005).

In particular, according to CBD, there exists a mechanism of *cultural gravity*, driven by the fact that every rational human choice is subject to a locally specific cultural (maybe irrational) bias (see Tubadji and Nijkamp 2015).

The local specificity of this cultural bias is characteristic for those people who were raised in this locality with its particular local cultural attitudes and its resulting institutions and amenities creating an overall cultural environment. This local cultural environment is termed *cultural milieu* in the CBD framework. The cultural milieu is an aggregate of local characteristics. There may, however, also be an individual cultural (sometimes 'irrational') bias, sometimes termed individual order of preferences. The aggregate and individual cultural characteristics interact constantly. If they match, the individual stays in the locality. If there are economic stimuli from other localities, the individual may find this as an incentive to migrate, but the positive interaction between the individual and the aggregate cultural characteristics in the sending locality may incur cultural cost for this individual's migration and thus decrease the utility derived from the eventual act of migration and its economic return.

On the other hand, self-selecting migrants participate in spatial sorting due to personal preferences for certain economic incentives provided by the different localities. For a different local milieu, they can be attracted with different intensities to different localities, depending on the extent to which the personal preferences match with the receiving local milieu.

Furthermore, due to the power of habit and the path-dependence it creates, individuals still carry the characteristics of the place they originally come from. Even in post-migration, the incomplete overlap between the local cultural milieu where a migrant has arrived and the local cultural milieu of the locality where the migrant comes from, shapes a cultural distance.

Finally, both the migration itself and the efficiency of migrants in the recipient locality as economic agents depend on the interaction between the local cultural milieu and the cultural distance experienced by migrants. The cultural distance and the cultural milieu in a locality thus are 'push' or 'pull' factors for the reallocation of human capital through a self-selected spatial sorting. CBD terms this joint effect cultural gravity noting the potential of local culture to impact the spatial sorting of human capital.

Thus, the complete CBD impact mechanism from local culture to local socio-economic development passes through a neo-Weberian type of complex cumulative causation mechanism. A neo-Weberian mechanism is a mechanism of cultural impact that has two levels (two gears). At the first level, local culture impacts human capital formation and spatial concentration (in terms of preferences, spatial sorting and actual decision-making). This first gear is partially the classical Weberian place and attitude-relating mechanism. Yet, CBD augments it with a mobility component of spatial sorting that reflects the dynamics in addition to the static attitude and place effects. At the second gear, through the local human capital's decision-making, it affects the socio-economic choices shaping the development in a locality (see Tubadji 2012, 2013; Tubadji and Nijkamp 2014, for more details).

To express the above rationale in a general formal way, a slightly modified version of the Bairam and McRae (1999) and the Christopoulos and Tsionas (2004)[1] model will be presented. The model deals with tapping on local productive resources.

To express properly the CBD neo-Weberian mechanism, however, the full CBD model requires that the cultural effect is first reflected at the stage of formation of local human capital. And next, at a second stage (or second gear), the CBD model reflects the tapping on productive resources in the locality. Thus, we end up with the following CBD growth model:

[1] Christopoulos and Tsionas (2004) apply a model for investigating regional convergence in Greece, which comes close in relevance and application domain to our research.

$$\begin{aligned} \mathrm{HC}_{it} &= \mathrm{EW}_{i(t-n-m)}^{\alpha 1}\mathrm{EW}_{i(t-n)}^{\beta 1}\mathrm{DIV}_{it}^{\gamma 1}CC_{it}^{(\gamma 1-1)} \\ \mathrm{EW}_{it} &= A_i\,(t)\,K_{it}^{\alpha 2}\mathrm{HC}_{it}^{\beta 2}L_{it}^{(1-\beta 2)}, \end{aligned} \tag{1}$$

where i denotes the particular locality, HC stands for the local share of human capital and EW for economic welfare conceived of as local productivity and reflected in different present and past moments (noted by n, m and t, respectively, where t is the present moment, and $m > n > t$). DIV denotes the local level of heterogeneity (diversity), which gives rise to cultural distance, while CC denotes the local cultural milieu. The last two are combined in a joint cultural gravity effect, which explains why the coefficient of the one is equal to 1 minus the coefficient of the other (see Tubadji and Nijkamp 2014, for more details on cultural gravity). A stands for the knowledge which is a constant in a fixed moment in time, i.e. in a cross section; K is the physical capital available in the locality and L represents the share of the workforce in the local population.

2.2 Empirical evidence for culture-based development

So far, the CBD concept has accumulated a rich empirical evidence in various empirical studies. It has been tested both as a framework for the main CBD hypothesis and in relation to explaining several of the claimed main cultural effects in the above-mentioned culture-related domain.

Most empirical work is confined to case studies from the EU, Germany, and the USA counties. The CBD hypothesis as well as the neo-Weberian mechanism in the core of the CBD concept were both extensively tested on the basis of data on German labour market regions, on a EU NUTS2 and NUTS3 level. The main contributions in the CBD-related research show evidence of a cultural effect on local productivity. These studies show also the relevance of applying a principal component factor analysis to obtain a composite vector-like variable which is able to capture culture as a latent variable instead of using the inferior atomic variable approach to approximating culture (see Tubadji 2012, 2013 etc.).

Furthermore, the study of the effect of local cultural capital on inequality and happiness in a locality is also part of the CBD paradigm. The work of Tubadji and Gnezdilova (2014) finds evidence for the effect of the path-dependently motivated cultural preference for egalitarianism as the driving force behind voting. The paper uses a case study on the German miracle of job creation through work-time reduction during the beginning of the recent economic crisis around the year 2007.

It should be added that, Tubadji et al. (2014a, b) have also used a large dataset at the USA county level. This research was able to identify significant negative effects of local cultural capital on criminality levels in a locality. It also reports positive effects from the overall social well-being in the locality.

On the other side, methodologically, this research is mostly cross-sectional, due to data limitations. Part of it uses 3SLS estimations of recursive CBD models expressing the neo-Weberian cultural mechanism. Elsewhere, CBD-related research has applied other techniques that are relevant for cross-sectional data such as logistic regression, multi-nominal logit, 2SLS models, etc., Yet, all empirical works shared all consistently clear evidence for the main theoretical CBD claims (see Tubadji 2012, 2013, Tubadji and Nijkamp 2014 for more details).

The effects of cultural distance and cultural milieu on the locational choice and productivity of immigrants to the EU was also explored by Tubadji and Nijkamp (2014, 2015). This effect is termed cultural gravity in a CBD context and is essentially an extension of the CBD mechanism in a dynamic framework. The first gear of the CBD mechanism is clearly neo-Weberian in nature, while the second gear is the cultural interaction gear where local economic choices get biased by the clash between local milieu and existing cultural distances between immigrants and locals, i.e. by cultural gravity (see Tubadji and Nijkamp 2015 for more details).

Among the most interesting modelling applications of the CBD concept is the partial-least squares path modelling (PLS-PM) application of this concept to labour market regions in Germany. Tubadji and Pelzel (2015) constructed such a PLS-PM model and found the model to be relatively stable; their study suggests that cultural heritage generates a strong significantly negative effect on local human capital and its productivity.

Moreover, the PLS-PM application confirms one of the main empirical propositions of CBD, namely that local cultural capital is to be quantified as a latent variable comprising various indicators. Yet, the reason why this study is especially interesting is a different one. It lies in the fact that PLS-PM has been recognized as a method allowing to ‘see the forest, not only the trees’ in an empirical way (see Sanchez 2013).

Against the background of the previous empirical evidence, we aim to construct here a new PLS-PM model capturing the effect of local cultural capital in Greece. First, this exploration will investigate the relevance of cultural capital through an illustrative Greek case study. Second, this exploration will quantify the underlying latent variables and will apply both nonparametric (PLS-PM) and parametric (3SLS and SEM) tests. This mixed methods approach is used to obtain relevant informed insights from our data about the main CBD hypothesis in the case of Greece.

3 Empirical analysis of cultural impacts on regional development in Greece

3.1 Database

The dataset compiled is composed of 134 indicators on a NUTS3 level for Greece. The base year of the output variables is 2001. The input indicators are mostly from the same year or from previous years (indicated in more detail below).

The data are used to quantify nine latently present variables: living culture (lvLC), cultural heritage (lvCH), cultural diversity (lvDIV), an amenities-generated endogenous factor for human capital reallocation (lvENDOAM), human capital (lvHC), labour (lvL), economic welfare (lvEW) and social well-being (lvSW). These are quantified through suitable indicators as follows. The sources of the various indicators are also described.

For lvLC, we have 35 available indicators in total. The first 31 indicators are attitude-related variables from the European Social Survey (ESS), related to participation in social activities; activities related to culture; negative and positive attitudes towards immigrants in various aspects—political, economic, and social; trust in local and international institutions of various kind; general trust in people; trust in the altruistic helpfulness of people and their fairness; as well as an aggregate measure of negative attitudes obtained by factor analysis on an individual level of the ESS data and aggregated on a NUTS3 level at a later stage.[2]

Additionally, we have four variables related to material, objectified living culture, the second part of living culture according to the CBD definition. These variables are: density of museums per square kilometre (from the Greek version of yellow pages), the share of visitors per museum (from the National Statistical Office), and the active/operating churches per head and theatres per head (with yellow pages serving again as a source for both indicators).

Quantifying lvCH takes all in all nine indicators from our dataset. These are the per square metre share of temples from the Prehistoric, Byzantine, Classical, and Modern Periods as well as the share of castles, sites, settlements, Prehistoric fortresses, and the overall share of cultural heritage spots per area. The source of the data is the Hellenic Ministry of Culture special report on cultural heritage in Greece.

The lvDIV is approximated by eighteen indicators, namely the share per head of internal and foreign migrants; new and old migrants, the number, share per head, and a zero-one dummy variable for presence of surviving Jews in the territory (original city level data) after the WWII period; the share of locals among the local population; the share of active internal immigrants; and the share of active foreign immigrants as well as their shares gender-wise (all immigrants-related shares being calculated per total number of employment in the locality). The source of all data, except the Jews-related one, is the EUROSTAT Census data from 2001. The data on the Jews' spatial concentration is obtained from Bowman (2002) and concerns the year 1995.

The lvENDOAM is a Tiebout (1956)-motivated variable where local culture is expected to determine the local public investment which affects the human capital 'emoting with their feet' in a spatial sorting movement. The lvENDOAM is approximated by ten indicators in our dataset.

