RESEARCH PAPER

The Causal Relationship of Public Expenditure on Culture and Sustainable Development: The Case of the European Union

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Abstract
In the literature of economics, culture is a public good that is largely influenced by public expenditure, policies and government interventions. On the other hand, sustainable development (encompassing economic, social and environmental dimensions) has become the dominant paradigm in the discourse of governments and international institutions. Therefore, investigating causal relationships between cultural expenditure (as an indicator of the relative importance of the cultural sector in public policy-making of governments) and the various dimensions of sustainable development can help explain the importance of culture in development policies. In this regard, the present paper examines these causal relationships using the panel vector error-correction (PVEC) model for the European Union countries during the period 2000 to 2015. The results indicated that the cultural expenditure (share of total expenditure or GDP) is the Granger causality of the indicators of sustainable development. In addition, an inverse causal relationship from development to public expenditure on culture confirms some of the indicators of sustainable development such as public expenditure on education, the level of citizens' confidence, gross domestic product, and the final consumption expenditure of households.
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JEL Classification: C39, H50, Q01, Z10.

Introduction

During the last decade, most developed and developing economies have faced two opposing issues in public policy-making including the reduced public budgets for improving their economies, and the growing need of the culture and art sector for more public budgets. This has led to significant attention on the impact of the public expenditure of culture sector on economic indicators over the last few years, especially in European countries (Belfiore, 2015).

However, reviewing the previous studies indicated that they often evaluated the effect of a single project or a phenomenon in specific fields. Hence, these studies lack macro analysis (Gielen et al., 2015). Some studies also employ cross-section data (Jeretic, 2014). In addition, almost all the studies have used the comprehensive definition of culture which has been referred to in the next sections. This general definition of culture has caused problems in collecting comparable data from all countries, and hence the possibility of accurate analysis disappears.

In sum, previous studies have been performed based on micro or project approach, cross-

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section data, short-run effect, and a comprehensive definition from the culture sector. In this regard, the present paper tries to include only main contributions such as macro analysis, panel data method, and a constrained definition of culture based on the literature of *cultural economics*. In addition, this paper focused on addressing aggregate levels of cultural expenditure, examining long-term effects of this expenditure using time series data, and considering causal relations between culture indices and sustainable development.

The rest of the paper is organized into six sections as follows. Section 2 focuses on explaining theoretical literature. Section 3 reviews the previous studies. Section 4 presents data and method. The empirical findings are analyzed in Section 5. Finally, the conclusions are in Section 6.

Theoretical Literature

Cultural Economics

As defined by Throsby (2001), culture can be a set of peoples' activities and the products of these activities including three main characteristics such as creativity in the production, transmission of symbolic meaning, and the existence of a potentially rational feature. These activities form around the central core of creative ideas. In this regard, Towse (2010) considered culture as a combination of three parts of the arts, heritage, and creative industries[1].

The economics of culture, as a specific field, began in the 1960s with the Galbraith (1960) and Robbins (1963), and Baumol and Bowen (1966). Galbraith (1960) and Robbins (1963) argued about the role of government in paying subsidies for museums costs. Baumol and Bowen (1966) proposed the theory of cost disease related to the effectiveness of artistic activities. Cultural economics has grown a lot and Scott (1999) claims that it can involve all sectors of modern capitalism. In addition, it embraces the consumers' needs for entertainment, beauty and decorations, internal satisfaction and social expression[2].

The culture and economics, as two disciplines, are only engaged in dialogue for a relatively short period. This interaction has brought about two different approaches. The first approach was developed in the United States in the 1960s that discussed two main issues of government intervention in the cultural sector and also effective allocation of public expenditure (Heilbrun and Gray, 2001). The studies undertaken with this approach including contemporary Anglo-Saxon arts (such as the performing arts, painting, sculpture, and museums) which are known as high culture. To contrast, everything that does not cover this definition remains for the market and analysis in industrial economics.

The second approach began in the late 1970s and early 1980s, when budget cuts of European governments led to a new view about the role of public spending in the cultural sector. Accordingly, the allocation of funds to stimulate manufacturing sectors was prioritized due to the economic crisis. However, it should be noted that some culture-related activities have a similar economic impact on other sectors of an economy. In addition, these activities have positive effects such as learning and knowledge, and hence the culture sector contributes to economic and social development (Hérubel, 2000).

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1. For further studies on the culture sector, see Crane (1994), Hilbern and Gary (2001), Sedgwick and Edgar (2002), Wasko et al. (2005), and Throsby (2010).
2. For more details on the history of the economics of culture, see Towse (2003), Ginsburgh and Throsby (2008), McCainb (2006), and De Jong (2013).

Culture and Sustainable Development

Theoretically, there is a mutual relationship between culture and sustainable development[1]. On the hand, economic development influences the cultural sector through different channels. For example, economic growth helps to develop the culture sector from three perspectives of the demand side, supply side, and government and private sectors support. The effect of the demand side is simple and straightforward. Since the demand for art is related to household incomes and education, the cultural activities are becoming commercially profitable, along with an increase in the level of wealth and education of people. The effect of the supply side is more complex and indirect. Economic development provides a better infrastructure in such a way that remote areas will be easier for traveling orchestras and similarly cultural centers for traveling residents (García et al., 2003; Kunz et al., 1997).

On the other hand, the culture sector affects economic development from different channels. The importance of the culture sector in development can be seen from the studies of the 1960s and the reports of the 1980s, in which the role of cultural and artistic activities have been emphasized in the development of European and American cities. Myerscough (1988) indicated that the art sector is regarded as an important and growing field with intrinsic value which has a turnover of 10 billion pounds and the creation of about half a million jobs.

Severino (2005) argued that cultural products should have cultural value as well as commercial value. Furthermore, a large number of studies have been conducted to explain the potentials capacity of the culture sector for job creation and urban regeneration. For example, the following studies can be mentioned Fuchs (2002), Lorente (2002), Weinstein and Clower (2000), Bryan et al. (2000), Landry (2000), Dziembowska-Kowalska and Funck (1999), O'Connor (1998), Hudson (1995), Bassett (1993), Bianchini (1993), Hilbran and Gray (1993), and Whitt (1987).

Cultural activities are based on creativity and human capital, for this reason, the culture sector has capabilities to offer the local and regional economies. The labor force of the cultural and creative industries displays four distinct characteristics such as youthfulness, high productivity, self-sufficiency and entrepreneurship, and a high level of education, which seems to affect the variables related to sustainable development. In addition, some evidences indicated that women's access to cultural employment is better, and thus the commercial aspect of culture can play a significant role in sustainable rural development (Reeves, 2002).

A large number of studies attempted to estimate the economic impacts of culture and art projects in the last decade. The British Arts Council and the British National Museum in 2013 suggested a study to explain the role of culture and art in development to the Centre for Economics and Business Research (CEBR). This study confirms that the arts and culture sector directly influence macroeconomic indicators such as production, employment, and household income, and also other sectors, indirectly. In addition, it was found that the arts and cultural sector generated a turnover of 12.4 million pounds and also the value added was 5.9 million pounds in 2011 (CEBR, 2013).

Transitioning the structure of economies towards service-oriented activities and increasing the trend for leisure and entertainment goods have caused the creative industries to be significantly considered. In this regard, the Local Government Association published many studies on how local investment in culture and the arts affect the local economy and economic growth. Generally, these reports identified five main channels in which the arts and culture can boost the local economy. These channels include attracting visitors, employment and skills improvement, attracting and sustaining businesses, and the revitalizing of locations and building.

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1. For example, see Hirsch (1972), Zukin (1991), Harvey (1992), Bourdieu (1992), Mitchell (1995), and Lampel et al. (2000).

For example, 500000 visitors of Hepworth Wakefield contributed 10 million dollars to Wakefield's local economy during the first year. They spend their money on entrance fees (exhibition, museum, and festival), using local restaurants and hotels, and shopping from local stores. Alternatively, it is estimated that Yorkshire Sculpture Park will contribute 6 million pounds annually to the local economy (LGA, 2013). In addition, arts and cultural services improve the quality of the local community, and as a result, attract top companies and a high-skilled workforce.

Some studies also argued that arts and culture activities reduce the need for other public services and thus saves on public spending. For example, arts education can reduce the social cost of deprivation of education, and reduces clinical care during a hospital stay.

In addition to the economic effects mentioned above, culture and art produce positive social effects, which are related to health, education, crime reduction, and economic welfare (Morris, 2003; Lingayah et al., 1997). These effects became more evident in the early 1990s with the failure of capitalist policies. The importance of potential cultural and artistic capacities has been considered by urban renewal strategies, especially in the UK (Landry et al., 1996; Smith, 1998).