Nine of the indicators approximating lvENDOAM are from the Ministry of Health Annual Report for 2001 and are related to the occupational specialization of doctors in Greek NUTS3 regions: the share of general practitioners, dermatologists, neurophysicians, neurosurgeons, ophthalmologists, pediatricians, surgeons, non-specialized medical staff, and dentists, and overall share of doctors (all shares being calculated per head of population). Lastly, the number of heating days from EUROSTAT is involved

[2] These variables were transformed into a likelihood of having six people in a row sharing this attitude (the exact formula being: $\text{six\_}in\_a\_row\_X = ((\text{total\_}X - 1)/(\text{total} - 1)) \times ((\text{total\_}X - 2)/(\text{total} - 2)) \times ((\text{total\_}X - 3)/(\text{total} - 3)) \times ((\text{total\_}X - 4)/(\text{total} - 4)) \times ((\text{total\_}X - 5)/(\text{total} - 5)) \times ((\text{total\_}X - 6)/(\text{total} - 6))$, where X is the type of interest, total_X is all observation of type X, and total is the total number of people of all types at the NUTS3 region). The ESS data are on a NUTS2 level; therefore, we used the local number of people at a NUTS3 level to obtain locally specific attitudes from the ESS data. The six people in a row likelihood are motivated by the six degrees of separation literature which suggests that it takes normally six immediate connections in a network for an idea to get transmitted throughout space (Traverse and Milgram 1969; Granovetter 1973; Watts and Strogatz 1998).

as an indicator related to quality of life which depends on local economic amenities, etc., in a NUTS3 region.

The lvHC is measured through five indicators, reflecting different classical concepts of ability, skills, and creativity as well as Florida's creative class concept, namely per total employment shares of skilled workers, people dealing with crafts (i.e. Bohemians), people with managerial positions (i.e. other Creative Core), professionals (i.e. Creative Professionals) (similar to the classification used in Möller and Tubadji 2009), and the overall number of creative workers, again as a share of total employment. All data are obtained from the EUROSTAT Census 2001.

For the lvL, there are nineteen indicators that we can use for quantification. These are in share of total population: local active population, local employment and local employment per sector, and the same measures gender-wise.

For the quantification of lvK, we have three variables: the overall share of factories per head; total land area; total arable land area (all of which are derived from the EUROSTAT regional dataset). It includes also the share of licences for use of natural resources of energy such as solar panels per company working in this sector, etc. (from the REA Center of Natural Resources, Greece).

The lvEW is approximated by nineteen indicators, all from the National Statistical Office of Greece. These involve share of wage expenses per worker in the industry, share of gross product in the industrial sector, and share of GDP as value added in industry. In addition, the latent variable is approximated with shares of gross value added for each industry: forests, manufacturing, construction, retail and ICT, financial sector, real estate, services, public spending, arts, and total gross value added per head for 2005, as well as GDP per head and GDP real value for the year 2001.

The lvSW is finally approximated by fifteen indicators in the dataset: share of waste water per square metres of land, share of waste to water per locally available water resource, share of live born children and death-to-birth ratio, population change, share of marriages per population, and share of marriages in urban, rural, and semi-urban areas. In addition, the variable includes political stability and left-orientation stability of an area based on election results for the whole territory of Greece, share of scout organizations, and share of NGOs (the latter two variables being provided as numbers by the relevant Association of Scout Organizations in Greece and of NGOs, respectively).

3.2 Estimation strategy

The PLS-PM model offers a comprehensive estimation strategy for large multivariate datasets. It is a nonparametric estimation method using a large amount of indicators to approximate each phenomenon of interest. These indicators are used to express mathematically more complex constructs—latent variables. The latent variable is a composite entity/structure that reflects the statistical dependence between all indicators that approximate it. Next, it applies multiple iterations and weighting procedures in order to find the best fit of the real data with two models: (1) the measurement model which uses the indicators in the data to estimate the proper value and composition of the latent variables and (2) the structural model which maps out the relationship between the latent constructs themselves. Put differently, PLS-PM has the power to quantify a composite variable as opposed to an atomic approximation of a phenomenon with a mono-dimensional variable.

The PLS-PM is, however, a much more advanced approach than the principal component factor analysis. The PLS-PM final value takes into consideration a more complex number of statistical relationships and re-measurements for 'fine-tuning' the final quantification of the latent variable. Thus, PLS-PM is a superior method for operationalizing the CBD approach of a multi-dimensional measurement of culture (see Tubadji 2014).

It is important to note that all our latent variables are considered latently present and only partially expressed through different observable effects captured by their indicators. This means in PLS-PM terminology that we treat all indicators as reflective (see Lohmoeller 1989 for more theoretical details on PLS-PM modelling).

Our empirical strategy is to estimate two versions of the CBD model as presented in model (1). First, we will consider a Specification 1 with nine latent variables, where living culture (lvLC), cultural heritage (lvCH), diversity (lvDIV), and local amenities (lvENDOAM) are determinants of local human capital (lvHC), which in turn determines the tapping on labour (lvL) and the tapping on local physical capital (lvK), which are the standard inputs for both local economic well-being (EW) and social welfare (SW).

The economically dependent amenities (which are included to account for endogeneity issues), however, may cause some measurement problems, as they might also be viewed as a suitable measure for economic welfare. Therefore, we consider a reduced parsimonious model—Specification 2—with only eight latent variables, where the amenities are excluded. The motivation behind these two models is our main working hypothesis:

H01 Local culture (living culture and cultural heritage) are latent variables that impact local socio-economic development through a direct effect on the local disparities in accumulation and spatial concentration of human capital and an indirect effect in the decision-making processes subject to the interactions among the locally available human capital.

Specification 1 takes into account the endogenous amenities as a factor for local accumulation and spatial concentration of human capital, inspired by research of Tiebout (1956), Glaeser et al. (2001), and Acemoglu and Robinson (2010). Specification 2 relaxes this assumption and drops the amenity-related latent variable, as this might be carrying a certain endogeneity or even circularity complications in the system due to its relationship to the latent variable EW. Figure 1a below represents the endogenous model and Fig. 1b the parsimonious model with eight latent constructs.

The estimation strategy and analysis of this paper will proceed as follows. We will offer a comparison between our two model specifications in terms of outer (measurement) and inner (structural) model. The outer model is the measurement model for assessment (i.e. regarding the unidimensionality of the latent variables, the outer model communalities, loadings and cross-loadings of the indicators building up each latent construct). The inner (also termed structural) model is used to compare performances between specifications (i.e. the differences in inner model R-square, redundancies, and goodness-of-fit statistics).

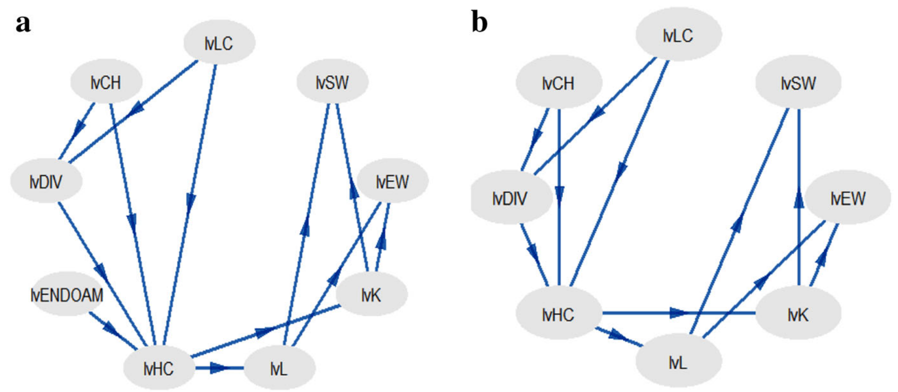

Fig. 1 Structural model, Specification 1 and 2, representation of the structural PLS-PM model. Specification 1 includes endogenous amenities as a separate latent entity and Specification 2, the same model, is without the amenities related latent variable.The two specifications are an operationalization of the CBD theoretical model, where living culture (*lvLC*), cultural heritage (*lvCH*), diversity (*lvDIV*) and alternatively with or without local amenities (*lvENDOAM*), affect local human capital (*lvHC*), which next, together with local physical capital (*lvK*) and labour (*lvL*), affects the local social wellbeing (*lvSW*) and economic welfare (*lvEW*). *Source* Authors' calculations. **a** Specification 1 of the PLS-PM model. **b** Specification 2 of the PLS-PM model

Put differently, we will first examine the success with which our data and latent constructs fit each other (i.e. we will evaluate the statistical success of the data to inform our model). Next, we will discuss the relationship between the latent variables in our two specifications (the latter being the actual test of our working hypothesis). Finally, some bootstrapping validation of the results will be undertaken as a control check (see Sanchez 2013 for details).

In the next step, we will undertake some parametric tests in order to triangulate the results obtained through our PLS-PM nonparametric estimations. We will undertake: (1) a 3SLS estimation of a recursive model represented as a system of two equations expressing the main CBD mechanism (model (1)), where culture affects human capital and then through human capital—as one of the input factors for productivity—indirectly affects local socio-economic development and (2) a structural equations model (SEM) test for the main CBD hypothesis that local cultural capital affects local productivity levels.

The 3SLS estimation will use as dependent and explanatory variables the obtained values of the latent variables (LVs) from the PLS-PM model. Clearly, the 3SLS estimation will obtain better estimates of the parameters for each LV, i.e. we will obtain a better estimate for the path coefficients between the LVs. The path coefficients expressing the LV interdependences are obtained in the PLS-PM through OLS regressions, while we will estimate these relationships better through a more precise 3SLS estimation.

The SEM model, on the other hand, is a parametric model which has the opportunity to provide a better goodness-of-fit information for the entire model. The difference between PLS-PM and SEM estimations can be summarized in a stylized manner, in that PLS-PM is a cascade of dependencies estimations, while SEM is a simultaneous fitting into the suggested theoretical model of the whole matrix of available data.

The parameters obtained through SEM, however, are statistically more powerful and the meaning of the goodness-of-fit tests is more straightforward than with nonparametric techniques. The fitting of the model, however, is a more challenging task with a parametric test, as more assumptions have to hold true regarding the whole dataset. To meet this challenge, we will first use only the data confirmed by the PLS-PM estimations as best fitting the model, when the cascading relationships are considered (for which SEM estimations cannot account).