Several studies such as Landry et al. (1993) and Matarasso (1997) indicated that cultural activities are considered as an engine for developing the individuals and society, and cultural programs in cities lead to increasing social cohesion, decreasing criminal behavior, promoting environmental awareness, developing self-confidence, creating public-private partnerships, increasing organizational capacity, and supporting individual autonomy. The expressed effects, in fact, are regarded as the same dimension of the social and environmental of sustainable development.

Empirical Studies

Myerscough (1988) indicated that expenditure related to the arts sector led to the increase of wealth and employment in other economic sectors, and makes cities more attractive to citizens and corporations.

O'Brien and Feist (1995) focused on identifying employees in the field of culture and handicrafts. They argued that an increase in population density and concentration in London increased cultural occupations by 34 percent from 1981 to 1991. This finding reflects the strong and growing role of the art sector in urban economics.

Casey et al. (1996) analyzed various cultural and artistic fields namely performing arts, composite arts, museums, galleries and national collections, handicrafts, visual arts and trade in arts, literature, films and historical buildings. Accordingly, they concluded that the culture sector has significant job creation potential in the UK. The characteristic of the culture sector is training people, among whom more than 40 percent are self-employed or do part-time work.

Knott (1994) examined the handicrafts sector in the UK and concluded that approximately 25000 workers were active in this sector. Travers (1998) also studied the industries in the field of culture and art in London's economy and showed that 5 to 7 percent of the London economic capital was produced in this sector.

Getzner (2002) questioned whether cultural expenditure by the public, as pointed out by political parties and politicians, indicates the importance of cultural policy compared to other political branches in Austria for 1968-1998. He found that cultural expenditure has increased by raising the GDP growth, but is vulnerable to short-term fluctuations.

Böhm and Land (2009) has examined the articulation of the value of investment in culture and the arts through a critical discourse analysis of policy documents, reports and commentary since 1997. They indicated that discourses about the value have changed from

the direct economic contributions of the culture industries to indirect economic benefits (such as creativity and innovation, employability and social inclusion). The recent discourse involves more complex articulations of the value of culture and the arts that including wider social measures such as well-being, health, education, creativity, innovation, social inclusion, human capital, and social capital.

Pedroni et al. (2012) investigated the relationship between the per capita cultural expenditure and income level in cities in the US and confirmed a mutual relationship. Findings highlighted that cities with higher levels of per capita cultural expenditure tend to have higher levels of per capita GDP.

Håkonsen and Løyland (2015) examined the budget allocation for cultural services in Norwegian municipalities. The budget of cultural sector is decomposed into the eight subcategories: child and youth activities, libraries, cinemas, museums, arts dissemination, cultural heritage, cultural schools, and other cultural services. Then they estimated a system of demand relations using data from 409 Norwegian municipalities during the period 2002 to 2010. The findings have shown that cultural services are luxury goods with high income elasticity. In addition, the development of the cultural sectors is influenced by the demographic parameters, and hence crowding-out effects for the cultural sectors is confirmed.

Srakar and Vecco (2016) evaluated the Eurostat data during the period 1990 to 2014 and ranked EU countries using weighting indicators of sustainable development, as well as culture-related indicators. They found that adding cultural indicators to sustainable development indicators, including expenditure in the field of culture, has a significant impact on changing a country's rank. This issue makes culture a separate dimension of sustainable development with a direct relationship to the wealth of countries.

Castro (2018) argued how the functional components of public expenditure affect the economic growth, unemployment, and income inequality. A dynamic panel data model for a sample of 15 European Union countries during the period 1990 to 2012 is employed, and it is concluded that expenditure on recreation, culture, and religion, and also expenditure on education are the components that contribute more with respect to economic growth. In addition, the promotion of recreational and cultural activities has a positive spillover effect on the economy.

Srakar et al. (2018) constructed an index of culture using Eurostat's Cultural Statistics Pocketbooks and Eurostat's COFOG datasets. Then they found that there is a strong relationship between the resulting index and general development. Moreover, this index of culture strongly related to the levels of GDP, unemployment, inflation, and happiness index.

Nemac and Pelc (2019) commented that Slovenia often had very moderate conditions for agricultural production and hence people tried to find additional sources of income through their various skills that were handed down from generation to generation, and today represent an immaterial cultural heritage. In this regard, handicrafts were often seen as a developmental opportunity and were incorporated into the developmental plans of (marginal) rural areas. They demonstrated that the traditional handicrafts, such as lace-making, pottery, straw plaiting or woodenware-making, have been re-introduced or have acquired a new role in the local economy.

Methodology

Data

The present paper aimed to investigate the casual relations between various dimensions of sustainable development and public expenditure on culture and art. In the following, the indicators used for each of these variables are explained. The data were collected during of

the period 2000 to 2015 from the 31 European Union members including Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Malta, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, and United Kingdom.

There are various definitions about cultures and also different classifications of goods and services in cultural economics. In this paper, the international classification of public expenditure proposed by the United Nations is used. In this category, the culture is at level 1 and the entertainment, culture and religion are observed in group 08. Cultural services and radio, television and publishing services are observed at level 2 and in groups 08.2 and 08.3, respectively. Then the public expenditure on culture is considered in two ways: the ratio of cultural expenditure to total expenditure (POT) and the ratio of cultural expenditure to GDP (POG). These data are extracted from the Eurostat statistical databases.

Regarding sustainable development, it is possible to introduce a general and accepted definition. Accordingly, sustainable development can satisfy the needs of the present generation without compromising the ability of future generations to meet their own needs (Brundtland, 1987; Opoku and Ahmed, 2013). In this regard, based on the three dimensions of sustainable development suggested at the Rio De Janeiro Earth Summit 1992, the European Union categorizes sustainable development into ten subject areas, as illustrated in Figure 1. Accordingly, in this paper, the 15 indicators including economic, social, environmental, and institutional dimensions are extracted from the Eurostat statistical databases.
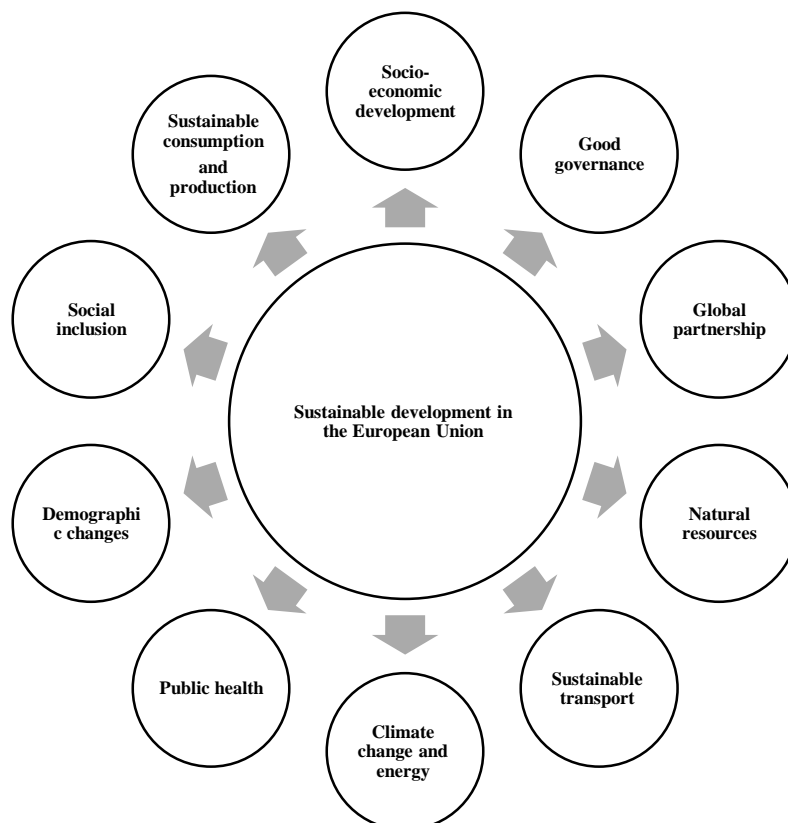

Figure 1. Sustainable Development
Source: European Union sustainable development indicators, Eurostat statistical databases

Methodology

Two variables can be dependent on each other, but there are no causal relations between them.

Kendall and Stuart (1961: 279) state that "A statistical relationship, however strong and however suggestive, can never establish causal connection: our ideas of causation must come from outside statistics, ultimately from some theory or other". Therefore, a statistical relationship in itself cannot logically imply causation. To ascribe causality, one must appeal to a priori or theoretical considerations. (Gujarati, 2002: 23).