Secondly, we will take into consideration all co-variances which have to be controlled for in order to obtain a well-fitted SEM model, which can provide reliable parameter estimations for the main CBD hypothesis and consistent goodness-of-fit statistics throughout the different available criteria for our SEM models. The expectation is that the parametric tests will confirm the nonparametric PLS-PM estimations.

As our dataset is relatively small (51 observations), the PLS-PM estimated mean path coefficients and factor loadings will likely be more reliable and stable than the ones with a SEM. Only the PLS-PM standard errors might be upward or downward biased. The SEM is usually challenged to fit a model with very small or very large datasets.

The PLS-PM, however, cannot provide one overall measure for the main assumption behind the model and the data fit. So, our 'SEM test' is meant to produce information on the question whether the data manages to fit the model and to obtain a chi-square that is not significant. Put differently, through our SEM, we will be able to obtain a goodness-of-fit measure for the overall CBD hypothesis (see Chin 2010 for more details on the reporting of PLS-PM and its comparison with SEM).

4 Interpretation of empirical results

4.1 PLS-PM nonparametric estimation of the CBD model for Greece

4.1.1 Measurement model assessment

The assessment of our CBD measurement model for Greece will address four main aspects: unidimensionality, loadings, commonalities, and cross-loadings performance. The assessment of Specification 1 of our CBD model was performed in four successive steps. First, we used all the data; then, we excluded those variables which did not have sufficient unidimensionality and loadings; next, we kept the best performing but also theoretically relevant indicators; and finally, we kept only the statistically best performing variables, without any consideration of the eventual theoretical support for weaker indicators to stay in the model. The next step was to estimate the outer model of Specification 2.

The **unidimensionality** criteria of assessing the measurement model requires that the Cronbach's alpha and Dillon–Goldstein's rho have a score above 0.7 for an indicator to be considered as satisfactorily performing.

Most of our indicators related to lvLC were performing somewhat below this critical level. Yet, we kept them initially and implemented a full estimation of the model with all data, as we assume that the CBD concept theoretically justifies keeping a larger number of attitude indicators approximating cultural capital. However, this clearly involves statistical drawbacks as a strategy, and therefore, at a next stage, we kept only the variables scoring above 0.7: positive attitudes to immigrants, faith that people are fair, and trust in general. Fortunately, even this reduced quantification form of lvLC that extends beyond the social capital notion, because it includes also the openness to the ‘otherness’ (i.e. attitude to immigrants), which may be counter-intuitive to the social capital notion often understood rather as homophily.

The openness is also theoretically essential in the gravity mechanism of CBD. We also note that some of the material living culture variables (such as theatres, museums, churches, etc.) were rejected as weak approximations of LC, perhaps due to their inbuilt endogeneity, and therefore, we dropped them.

The construct lvCH performs especially successfully in unidimensionality terms. Only at a later stage, for perfect statistical compliance, the number of classical buildings was dropped, though this variable was very close to all others with a value of only slightly below the margin of the 0.7 level of unidimensionality.

The latent construct lvDIV was finally defined as best characterized by the share of active foreign population and its employment in a locality. The historical variables related to number of Jews surviving the WWII, etc., were dropped, due to the probably relatively poor quality of the data.

The endogeneity-creating amenity factor that motivates the concentration of human capital in a locality was measured through lvENDOAM. This factor is theoretically best measured through the days not needing heating and the availability of public goods, such as the share of doctors and the health care services provided in the locality.

We alternatively kept only these two indicators, or approximated the amenities through a variety of health services measured through the share of specialized experts for each type of service. This different treatment of lvENDOAM distinguishes our estimation version 3 and 4 in Specification 1. The data of employment of doctors is of a very good quality; yet, if we use non-heating days (which we obtained as 1 minus the original heating days variable), we introduce more economically meaningful information in the model. Clearly, statistically speaking, lvENDOAM is best measured through the variety of health services expressed through occupational specialization of doctors in a locality.

The lvHC was successfully approximated by the bunch of selected variables on the share of creative professions, super-creatives, Bohemians, the share of highly skilled, etc. Only in the last, most statistically parsimonious, version of Specification 1, we had to drop the share of professionals as an indicator for lvHC.

The unidimensionality of lvL required preserving only two of the three sectors (avoiding the industry sector which is weakest and keeping the agricultural and service sectors most relevant to employment in the Greek economy). We also kept only the share of male employees per sector.

The lvK required dropping the variable on the share of factories, because even when multiplied by -1 and transformed into a measure of untapped local resources, this variable still did not match the unidimensionality criteria. Yet, land and natural

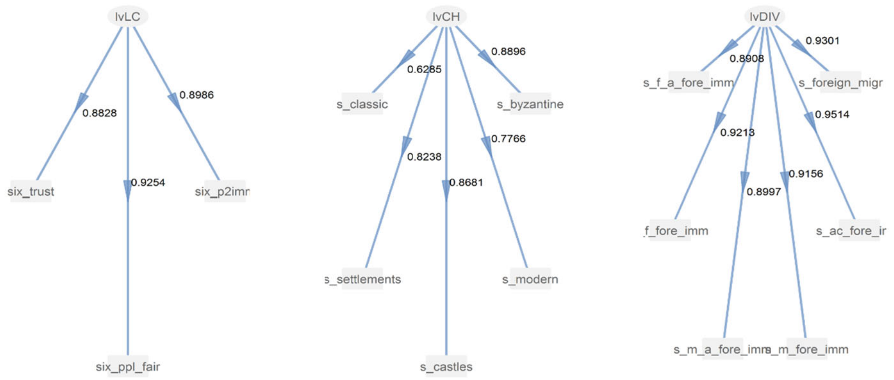

Fig. 2 Measurement model, Specification 1(a)—statistical relationship between indicators and latent variables (loadings)—cultural latent variables, representation of the outer (measurement) CBD PLS-PM model, Specification 1(2), for latent variables: living culture (*lvLC*)—quantified through indicators likelihood of six people in a row sharing trustful attitudes towards other people, towards fairness and positive attitude towards foreigners, cultural heritage (*lvCH*)—quantified through indicators number of classical buildings, historic settlements, castels, modern period historical buildings, byzantine historical buildings all as shares of the total for the country, diversity (*lvDIV*)—quantified through indicators share of women immigrants from all immigrants in the locality, share of foreigners in the locality, share of men from all foreigners in the country, share of employed foreigners and number of female emigrants. *Source* Authors' calculations

energy (wind, solar, etc.) sources of productivity were successfully recognized as a common group of economic capital inputs (for a definition of economic capital, see Baycan and Nijkamp 2012).

The economic welfare (lvEW) and social well-being (lvSW) needed a reduction in the indicators in order to become well approximated with the selected variables. In particular, lvSW preserves only the longevity-related variables such as share of births and share of deaths in the locality. The lvEW is finally best measured by the share of gross value added per sector. It consists of construction, retail, ICT, financial services, real estate, services, public sector, and art; it is also related to future total gross value added per capita in the locality (in our case in 2005), in a way acting as an autoregressive pattern in economic development. The GDP in the locality belongs to this latent variable, though not so for GDP per capita in the locality. This is an interesting finding, because it distinguishes between aggregate productivity and individual productivity. For a visualization of the above-described relationship between latent variables and their respective indicator blocks, see Figs. 2, 3, and 4.

All above results can be summarized in the message that in a sense our best approximated (by the collected data) latent variables are: lvCH, lvHC, lvSW, lvEW, as well as lvENDOAM. Alternatively, lvLC and lvK can be further improved upon availability of additional indicators. The conclusions regarding lvCH, lvHC, lvSW, and lvEW from our next explorations will be regarded with more caution.

Checking the outer model measurement characteristics requires values greater than 0.7 to consider the **loadings** of acceptable level. Therefore, only **communality** values greater than $0.7^2 = 0.49$ are considered as acceptable.

The communalities represent the amount of variability explained by a latent variable; thus, a communality greater than 0.5 means that more than 50 % of the variability

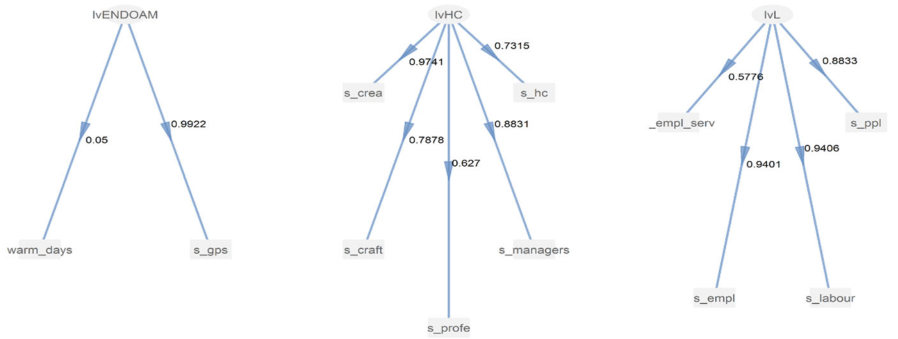

Fig. 3 Measurement model, Specification 1(b)— statistical relationship between indicators and latent variables (loadings)—other input latent variables, representation of the outer (measurement) CBD PLS-PM model, Specification 1(2), for latent variables: local amenities (*lvENDOAM*)—quantified through indicators share of general practitioners in health services and yearly percentage of warm days, human capital (*lvHC*)—quantified through indicators share of creative professions, super-creatives, Bohemians, share of managerial occupations, the share of highly skilled, labour (*lvL*)—quantified through indicators, share of total population, total labour force and total employment, as well as share of male employees in services. *Source* Authors' calculations

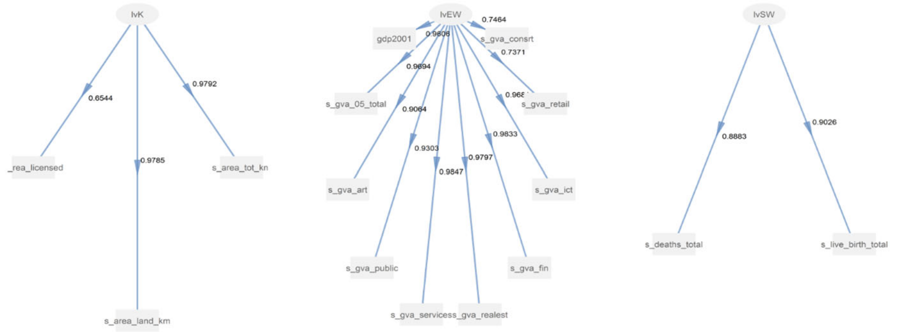

Fig. 4 Measurement model, Specification 1(a)— statistical relationship between indicators and latent variables (loadings)—physical capital and output latent variables, representation of the outer (measurement) CBD PLS-PM model, Specification 1(2), for latent variables: local physical capital (*lvK*)—quantified through indicators land (in terms of a pure measure of arable land and in terms of total area including) and natural energy (licences for wind, solar etc.) sources of productivity, labour economic welfare (*lvEW*)—quantified through indicators, share of gross value added per sector, namely: construction, retail, ICT, financial services, real estate, services, public sector, art; it is as well as future total gross value added per capita in the locality (in our case in 2005), and local GDP—local social well-being (*lvSW*)—quantified through indicators longevity related variables such as share of births and share of deaths in the locality. *Source* Authors' calculations

in an indicator is captured by its latent construct. As practically all loadings and communalities are related, when we keep the indicators with loadings above 0.7, all communalities are also above the 0.5 level.