For this reason, it is necessary to identify the causal relationship between these two phenomena before emphasizing the cultural expenditure impacts on sustainable development. Furthermore, the inverse relationship of these phenomena has been less investigated although a large number of studies have focused on the impact of culture on sustainable development. Hence, the present study aimed to investigate the mutual causal relations between public expenditure on culture and the sustainable development by using the Granger causality test.

Granger (1969) suggests a method to examine statistical causality. In the Granger approach, variable x will be the cause of variable y, if future values of y can be predicted better (with a smaller forecast error variance) by employing current and past values of x. However, Granger test is not reliable for non-stationary variables. For this reason, the Johnson-type ECM model is suggested as an alternative approach to test non-stationary VAR model. The VECM model enjoys two general advantages. Firstly, this is applicable for non-stationary variables; secondly, it is possible that the causality between variables is separately tested in the long-run and the short-run.

However, time series method is a common approach to examine the causality between two macroeconomic variables; but when data are related to different countries, time series methods fail to produce valid results because of ignoring the economic, social, and environmental differences in countries. Therefore, a panel vector error-correction (PVEC) model must to be used to overcome this problem.

Testing the stationary of variables is the first stage for estimating the model. There are various statistical tests related to panel data. In some unit root tests such as Levin et al. (2002) test, it is assumed that the coefficients are the same across different sections while some tests such as the Im et al. (2003) test are based on the assumption of the variability of coefficients among sections.

In the second step, if the variables are non-stationary, the long-term cointegration test should be used to ensure that the relationships are not spurious. For the first time, Granger (1980) introduces the concept of long-term cointegration. If the variables are cointegrated, it means that they move with each other over time such that short-term differences are corrected in the long-term, and as a result, the existence of the long-term relationship is verified between variables. In this regard, the various tests such as Pedroni (1999, 2002) are introduced for panel data models.

Finally, if there is a cointegrated relationship, the vector error correction model is written as follows:

$$\Delta Y_{it} = \sum_{s=1}^{S} \gamma_{1,s} \Delta Y_{i,t-1} + \sum_{s=1}^{S} \delta_{1,s} \Delta X_{i,t-s} + \lambda_1 ECT_{i,t-1} + \varepsilon_{it}^1, \tag{1}$$

$$\Delta X_{it} = \sum_{s=1}^{S} \gamma_{2,s} \Delta X_{i,t-1} + \sum_{s=1}^{S} \delta_{2,s} \Delta Y_{i,t-s} + \lambda_2 ECT_{i,t-1} + \varepsilon_{it}^2, \tag{2}$$

where the error correction term (ECT) is the remainder of the long-term relationship which is calculated as follows:
$$ECT_{it} = Y_{it} - \varphi_0 - \varphi' X_{it}. \tag{3}$$

In order to determine the causality between the two variables X and Y, the significance of coefficients δ and λ are tested. If the null hypothesis $\delta_{1,1} = \cdots = \delta_{1,S} = 0$ is rejected in Eq. (1), it is concluded that the variable X is the Granger causality of variable Y in short term. In the same way, if the null hypothesis $\delta_{2,1} = \cdots = \delta_{2,S} = 0$ is rejected in Eq. (2), the variable Y will be the causality of variable X.

The causality in the long-term is investigated through the coefficient of error correction term. If the null hypothesis $\lambda_1 = 0$ is rejected, the variable X will be the Granger causality of the variable Y in the long-term. Similarly, if $\lambda_2 = 0$ is rejected, the long-term causality from Y to X is confirmed.

Empirical Findings

The results of unit root tests for the level of variables are indicated in Table A1. Given that the statistics are often smaller than the critical statistics, the null hypothesis is not rejected, and as a result, all variables are considered as non-stationary in this level. The results of the unit root tests for the first-order difference of variables is reported in Table A2., which shows that all variables are stationary in the difference.

Table A3 summarizes the results of the existence of a cointegration relationship between each of the 15 sustainable development indicators with the two culture indicators. The probability of the estimated statistics is higher than the significance level 5 percent, and hence the null hypothesis of the absence of a cointegration relationship between two variables is rejected in all the cases. Now, the long-term and short-term causality between sustainable development and culture can be investigated. The optimum lags are determined based on the Schwarz-Bayesian criterion, and the results are given in Tables 1 and 2.

Table 1. Causality between Cultural Expenditure (POT) and Sustainable Development Indicators

Causality from POT to SDIs				Causality from SDIs to POT			
Null hypothesis	δ_1	λ_1	Causality	Null hypothesis	δ_2	λ_2	Causality
$POT \nrightarrow CBI$	-0.1	-4.75***	Long-term causality	$CBI \nrightarrow POT$	-0.64	-1.12	Non-causality
$POT \nrightarrow DDR$	0.4	5.20***	Long-term causality	$DDR \nrightarrow POT$	61.60	0.49	Non-causality
$POT \nrightarrow DGN$	0.20	-8.20***	Long-term causality	$DGN \nrightarrow POT$	2.10**	-0.70	Short-term causality
$POT \nrightarrow ECTR$	-0.60	-7.20***	Long-term causality	$ECTR \nrightarrow POT$	0.93	1.7	Non-causality
$POT \nrightarrow EOW$	1.42	-3.90***	Long-term causality	$EOW \nrightarrow POT$	1.42	0.23	Non-causality
$POT \nrightarrow FCEH$	1.5	-11.6***	Long-term causality	$FCEH \nrightarrow POT$	-4.09***	-1.87*	Long and short-term causality
$POT \nrightarrow GDP$	-1.70*	-8.01***	Long and short-term causality	$GDP \nrightarrow POT$	2.35**	0.46	Short-term causality
$POT \nrightarrow GGE$	0.45	-2.58***	Long-term causality	$GGE \nrightarrow POT$	1.95*	-0.003	Short-term causality
$POT \nrightarrow HLY$	0.24	-10.6***	Long-term causality	$HLY \nrightarrow POT$	0.30	0.42	Non-causality
$POT \nrightarrow LCC$	-0.66	-3.26***	Long-term causality	$LCC \nrightarrow POT$	0.59	1.81*	Long-term causality
$POT \nrightarrow NPH$	-0.79	-7.03***	Long-term causality	$NPH \nrightarrow POT$	-0.33	-0.36	Non-causality
$POT \nrightarrow PEC$	1.35	-2.23**	Long-term causality	$PEC \nrightarrow POT$	0.54	0.5	Non-causality
$POT \nrightarrow PEE$	1.63	-9.42***	Long-term causality	$PEE \nrightarrow POT$	-0.72	-2.71***	Long-term causality
$POT \nrightarrow PRP$	0.16	-5.28***	Long-term causality	$PRP \nrightarrow POT$	-1.50	-0.39	Non-causality
$POT \nrightarrow RP$	-1.20	-1.83*	Long-term causality	$RP \nrightarrow POT$	-2.63***	-0.97	Short-term causality

Note: ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.
Source: Research finding.

The results indicate that both the share of culture public expenditure from the total public expenditure (POT) and the share of culture public expenditure from GDP (POG) are regarded as the main reason for improving sustainable development indicators in the long run. However, this causal relationship is not confirmed in the short run. The movement of economies, especially urban economies, towards the artistic and creative industries can help improve the economic, social and environmental dimensions of sustainable development.

Table 2. The Causality between Cultural Expenditure (POG) and Sustainable Development Indicators

Causality from POG to SDIs				Causality from SDIs to POG			
Null hypothesis	δ_1	λ_1	Causality	Null hypothesis	δ_2	λ_2	Causality
$POG \nrightarrow CBI$	0.31	-4.28***	Long-term causality	$CBI \nrightarrow POG$	0.90	-1.08	Non-causality
$POG \nrightarrow DDR$	-0.89	-4.82***	Long-term causality	$DDR \nrightarrow POG$	-0.18	1.33	Non-causality
$POG \nrightarrow DGN$	0.96	-8.02***	Long-term causality	$DGN \nrightarrow POG$	0.70	6.79***	Long-term causality
$POG \nrightarrow ECTR$	1.35	-6.97***	Long-term causality	$ECTR \nrightarrow POG$	0.77	0.13	Non-causality
$POG \nrightarrow EOW$	5.70***	-3.93***	Long and short-term causality	$EOW \nrightarrow POG$	1.72*	2.13**	Long and short-term causality
$POG \nrightarrow FCEH$	0.67	-10.9***	Long-term causality	$FCEH \nrightarrow POG$	-1.46	-3.37***	Long-term causality
$POG \nrightarrow GDP$	-1.99*	-8.07***	Long and short-term causality	$GDP \nrightarrow POG$	7.23***	3.62***	Long and short-term causality
$POG \nrightarrow GGE$	0.95	-2.96***	Long-term causality	$GGE \nrightarrow POG$	0.78	0.77	Non-causality
$POG \nrightarrow HLY$	-0.52	-10.5***	Long-term causality	$HLY \nrightarrow POG$	-0.35	0.45	Non-causality
$POG \nrightarrow LCC$	0.47	-3.67***	Long-term causality	$LCC \nrightarrow POG$	-0.90	-1.83*	Long-term causality
$POG \nrightarrow NPH$	0.28	-7.26***	Long-term causality	$NPH \nrightarrow POG$	-1.50	0.65	Non-causality
$POG \nrightarrow PEC$	0.99	-2.12**	Long-term causality	$PEC \nrightarrow POG$	0.12	0.83	Non-causality
$POG \nrightarrow PEE$	0.42	-9.47***	Long-term causality	$PEE \nrightarrow POG$	1.63	-3.28***	Long-term causality
$POG \nrightarrow PRP$	0.49	-10.7***	Long-term causality	$PRP \nrightarrow POG$	-1.46	-2.72***	Long-term causality
$POG \nrightarrow RP$	1.77	-4.89***	Long-term causality	$RP \nrightarrow POG$	-1.79*	-1.78*	Long and short-term causality