Yet, more informative and interesting insights in our case arise from the comparison of **cross-loadings**; such cross-loadings check whether the selected indicators have the highest correlation with the latent variable, where they were theoretically assumed to be best allocated according to the theoretical CBD model.

In our dataset, we allocated the share of museums and churches to living culture (lvLC), as the data attribute the indicators 'active temples' and 'cultural access points' to cultural heritage (lvCH). However, the PLS-PM cross-loading assessment identified them as better related to cultural heritage. Yet, as the other indicators in lvCH were much better performing and with higher unidimensionality, we finally dropped completely the share of museums and the share of churches as indicators.

In addition, the cross-loadings identified the per worker productivity as a characteristic of human capital rather than of local productivity. This finding is interesting and important as it may be seen as a support for the 'jobs follow people' hypothesis of Florida and others.

Finally, Specification 2 had measurement criteria outperforming the ones of the measurement model of Specification 1. This is a sign that likely the endogeneity due to the amenities' impact on human capital concentration is a premise with lesser importance to the real-world phenomena of economic and social development in Greece.

Clearly, our gathered data have sufficient statistical power to quantify adequately the CBD model of interest for Greece. We refer to Appendix 3, 4 and 5 for the loadings of each latent variable per specification tried out.

4.1.2 Structural model assessment

Our structural model assessment will now offer an analysis of the path coefficients (direct and indirect effects between latent variables), the goodness of fit of the entire model, and the boot-strapped scores. This will inform us on the overall relevance of the CBD framework for Greece. Put differently, we will test here our main working hypothesis.

The path coefficients, i.e. the direct effects from latent variables to each other, were relatively consistent over the different specifications tried and met the standard economic theoretical expectations. In addition, lvCH always impacted negatively the local human capital formation, as was theoretically expected by CBD. This finding is consistent with the PLS-PM findings of Tubadji and Pelzel (2015) about Germany and thus supports a consistent evidence for the performance of the CBD model.

The theoretical CBD explanation lies in the relationship between cultural heritage and traditionality/closedness of the local cultural milieu, which is expected to act as a barrier and to generate negative cultural gravity effects for human capital spatial concentration and interaction. This path-dependent effect is also much stronger than the effect from living culture lvLC; see Table 1 below.

The results presented in Table 1 can be also visualized in a mode similar to the way we presented the two specifications of interest in Fig. 1a, b, adding now also the estimated impact between the latent variables. For instance, Fig. 5 below visualizes the results of the inner model path coefficients for Specification 1(2), which is the specification keeping all indicators that are theoretically and empirically acceptable to stay in the model.

The results of each specification presented in Table 1 can alternatively be visualized as presented in Fig. 5 for Specification 1(2).

As can be seen from Table 2 representing the indirect effects in the model, both lvLC and lvCH appear to influence consistently almost the whole model. However,

Table 1 PLS-PM, path coefficients—direct relationships between latent variables

			Spec. 1				Spec. 2
			1	2	3	4	5
lvLC	→	lvCH	0.000	0.000	0.000	0.000	0.000
lvLC	→	lvDIV	0.610	0.398	0.396	0.396	0.396
lvLC	→	lvENDOAM	0.000	0.000	0.000	0.000	–
lvLC	→	lvHC	0.423	0.256	0.258	0.310	0.312
lvLC	→	lvL	0.000	0.000	0.000	0.000	0.000
lvLC	→	lvK	0.000	0.000	0.000	0.000	0.000
lvLC	→	lvEW	0.000	0.000	0.000	0.000	0.000
lvLC	→	lvSW	0.000	0.000	0.000	0.000	0.000
lvCH	→	lvDIV	0.030	0.113	0.132	0.132	0.132
lvCH	→	lvENDOAM	0.000	0.000	0.000	0.000	–
lvCH	→	lvHC	0.018	0.237	0.273	0.196	0.243
lvCH	→	lvL	0.000	0.000	0.000	0.000	0.000
lvCH	→	lvK	0.000	0.000	0.000	0.000	0.000
lvCH	→	lvEW	0.000	0.000	0.000	0.000	0.000
lvCH	→	lvSW	0.000	0.000	0.000	0.000	0.000
lvDIV	→	lvENDOAM	0.000	0.000	0.000	0.000	–
lvDIV	→	lvHC	−0.120	−0.052	−0.051	−0.054	−0.069
lvDIV	→	lvL	0.000	0.000	0.000	0.000	0.000
lvDIV	→	lvK	0.000	0.000	0.000	0.000	0.000
lvDIV	→	lvEW	0.000	0.000	0.000	0.000	0.000
lvDIV	→	lvSW	0.000	0.000	0.000	0.000	0.000
lvENDOAM	→	lvHC	0.329	0.134	0.160	0.322	–
lvENDOAM	→	lvL	0.000	0.000	0.000	0.000	–
lvENDOAM	→	lvK	0.000	0.000	0.000	0.000	–
lvENDOAM	→	lvEW	0.000	0.000	0.000	0.000	–
lvENDOAM	→	lvSW	0.000	0.000	0.000	0.000	–
lvHC	→	lvL	0.507	0.433	0.280	0.290	0.288
lvHC	→	lvK	−0.157	−0.142	−0.141	−0.148	−0.147
lvHC	→	lvEW	0.000	0.000	0.000	0.000	0.000
lvHC	→	lvSW	0.000	0.000	0.000	0.000	0.000
lvL	→	lvK	0.000	0.000	0.000	0.000	0.000
lvL	→	lvEW	0.907	0.948	0.949	0.949	0.949
lvL	→	lvSW	−0.161	−0.086	−0.145	−0.145	−0.145

Table 1 continued

			Spec. 1				Spec. 2
			1	2	3	4	5
lvK	→	lvEW	0.111	0.153	0.135	0.136	0.136
lvK	→	lvSW	0.608	0.384	0.365	0.365	0.365
lvEW	→	lvSW	0.000	0.000	0.000	0.000	0.000

The table presents the actual test of our hypothesis. It presents the effects that each latent variable has on the rest of constructs by taking into consideration the total number of connections in the inner model. The direct effects (i.e the hypothesized relationship between our variables) are actually the path coefficients. Two basic versions of the model are estimated. The first model contains nine constructs: cultural capital (living culture (lvLC), cultural heritage (lvCH), and diversity (lvDIV)), human capital (lvHC), endogeneity-creating local amenities (lvENDOAM), labour (lvL), economic capital (lvK), economic welfare (lvEW), and social well-being (lvSW). The second model contains eight latent variables, the difference being that in the second model, culture is modelled as fully exogenous, thus avoiding certain collinearities between the endogenous amenities lvENDOAM construct and the economic output variables in the model (lvEW). Four specifications with endogenous component quantified either with all available variables (1 and 2) or with those best theoretically motivated (3) or those statistically best performing (4), and one specification of a fully parsimonious CBD model. *Source* Authors' calculations

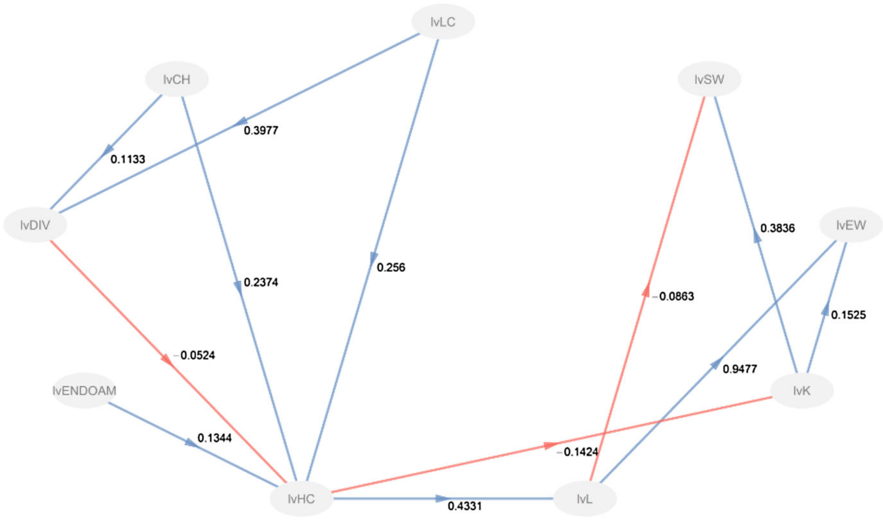

Fig. 5 Structural model, Specification 1(2): impact between latent variables (path coefficients), representation of the impact that latent variables exert on each other in our structural PLS-PM model, for Specification 1(2), which include endogenous amenities as a separate latent entity. The specification is an operationalization of the CBD theoretical model, where living culture (*lvLC*), cultural heritage (*lvCH*), diversity (*lvDIV*) and alternatively with or without local amenities (*lvENDOAM*), affect local human capital (*lvHC*), which next, together with local physical capital (*lvK*) and labour (*lvL*), affects the local social well-being (lvSW) and economic welfare (*lvEW*). *Source* Authors' calculations

what is more affected by these is social well-being, while economic welfare remains largely affected by the economic capital inputs. It is the labour which is more sensitive to the cultural factor (see Table 2 below).