Note: ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.
Source: Research finding.

A causal relation from the cultural industries to the natural resource index (CBI) is confirmed. Development of cultural and artistic activities provides a platform for the participation of people to improve the environment in various dimensions such as reducing the degradation of forests and habitats of birds. Furthermore, products of cultural and creative industries overall play a key role in reducing the consumption of natural resources and also in preventing the destruction of forest habitats.

The causality from cultural industries to the global participation index (DDR) is confirmed.

The costs of publishing and media activities with the aim of providing them in the form of a supportive and promotional package with educational themes can affect the education index. Furthermore, such support is regarded as a marketing strategy for cultural activities, which tries to regulate and promote the preferences and habits of cultural consumption in recipient countries to allow the exports of cultural and creative industries, as well as having political and religious motivation.

A Causal relation is confirmed from the cultural industries to sustainable transportation index (ECTR). The nature of the products of the cultural and creative industries in the proliferation and diffusion of new platforms and the digital industry reduce the transportation costs and also energy consumption.

The results indicated that cultural expenditure is the cause of the demographic index (EOW). A large part of the activities of culture, such as arts and cultural industries, are based on the human and social capital capacity of individuals who have gained experience and recognition over time. Unlike other sectors, the retirement age in this area is related to the physical ability of individuals and accordingly the percentage of elderly people who work in the culture and art sector is higher than other sectors. In addition to the obvious economic benefits, public expenditure on culture can help the countries with low and negative population growth rates by improving individual health and preventing social isolation.

Increasing public expenditure on culture leads to better access of households to services and products of the cultural sector (FCHE). In addition, increasing expenditure on culture can affect the resource efficiency index (PR). Cultural activities are mostly human-powered, and accordingly they have relatively less need for resources from other sectors. In particular, the development of creative and digital industries has played a significant role in reducing production resources during the last decade. Hence, governments are more successful in choosing a basic culture-based economy as a strategy for resource efficiency.

Public expenditure on culture can influence the index related to the reduction of environmental pollution through the development of cultural and creative industries as an alternative for polluting industries, as well as changing the attitude of people in protecting the environmental (CGE).

The causal relation is confirmed from the cultural expenditure to the health Index (HLY). Studies have shown that general activities of art and culture can be effective in reducing diseases, increasing self-confidence, preventing social isolation, and improving life satisfaction. Therefore, the reduction of social anomalies and improvement of individual health (physical and mental), especially for the young and older people, can be regarded as one of the main motivations of policy-makers to allocate public expenditure to the art and culture sector.

The existence of a causal relation is confirmed from cultural expenditure to the governance index (LLC) which is of great importance in policy-making. The public expenditure on culture increases the trust in institutions by increasing citizens' participation in cultural activities. Of course, this is only when the interventions are neither accompanied by political orientation nor monopolies of government-related institutions such as mass media management and publication audits.

Causality from the cultural expenditure to the social development index (PEE, PRP) is confirmed. In this context, reducing social deprivation will be beneficial through the fair distribution of facilities, services and cultural and artistic productions and providing better access for the vulnerable population to increase their participation in these activities and taking advantage of its secondary outcomes.