Table 2 PLS-PM, indirect effects between latent variables

			Spec. 1				Spec. 2
			1	2	3	4	5
lvLC	→	lvCH	0.000	0.000	0.000	0.000	0.000
lvLC	→	lvDIV	0.000	0.000	0.000	0.000	0.000
lvLC	→	lvENDOAM	0.000	0.000	0.000	0.000	–
lvLC	→	lvHC	−0.073	−0.021	−0.020	−0.021	−0.028
lvLC	→	lvL	0.177	0.102	0.067	0.084	0.082
lvLC	→	lvK	−0.055	−0.033	−0.033	−0.043	−0.042
lvLC	→	lvEW	0.155	0.091	0.059	0.074	0.072
lvLC	→	lvSW	−0.062	−0.022	−0.022	−0.028	−0.027
lvCH	→	lvDIV	0.000	0.000	0.000	0.000	0.000
lvCH	→	lvENDOAM	0.000	0.000	0.000	0.000	–
lvCH	→	lvHC	0.004	−0.006	−0.007	−0.007	−0.009
lvCH	→	lvL	0.011	0.100	0.075	0.055	0.067
lvCH	→	lvK	−0.003	−0.033	−0.038	−0.028	−0.034
lvCH	→	lvEW	0.010	0.090	0.066	0.048	0.059
lvCH	→	lvSW	−0.004	−0.021	−0.025	−0.018	−0.022
lvDIV	→	lvENDOAM	0.000	0.000	0.000	0.000	–
lvDIV	→	lvHC	0.000	0.000	0.000	0.000	0.000
lvDIV	→	lvL	−0.061	−0.023	−0.014	−0.016	−0.020
lvDIV	→	lvK	0.019	0.007	0.007	0.008	0.010
lvDIV	→	lvEW	−0.053	−0.020	−0.012	−0.014	−0.018
s lvDIV	→	lvSW	0.021	0.005	0.005	0.005	0.007
lvENDOAM	→	lvHC	0.000	0.000	0.000	0.000	–
lvENDOAM	→	lvL	0.167	0.058	0.045	0.093	–
lvENDOAM	→	lvK	−0.052	−0.019	−0.023	−0.047	–
lvENDOAM	→	lvEW	0.146	0.052	0.040	0.082	–
lvENDOAM	→	lvSW	−0.058	−0.012	−0.015	−0.031	–
lvHC	→	lvL	0.000	0.000	0.000	0.000	0.000
lvHC	→	lvK	0.000	0.000	0.000	0.000	0.000
lvHC	→	lvEW	0.443	0.389	0.247	0.255	0.253
lvHC	→	lvSW	−0.177	−0.092	−0.092	−0.096	−0.095
lvL	→	lvK	0.000	0.000	0.000	0.000	0.000
lvL	→	lvEW	0.000	0.000	0.000	0.000	0.000
lvL	→	lvSW	0.000	0.000	0.000	0.000	0.000
lvK	→	lvEW	0.000	0.000	0.000	0.000	0.000
lvK	→	lvSW	0.000	0.000	0.000	0.000	0.000
lvEW	→	lvSW	0.000	0.000	0.000	0.000	0.000

The table presents the estimation results (i.e the non-hypothesized relationship identified to exist statistically between our variables) for indirect effects for the same specifications as presented in Table 1. An indirect effect is the influence of one construct on another construct by taking a nonlinear path. *Source* Authors' calculations

This means that in the case of Greece, culture operates in a broader than a classical Weberian religion-education human capital-related mechanism. The cultural factor appears to impact indirectly the overall work force structure, indifferently of their skill level, and thus influences not only productivity but also the overall quality of life in the country. This result is consistent with the USA case study results of Tubadji et al. (2014a, b), who find evidence for cultural effects on crime and social well-being.

The summary of the overall performance of the inner model and its goodness of fit (GoF) are presented in Table 3 below. The goodness-of-fit criteria are not a particularly strict carrier for a PLS-PM model.

Yet, the PLS-PM GoF index is a pseudo-goodness-of-fit measure that accounts for the model quality in both the measurement and the structural models. This GoF is calculated here as the geometric mean of the average communality and the average R-square value. Since it takes into account communality, this index is more applicable to reflective indicators than to formative indicators.

Our model is only incorporating reflective variables, and therefore, the GoF measure is relevant in a most meaningful format for a PLS-PM case. A general level of over 70 % of goodness of fit is normally expected, though some authors suggest even a limit of 0.90; see Tenenhaus et al. (2005).

Our estimations vary from 35 to 50 % for the most parsimonious version of Specification 2. Though far from optimal, this performance is, however, not as crucial as in a standard parametric model, but given the size of the dataset, we consider it as reasonable. And we will infer additionally the goodness-of-fit of the CBD model through a parametric structural equation model (SEM) to obtain better information.

In a next step, and partially also to cross-check the significance of the GoF, we use a validation bootstrap test to analyse the robustness of our results, as presented in Table 4 below.

The bootstrapping test for our CBD model supports the classical dependence between human capital, labour, and economic well-being. Negative dependence is confirmed also between physical capital and social well-being. This possibly supports the negative spillovers for ecology from production activity.

The bootstrap result is a good sign for the reliability of our CBD model, as it seems to comply with standard economic expectations. Our dataset is relatively small though, and therefore the bootstrapping might be a somewhat overly ambitious procedure. Still, as seen from Table 4, the effect from lvLC to lvDIV and from lvCH to lvHC survives the bootstrap test in the more parsimonious specifications.

Thus, our nonparametric PLS-PM test for Greece confirms the validity of the CBD model and its cultural impact on local development through the neo-Weberian mechanism. More interestingly, for the case of Greece, the CBD model seems to operate on an extensive neo-Weberian dimension. It affects not only the highly skilled, but also the overall work force structure, while impacting significantly the overall quality of life beyond the economic productivity of the region.

The theoretical assumptions for the composition of the cultural latent variables is also generally confirmed, outlining path-dependency carrying cultural heritage as a more powerful cultural capital type. The latter is a signal for possible cultural persistence interpretations about local development in the country.

Table 3 PLS-PM, inner model summary, and goodness of fit

		Spec. 1												Spec. 2		
		1			2			3			4			5		
		R^2	Commu	Redun	R^2	Commu	Redun	R^2	Commu	Redun	R^2	Commu	Redun	R^2	Commu	Redun
lvLC	Exogenous	0.00	0.2	0.0	0.00	0.8	0.0	0.00	0.8	0.0	0.00	0.8	0.0	0.00	0.8	0.0
lvCH	Exogenous	0.00	0.5	0.0	0.00	0.6	0.0	0.00	0.7	0.0	0.00	0.7	0.0	0.00	0.7	0.0
lvDIV	Endogenous	0.35	0.5	0.2	0.21	0.8	0.2	0.22	0.8	0.2	0.22	0.8	0.2	0.22	0.8	0.2
lvENDOAM	Exogenous	0.00	0.7	0.0	0.00	0.5	0.0	0.00	0.5	0.0	0.00	0.9	0.0	–	–	–
lvHC	Endogenous	0.27	0.7	0.2	0.19	0.7	0.1	0.22	0.7	0.2	0.29	0.7	0.2	0.19	0.7	0.1
lvL	Endogenous	0.26	0.4	0.1	0.19	0.7	0.1	0.08	0.9	0.1	0.08	0.9	0.1	0.08	0.9	0.1
lvK	Endogenous	0.02	0.6	0.0	0.02	0.8	0.0	0.02	0.8	0.0	0.02	0.8	0.0	0.02	0.8	0.0
lvEW	Endogenous	0.76	0.5	0.4	0.81	0.8	0.7	0.83	0.8	0.7	0.83	0.8	0.7	0.83	0.8	0.7
lvSW	Endogenous	0.47	0.2	0.1	0.18	0.8	0.1	0.19	0.8	0.2	0.19	0.8	0.2	0.19	0.8	0.2
GoF		0.39			0.45			0.45			0.47			0.46		

The table presents summary statistics for the inner models of the experimented specifications (i.e. describes the statistical reliability of our model to test our hypothesis). Three main statistics are shown: R-square, the average communality, and the redundancy of each construct, which has the same meaning as in OLS, as PLS-PM is basically based on OLS. The average communality 'Commu' indicates how much of a reflective block variability is reproducible by the latent construct. The criteria valid here is to have at least 50 % of communality in a reflective block. The average redundancy 'Redun' reflects the ability of the independent latent variables to explain the average variation of the indicators in the dependent construct. There is also a summary statistic called average variance (AVE), but we did not present this here, as the AVE measures the amount of variance that a latent variable captures from its indicators in relation to the amount of variance due to a measurement error. The criteria on being that AVE has a value greater than 0.5, to be interpreted that 50 % or more of the indicators' variance is accounted for. *Source* Authors' calculations

Table 4 PLS-PM, bootstrap test

			Spec. 1								Spec. 2	
			1		2		3		4		5	
			Perc. 025	Perc. 975	Perc. 025	Perc. 975	Perc. 025	Perc. 975	Perc. 025	Perc. 975	Perc. 025	Perc. 975
lvLC	→	lvDIV	−0.525	0.854	0.174	0.632	0.170	0.637	0.144	0.682	0.151	0.603
lvLC	→	lvHC	−0.252	0.882	−0.048	0.559	−0.077	0.512	−0.041	0.537	0.055	0.538
lvCH	→	lvDIV	−0.337	0.324	−0.105	0.355	−0.083	0.424	−0.099	0.406	−0.074	0.400
lvCH	→	lvHC	−0.270	0.336	−0.007	0.531	0.082	0.567	−0.027	0.506	0.038	0.535
lvDIV	→	lvHC	−0.463	0.192	−0.337	0.164	−0.300	0.185	−0.302	0.209	−0.366	0.188
lvENDOAM	→	lvHC	0.181	0.764	−0.347	0.342	−0.393	0.441	0.227	0.714	–	–
lvHC	→	lvL	0.228	0.707	0.199	0.659	−0.164	0.501	0.065	0.503	−0.095	0.526
lvHC	→	lvK	−0.315	0.055	−0.304	0.061	−0.300	0.095	−0.324	0.029	−0.324	0.076
lvL	→	lvEW	0.507	1.018	0.601	1.042	−0.519	1.041	0.589	1.039	−0.503	1.024
lvL	→	lvSW	−0.575	0.060	−0.657	0.042	−0.799	−0.004	−0.779	−0.028	−0.829	−0.028
lvK	→	lvEW	−0.412	0.161	−0.291	0.219	−0.389	0.210	−0.342	0.195	−0.421	0.201
lvK	→	lvSW	0.134	0.747	0.034	0.588	−0.065	0.575	−0.014	0.592	−0.067	0.621

The table presents a robustnest test for our estimated models. It shows the estimation of a nonparametric bootstrap test. As a PLS-PM estimation method is not calculated based on any distributional assumptions, a bootstrap test using 200 resampling procedures is inquired to obtain information about the variability of the parameter estimates. The bootstrap test results are interpreted through the inclusion of zero within the 0.025 and 0.975 % interval, which would be a sign of lack of statistical significance of the estimated path coefficients in the model at a 5 % confidence level. We observe that the test confirms our CBD model as economically reasonably performing and also supports some of the theoretical cultural effects claimed by CBD, mostly in the parsimonious specifications tried here. *Source* Authors' calculations

These results are both consistent with previous tests and confirm the CBD hypothesis as convincingly relevant for the Greek case. We will next try to extract the maximum information from these nonparametric tests and to cross-check them through triangulation of these results with some parametric tests (see Sect. 4.2).

4.2 Parametric tests for triangulating the PLS-PM results

4.2.1 3SLS with the PLS-PM latent variables scores

PLS-PM is a particularly powerful technique among others, due to its ability to calculate scores for the latent variables of the model. Figure 6 presents the scores for LC, CH, HC, EW, and SW on choropleth maps for the NUTS3 regions in Greece. Enabling optical examination of the results, these scores can be used for further tests to detect the impacts and interconnections between these latently present forms of capital and aggregate outputs in the locality.

However, in the PLS-PM method, this great advantage of having a precise quantitative measure for the latent variables of interest is exploited to identify the path coefficients only through OLS estimations (which is still an OLS, even if combined with a certain weighting procedure and iterations). Therefore, as a parametric triangulation test for our path coefficients in the Structural CBD model, we implement a 3SLS, using the scores of the latent variables obtained in the PLS-PM. The results are shown in Table 5 below.

We construct now a recursive type of empirical model where in the first equation, the latent variable for human capital (lvHC) is predicted by the latent variables for living culture, cultural heritage, and diversity (lvLC, lvCH and lvDIV, respectively). In the second equation, we insert lvHC as an explanatory variable in an equation where local development is predicted by labour (approximated by lvL), physical capital (lvK), and human capital. This model reflects the basic CBD Weberian type of mechanism.

We next try four specifications of our empirical model. We approximate local development once with economic welfare (lvEW) and alternatively with social well-being (lvSW). These are the basic two parts of the CBD model—culture affecting local welfare through its direct impact on human capital and culture indirectly affecting social well-being through its direct impact on local human capital. For each of these cases, we try two possible specifications: one directly as stated above and an additional specification where we include lvL as an explanatory variable in the first equation. In this way, we explain lvHC with the overall lvL in the locality as well.

The motivation for this attempt is to capture the effect of the size of the market as well as the economic endogeneity of the lvHC. Indeed, additional specifications could be tried—for example, lvEW might explain lvSW or vice-versa, but we stick here to the basic four specifications presented in Table 5, because they reflect the basic direct paths of influence of the CBD hypothesis.

Although not perfect, our 3SLS results have three major advantages. First, the main economic expectations—such as the effect of labour and physical capital on local productivity—are confirmed. This means the scores have produced economically reasonable scores also according to the more precise parametric test. Second, the effect

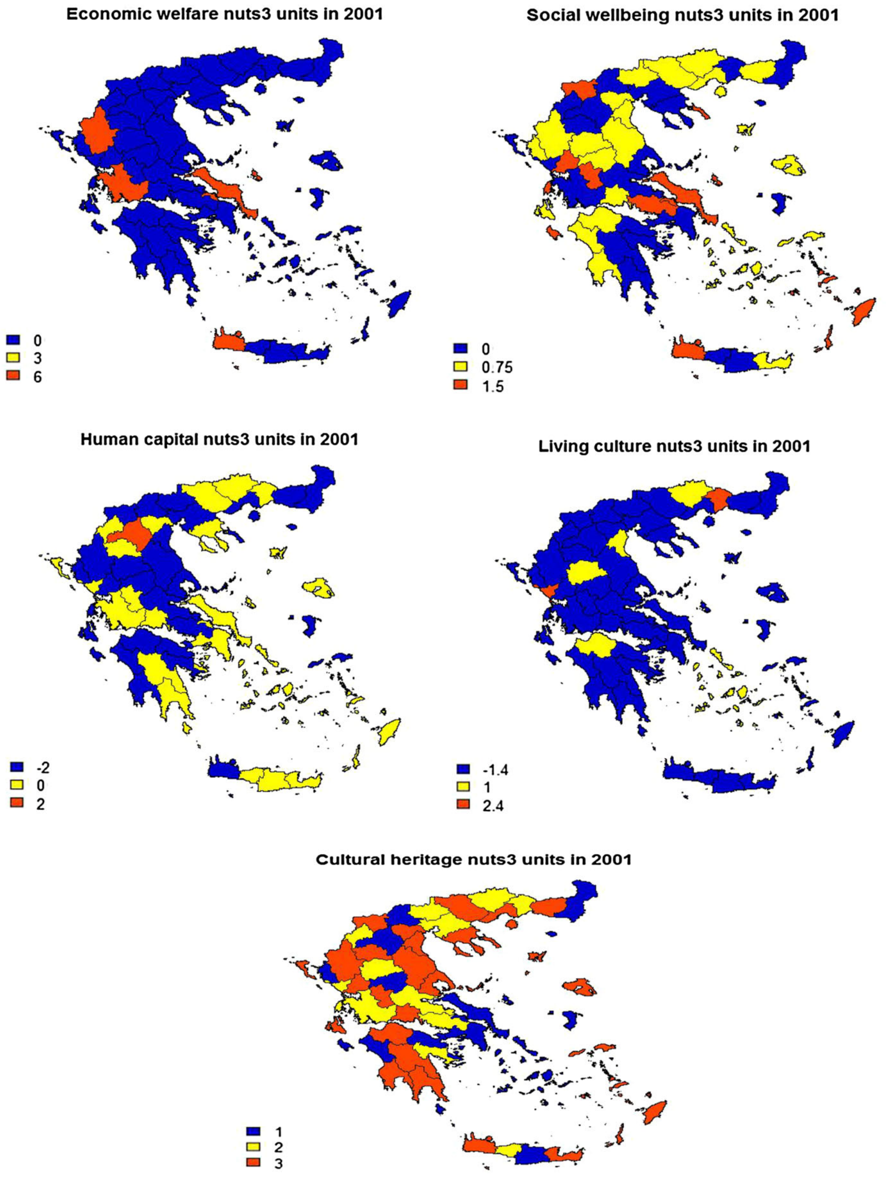

Fig. 6 Latent variable scores plotted on choropleth maps for Greece, NUTS3 level, representation from *top left corner in rows*, respectively—spatial distribution of the latent variables scores for: economic welfare (*lvEW*), social well-being (*lvSW*), cultural heritage (*lvCH*), living culture (*lvLC*), and human capital (*lvHC*). *Source* Authors' calculations

of lvCH is confirmed as being a strong determinant for the lvHC. This confirms the findings we obtained through the PLS-PM estimations. Third, our 3SLS tests find the path coefficient for labour related to the local human capital levels, where next labour

Table 5 3SLS parametric test of the CBD mechanism for Greece, NUTS3, 2001

Spec.	1		2		3		4	
	Coef.	*z* value	Coef.	*z* value	Coef.	*z* value	Coef.	*z* value
dep.var.1	lvHC				lvHC			
lvLC	0.198	1.46	0.213	1.52	0.269	1.89	0.284	1.93
lvCH	0.307	2.44	0.337	2.60	0.230	1.73	0.262	1.91
lvDIV	−0.012	−0.09	−0.033	−0.26	−0.019	−0.14	−0.044	−0.32
lvL	0.233	1.89	–	–	0.238	1.93	–	–
_cons	−2.19E−09	0.00	−2.91E−09	0.00	−2.30E−09	0.00	−3.03E−09	0.00
RMSE	0.874		0.868		0.905		0.899	
χ^2	17.55		16.75		13.03		12.15	
P	0.0015		0.0022		0.0046		0.0069	
Dep. var. 2	lvEW				lvSW			
lvHC	0.231	1.52	0.217	1.43	0.287	0.93	0.274	0.89
lvK	0.168	2.71	0.167	2.69	0.396	2.95	0.396	2.94
lvL	0.894	11.36	0.943	12.78	−0.216	−1.36	−0.173	−1.10
_cons	1.16E−09	0.00	1.29E−09	0.00	−1.24E−10	0.00	−2.03E−11	0.00
RMSE	0.454		0.905		0.451		0.904	
χ^2	215.06		13.80		278.34		12.57	
P	0.0000		0.0032		0.0000		0.0057	
N	51		51		51		51	

The table presents the estimation of a recursive model expressing the basic CBD mechanism (model (1)) and quantified with the latent variables scores obtained from the PLS-PM estimation. *Source* Authors' calculations affects the economic well-being; this is obviously the reason for our PLS-PM found relationship between social well-being and labour.

Put differently, cultural heritage affects human capital, but is also related to the entire workforce and therefore affects the overall economic welfare. Thus, we consider this as an account for both the side-effects (externalities) and the cultural direct effect on the human factor at large (indifferent of skills and specialization). Clearly, culture appears to affect directly the whole labour force, which determines local welfare, and next indirectly the social well-being in the locality as a side-effect.

The statistical tests of the 3SLS model are also relatively satisfactory. So, we can accept the 3SLS parametric test as generally consistent and confirmatory for our PLS-PM results.

4.2.2 Structural equation model (SEM) with the Greek data

It is well known that a SEM estimation does not provide scores for the latent variables, but rather treats them as pass-through points. Of course, in general, SEM provides better estimates for parameters and coefficients. Yet, SEM estimations perform weaker with smaller datasets like ours. Therefore, we do not use it as a main estimation strategy.

A major advantage of SEM, however, is that fitting all variables in the same matrix at the same time (as opposed to the partial or 'cascading' integration of the different parts of the model with PLS-PM) results in a more informative—and straightforward for interpretation—measure for the statistical power of this overall goodness-of-fit measure. Nevertheless, the SEM estimation can by definition report less on the components of the model.

Therefore, we use from the PLS-PM model results the information on which variables from our dataset we should use as best defining our latent variables. And next, we attempt to run a SEM estimation as a perfect equivalent of the parsimonious CBD model estimated with our PLS-PM, using the same data and the same theoretical model for the components and paths between them. The results of this exercise show that this model failed to fit.

To cross-check the reason for this, we performed a SEM estimation for each component taken separately. This step, equivalent to factor analysis, finds power to identify only our latent variables lcCH, lvLC, and lvEW as fitting a SEM model successfully with the reflective indicators selected by the PLS-PM as most relevant measures. The latter means that the way our indicators relate to the other latent variables reflected in our PLS-PM model are based on relationships extending beyond a maximum likelihood matrix conversion. The main CBD hypothesis, however, contains in its core the effect of living culture and cultural heritage on local economic welfare. And these LVs were found as fitting by both the PLS-PM and SEM approach.

Thus, we were next able to establish such a simplified, reduced version of the CBD PLS-PM model to test our SEM. Through an individual investigation of each latent variable with a SEM procedure, we were able to identify which co-variances have to be ruled out for the latent variable models to fit well. We take the same co-variances out of our estimation of Specification 1. In the next step, we cross-check which co-variances have to be ruled out, once the three latent variables lvCH, lvLC, and lvEW are combined in a model together. This is our SEM Specification 2. The results are shown in Table 6 below.

Both specifications produce SEM estimates with highly significant and positive coefficients about the indicators in the measurement model. This result confirms that our PLS-PM measurement has been rather successful in finding an approximation for these three latent variables of interest (lvCH, lvLC, and lvEW).

Table 6 presents the path coefficient estimations of the structural model; as these contain the main test, it may be important to triangulate here. It is clear that the results in the structural model will inform us on whether there is indeed an effect of local cultural capital on economic welfare in Greece according to our parametric SEM tests as well.

As can be seen from Table 6, SEM finds also a strong significant effect from local cultural heritage on local economic development (a finding also reported by our PLS-PM model). The difference in signs of the effects of CH may be due to the lower power of SEM to account for the cascading interrelationships in the model. The second specification, properly controlled for co-variances, appears to fit the model properly and to report chi-square statistics which are not significant.

Fitting the model is, in general, a rare success for a SEM model with such a small dataset; it is, therefore, a very positive sign for the goodness of fit and general reliability of our finding. The GoF is confirmed also by the Bayesian information criterion (BIC) statistics for the second specification and by the lower than 0.05 level of the root mean squared error of approximation (RMSEA) test for goodness of fit. In conclusion, our SEM estimations confirm the main proposition of the CBD hypothesis that is also regarded as relevant in the PLS-PM model in the context of Greece.

5 Conclusion

The approach in the present study has adopted a broad regional development perspective, including cultural factors. Summing up the results from testing our main CBD hypothesis, regional development in Greece tends to be closely related to the regional concentration of cultural capital.

In particular, its cultural heritage seems to have an identifiable effect that is detectable by both nonparametric and parametric estimation techniques. This relationship seems to be more persistent than the relationship between human capital and socio-economic development, which is a very strong indication of the regional economic relevance of cultural factors for local development. Despite the limitations of our dataset, the overall performance of the model is generally satisfactory, confirming the relevance of the multi-factor approach to approximating culture as suggested by the CBD framework and supportive for the general principles of the CBD mechanism.

Our findings with the nonparametric PLS-PM model indicate that both the main theoretical and empirical claims of the CBD paradigm find confirmation in the data about Greece: (1) the structure of the mechanism of cultural impact is confirmed as being a two-gear mechanism, centred around the concentration of human capital; (2) cultural capital is most successfully approximated through a vector variable aggregating local attitudes. The parametric tests involved to triangulate these results provide a generally consistent result with the PLS-PM picture.

Table 6 SEM parametric test of main CBD hypothesis for Greece, NUTS3, 2001

Spec.	Unfitted	Fitted					
Estimation method = ml		Estimation method = ml					
Log likelihood = −485.459		Log likelihood = −446.161					
Iterations = 20		Iterations = 13					
N obs = 51		N obs = 51					
Standardized		Coef.	*z* value	Standardized		Coef.	*z* value
Structural model							
EW	←			EW	←		
LC	|	−0.164	−1.16	LC	|	−0.294	−1.90
CH	|	0.370	3.59	CH	|	0.355	2.62
GoF Statistics							
LR test	$\chi^2(145) = 234.06$	Prob> $\chi^2 = 0.0000$	$\chi^2(139) = 155.46$	Prob> $\chi^2 = 0.1610$			
RMSEA	0.110		0.048				
90 % CI,							
lower bound	0.083		0.000				
upper bound	0.135		0.085				
pclose	0.000		0.511				
Information							
AIC	1020.917		954.321				
BIC	1069.213		1014.208				

The table presents the results from the structural model, i.e. relationship between the latent variables, from a SEM estimation, as well as GoF tests. *Source* Authors' calculations

In summary, CBD seems to be a relevant framework for explaining regional discrepancies in Greece, and therefore, the cultural factor is to be considered as an important and robust driver of spatial economic development of Greece, also in the context of the current economic crisis. From a more general perspective, the current research provides evidence for the significance of informal socio-cultural institutions in Greece, such as the aggregates of attitudes, beliefs, and cultural participation as well as the aggregate of the different links with the existing cultural heritage.

This result indicates that there are also local intangible and more sensitive to policy intervention factors (such as the latently present factors LC and CH), which represent intangible and informal socio-cultural institutions that are likely to exercise a significant influence on local social and economic development. These factors have an influence on local development besides the care for the efficiency of formal socio-economic and regional institutions (that can be reshaped more easily with external influence and sufficient political will).

Clearly, all these factors operate through a neo-Weberian CBD mechanism that can serve to predict policy implementation efficiency. Follow-up policy research can help us identify which will be the places where the success of policy implementation (such as crisis measures) can be expected to be more efficient and where less so throughout the regions in Greece.

6 Appendix

See Tables 7 and 8.

Table 7 PLS-PM, descriptive statistics of 134 indicators

Variable	Obs.	Mean	SD	Min.	Max.	LV approx.
six_p2imm	51	0.323	0.090	0.169	0.493	lvLC
six_prays	51	0.405	0.173	0.175	0.692	
six_ylaw	51	0.396	0.138	0.182	0.651	
six_happ	51	0.576	0.214	0.316	0.925	
six_left	51	0.000	0.000	0.000	0.002	
six_ppl_help	51	0.064	0.098	0.000	0.349	
six_trust	51	0.113	0.093	0.010	0.324	
six_cc_neg∼e	51	1.75E+12	3.61E+12	571.146	9.90E+12	
s_museum	51	0.001	0.001	0.000	0.005	
s_mus_vis	51	17,335.640	54,041.960	0.000	355,100.000	
s_byzantine	51	0.084	0.117	0.006	0.680	lvCH
s_modern	51	0.067	0.093	0.000	0.585	
s_castles	51	0.002	0.002	0.000	0.011	

Table 7 continued

Variable	Obs.	Mean	SD	Min.	Max.	LV approx.
s_sites	51	0.002	0.004	0.000	0.015	
s_settleme~s	51	0.009	0.016	0.000	0.078	
s_sonb	51	0.005	0.007	0.000	0.047	
s_prehis	51	0.008	0.009	0.000	0.053	
s_prehisto~r	51	0.008	0.009	0.000	0.053	
s_classic	51	0.025	0.022	0.000	0.112	
s_empl_ind	51	0.060	0.099	0.000	0.495	lvL
s_ppl	51	21.100	19.502	3.187	107.967	
s_labour	51	89.806	231.899	6.900	1645.100	
s_empl	51	83.543	217.174	6.200	1541.700	
s_empl_tot~f	51	0.344	0.021	0.302	0.390	
s_empl_agri	51	0.224	0.093	0.033	0.453	
s_empl_ind_m	51	0.872	0.060	0.719	0.953	
s_empl_serv	51	0.436	0.070	0.290	0.572	
s_empl_unk~n	51	0.041	0.015	0.014	0.071	
s_hc	51	0.164	0.032	0.110	0.265	lvHC
s_managers	51	0.080	0.014	0.049	0.115	
s_profe	51	0.095	0.018	0.063	0.149	
s_craft	51	0.147	0.030	0.092	0.255	
s_crea	51	0.323	0.049	0.208	0.439	
s_imm_new	51	0.076	0.051	0.034	0.283	
s_imm_fore~n	51	0.030	0.019	0.012	0.142	
s_residents	51	2.990	0.239	2.573	3.581	
s_factories	51	0.002	0.012	0.000	0.084	lvK
s_area_tot~m	51	0.073	0.053	0.009	0.314	
s_area_lan~m	51	0.072	0.052	0.009	0.305	
s_wage_ind	51	5344.869	7324.819	0.000	55,712.700	lvEW
s_grossva_01	51	33.544	16.417	22.539	137.232	
s_gva_manuf	51	3.587	5.381	0.132	32.857	
s_gva_consrt	51	3.604	1.543	1.679	10.814	
s_gva_retail	51	12.299	8.930	4.833	50.719	
s_gva_public	51	7.434	4.413	4.691	36.041	
s_derma	51	0.000	0.000	0.000	0.001	lvENDOAM
s_nonspec	51	0.004	0.002	0.000	0.018	
s_dentists~l	51	0.002	0.002	0.000	0.016	
s_waste2land	51	409.176	598.097	0.000	3357.350	
s_waste2wa~r	51	18.155	35.417	0.000	159.316	
s_heating	51	0.056	0.052	0.003	0.240	
s_inter_migr	51	0.073	0.049	0.033	0.268	lvDIV
s_foreign_~r	51	0.017	0.006	0.006	0.030	
s_ac_i_imm	51	0.025	0.016	0.010	0.118	

Table 7 continued

Variable	Obs.	Mean	SD	Min.	Max.	LV approx.
s_ac_fore_~m	51	0.007	0.002	0.003	0.015	
s_m_in_imm	51	0.032	0.023	0.012	0.121	
s_live_bir~l	51	0.011	0.013	0.000	0.030	lvSW
s_deaths_t~l	51	0.011	0.016	0.000	0.047	
s_marr	51	0.015	0.021	0.000	0.160	
s_polit_stab	51	−5.564	2.676	−16.690	0.110	
s_voters_y	51	3.437	0.982	1.893	7.451	
s_polit_free	51	0.725	0.091	0.504	0.850	

The table presents descriptive statistics for some of the 134 indicators available in our dataset mostly as shares of local population, used to approximate the nine latent variables of interest: living culture (lvLC), cultural heritage (lvCH) and diversity (lvDIV)), human capital (lvHC), endogeneity-creating local amenities (lvENDOAM), labour (lvL), economic capital (lvK), economic welfare (lvEW) and social well-being (lvSW) and endogenous amenities (lvENDOAM). *Source* Authors' calculations

Table 8 PLS-PM, descriptive statistics of latent variables

Variable	Obs.	Mean	SD	Min.	Max.
lvLC	51	2.96E−09	1.00995	−1.462	2.489
lvCH	51	8.40E−10	1.00995	−0.774	3.624
lvDIV	51	2.65E−09	1.00995	−1.926	2.677
lvHC	51	−2.09E−09	1.00995	−2.393	2.252
lvK	51	−3.94E−09	1.00995	−1.189	4.684
lvL	51	−3.05E−09	1.00995	−0.541	6.316
lvEW	51	−2.70E−09	1.00995	−0.498	6.902
lvSW	51	−1.63E−09	1.00995	−0.864	1.990

The table presents the basic summary statistics (number of observations, equal to the NUTS3 regions, mean, standard deviation, maximum and minimum value of each latent variable) describing the latent variables obtained in the PLS-PM analysis. *Source* Authors' calculations

References

Abdellaoui M, Baillon A, Placido L, Wakker P (2011) The rich domain of uncertainty: source functions and their experimental implementation. Am Econ Rev 101(2):699–727

Acemoglu D, Robinson J (2010) The role of institutions in growth and development. Rev Econ Inst 1(2):1–33

Arrow KJ (1951) Alternative approaches to the theory of choice in risk-taking situations. Econometrica 19:404–437

Axelrod R (1997) The dissemination of culture: a model with local convergence and global polarization. J Confl Resolut 41(2):203–226

Baillon A, Cabantous L, Wakker P (2012) Aggregating imprecise or conflicting beliefs: an experimental investigation using modern ambiguity theories. J Risk Uncertain 44:115–147

Banfield E (1958) The moral basis of a backward society. The free Press, Glencoe

Baycan T, Nijkamp P (2012) A socio-economic impact analysis of urban cultural diversity: pathways and horizons. In: Nijkamp P, Poot J, Sahin M (eds) Migration impact assessment: new horizons. Edward Elgar, Cheltenham, pp 175–202

Bourdieu P (1973) Cultural reproduction and social reproduction. In: Brown R (ed) Knowledge, education and social change: papers in the sociology of education. Tavistock Publications, UK, pp 71–112
Bourdieu P (1977) Cultural reproduction and social reproduction. In: Power and ideology in education, pp 487–511
Bourdieu P (1986) The Forms of capital, in handbook of theory and research for the sociology of culture, pp 241–258
Bowman S (2002) The Jews in Greece. In: Clogg R (ed) Minorities in Greece: aspects of a plural society. Hurst, London
Bucci A, Sacco PL, Segre G (2014) Smart endogenous growth: cultural capital and the creative use of skills. Int J Manpow 35(1/2):33–55
Chin W (2010) How to write up and report PLS analyses. In: Vinzi V, Chin W, Henseler J, Wang H (eds) Handbook of partial least squares. Springer, Berlin, pp 655–690
Christopoulos DK, Tsionas EG (2004) Convergence and regional productivity differences: evidence from Greek prefectures. Ann Region Sci 38:387–396
Currid E (2007) The Warhol economy: how fashion, art, and music drive New York City. Princeton University Press, Princeton
Dell M (2010) The persistent effects of Peru's Mining Mita. Econometrica 78(6):1863–1903
Florida R (2002a) The rise of the creative class: and how it's transforming work, leisure, community, and everyday life. Basic Books, New York
Florida R (2002b) Bohemia and economic geography. J Econ Geogr 2:55–71
Florida R (2005) The flight of the creative class: the new global competition for talent. Harper Collins, London
Glaeser EL, Laibson DI, Scheinkman JA, Soutter CL (2000) Measuring trust. Q J Econ 115(3):811–846
Glaeser E, Kolko J, Saiz A (2001) Consumer city. J Econ Geogr 1(1):27–50
Granovetter M (1973) The strength of weak ties. Am J Sociol 78(6):1360–1380
Hicks J (1969) A theory of economic history. Clarendon, Oxford
Huggins R, Thompson P (2015) Culture and place-based development: a socio-economic analysis, regional studies. Spe Issue Urban Region Horiz 49(1):130–159
Jacobs J (1961) Death and Life of great American cities. Random House, New York
Knack S, Keefer P (1996) Does social capital have an economic payoff? A cross-country investigation. Q J Econ 112(4):1251
Levine D (1980) Tunnel vision, special issue on social history. Theory Soc 9(5):677–678
Lohmöller J (1989) Latent variable path modeling with partial least squares. Physica, Heidelberg
Markusen A (2010) Organizational complexity in the regional cultural economy, regional studies. Special issue: cultural economy: an opportunity to boost employment and regional development 44(7): 813–828
Marx K (1859 [1973]) The Grundrisse. Penguin Harmondsworth, London
Marx K (1867) Das Kapital, Kritik der politischen Ökonomie. Verlag von Otto Meisner, Hamburg
Möller J, Tubadji A (2009) The creative class, bohemians and local labor market performance a micro-data panel study for Germany 1975–2004. J Econ Stat 229(2–3):270–291
Myrdal G (1957) Rich lands and poor: the road to world prosperity. Harper and Bros, New York
Myrdal G (1989) The equality issue in world development. Am Econ Rev 79(6):8–17
Nijkamp P, Poot J (2015) Cultural diversity—a matter of measurement. In: Bakens J, Nijkamp P, Poot J (eds) The economics of cultural diversity. Edward Elgar, Cheltenham forthcoming
Ottaviano G, Peri G (2005) Cities and cultures. J Urban Econ 58:304–337
Ottaviano G, Peri G (2006) The economic value of cultural diversity: evidence from US cities. J Econ Geogr 6:9–44
Ottaviano G, Peri G (2004) The economic value of cultural diversity: evidence from US cities. Cesifo Working Paper, No. 1117
Page SE, Toole J (2010) Forward path dependence, conference paper, Society of Political Methodology
Putnam RD (1995) Bowling alone: America's declining social capital. J Democracy 6(1):65–78
Rose R (1990) Valuing environmental services. Agric Resour Quart 2(3):300–306
Rosen S (1974) Hedonic prices and implicit markets: product differentiation in pure competition. J Polit Econ 82(1):34–55
Samuelson P (1994) Facets of Balassa–Samuelson thirty years later. Rev Int Econ 2:201–226
Sanchez G (2013) PLS path modeling with R. Trowchez editions. Berkeley
Sen A (1993) Internal consistency of choice. Econ Econ Soc 61(3):495–521

Smith A (1759) The theory of moral sentiments [English text, 2010]. Penguin Classics, London
Tabellini G (2010) Culture and institutions: economic development in the regions of Europe. J Eur Econ Assoc 8(4):677–716
Tadesse B, White R (2010a) Cultural distance as a determinant of bilateral trade flows: do immigrants counter the effect of cultural differences? Appl Econ Lett 17(2):147–152
Tadesse B, White R (2010b) Does cultural distance hinder trade in goods? A comparative study of nine OECD member nations. Open Econ Rev 21(2):237–261
Tadesse B, White R (2011) Emigrant effects on trade: re-examining the immigrant-trade link from the home country perspective. East Econ J 37(2):281–302
Tenenhaus M, Vinzi EV, Chatelin Y, Lauro C (2005) PLS path modeling. Comput Stat Data Anal 48:159–205
Tiebout C (1956) A pure theory of local expenditures. J Polit Econ 64(5):416–424
Traverse J, Milgram S (1969) An experimental study of the small world problem. Sociometry 32(4):425–443
Tubadji A (2009) See the forest not only the trees: culture based development (CBD)—conceptualizing culture for sustainable development purposes, in ACTED Collection, Interdisciplinary Centre for Comparative Research in the Social Sciences CIR - Interdisciplina, pp 180–205
Tubadji A (2012) Culture-based development: culture as an encompassing economic factor—empirical evidence for Germany. Int J Soc Econ 39(9):690–703
Tubadji A (2013) Culture-based development: a concept of culture as an encompassing economic factor. Forthcom Int J Soc Syst Sci 5(4):355–391
Tubadji A (2014) Was weber right? The cultural capital roots of economic growth. Int J Manpow 35(1/2):56–88
Tubadji A, Nijkamp P (2014) Altruism to strangers for our own sake: domestic effects from immigration—a comparative analysis for EU15. Int J Manpow Spec Issue Cult Labour 35(1/2):11–32
Tubadji A, Gnezdilova N (2014) The German miracle or the miracle of the cultural attitude: inequality and convergence as products of culture in Germany. Int J Soc Econ 41(11):1014–1037
Tubadji A, Nijkamp P (2015) Cultural gravity effects among migrants: a comparative analysis of the EU15 Econ Geogr (forthcoming)
Tubadji A, Moeller J, Nijkamp P (2014a) Introduction to cultural research approaches: applications to culture and labour analysis, special issue culture and labour. Int J Manpow 35(1/2):2–10
Tubadji A, Osoba B, Nijkamp P (2014b) Culture-based development in the USA: culture as a factor for economic welfare and social wellbeing at a county level. J Cult Econ 38(4):1–27
Tubadji A, Pelzel F (2015) Culture based development: measuring an invisible resource using PLS-PM method. Int J Soc Econ (forthcoming)
Watts DJ, Strogatz SH (1998) Collective dynamics of 'small-world' networks. Nature 393(6684):440–442
Weber M ([1904-1905] 1930) The Protestant ethic and the spirit of capitalism, published in English in 1930, Unwin Hyman, London, Boston