In contrast, the results revealed that some indicators of sustainable development are considered as the reason for expanding public expenditure in the field of culture. Public expenditure on education (PEE), the level of citizens' confidence (LCC), gross domestic

product (GDP), and final consumption expenditure of households (FCEH) cause an increase in both cultural indicators. In addition, causality relations from the social deprivation index (PRP), resource productivity (RP), and the employment of older workers (EOW) to the ratio of cultural expenditure to GDP are confirmed.

A causal relationship is confirmed from the educational expenditure index to expenditure of culture variable in the long run. Since it is not easy to make a clear distinction between an education and culture definition and activities, and countries may have overlap in expenditure and policy-making, it is expected that any increase in the share of cultural expenditure includes education expenditures. Thus, the negative relationship between these two variables was expected.

Causality between the final consumption expenditure of households' index (FCEH) and the cultural expenditure is confirmed in the long-term. Increasing household expenditure in this area stimulates policy-making in protecting and expanding the share of public expenditure on culture. An inverse causality of resource efficiency index (RP) is confirmed by cultural expenditure in the short and long run. Since the production of goods and services in the culture sector is related to human capital, heritage, and creativity, this sector influences resource efficiency and cost.

An inverse causal relation is confirmed between gross domestic product (GDP) and cultural expenditure in the short and long term. Indeed, the rising household incomes, as well as increasing government tax revenues, can increase the share of government public expenditure. In this regard, an inverse causal relationship is confirmed from the level of citizens' confidence index (LCC) to cultural expenditure. Increasing citizens trust level index can encourage policy-makers to allocate cultural expenditure to achieve social benefits.

The results have shown that there is a causal relationship from the labor force index (EOW) to cultural expenditure. In addition to the social benefits of the cultural sector including elderly people in this sector contributes to the production of services in this area such as the activities of the areas related to publication, media, film, tourism, and heritage, which results in generating income and increasing the share of culture in production.

Conclusion

In the present paper, the mutual causal relations between public expenditure on culture and the sustainable development are evaluated using the panel VEC model. In general, the results indicate that public expenditure on culture (ration to total public expenditure or GDP) causes sustainable development in the long run. Furthermore, the inverse causal relations from the sustainable development to the public expenditure on culture is observed for some indicators of sustainable development.

Therefore, cultural products and creative industries, which mostly need human capital and require less physical capital and natural resources, can play an important role in providing employment, increasing national wealth, enhancing social vitality, and reducing the exploitation of natural resources. Based on the competitive advantages of economies in different sectors of culture, it is suggested that governments accelerate cultural development through increasing public expenditure on culture and infrastructure development.

Governments can provide extensive access to cultural services and activities by increasing the share of culture in public spending, so that the public benefits from economic and social impacts of the cultural sector. However, the economic effects of cultural activities depend on the participation of the public as the final consumer. In addition, inappropriate economic conditions have a significant impact on reducing household consumption of goods and cultural services. Therefore, the government's role to encourage the consumption of creative industries through education as well as to improve the purchasing power of households to consume art and culture is crucial.

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Appendix

Table A1. Unit Root Test

Variable	Constant			Constant and Trend			
	LLC	IPS	ADF	LLC	Breitung	IPS	ADF
POT	87.65**	-2.18**	0.25	-5.66***	79.65*	-0.50	-2.05**
POG	66.42	-0.31	0.90	-2.35***	58.62	-0.005	-2.155**
CBI	52.69***	-3.95***	-3.07***	-7.70***	16.45	1.20	-0.85
DDR	51.29	0.10	0.35	-4.73***	39.15	1.53	-2.74***
DGN	77.38*	-0.97	1.64	-8.64***	94.09***	-1.88**	-6.04***
ECTR	108.65***	-3.70***	-0.90	-5.85***	56.08	1.2	-1.64***
EOW	75.32*	-1.01	1.46	-2.75***	48.38	3.07	-0.60
FCEH	59.18	0.41	2.26	-2.88***	91.33***	-2.86***	-5.38***
GDP	42.04	1.56	-1.66**	-3.06***	53.28	0.51	-2.80***
GGE	67.65	-0.41	3.30	-5.36***	38.12	5.27	4.50
HLY	89.52***	-1.24	1.37	-12.13***	125.20***	-4.80***	-8.47***
LCC	122.13***	-3.50***	-1.59*	-9.35***	71.25*	-0.55	-1.70**

Variable	Constant			Constant and Trend			
	LLC	IPS	ADF	LLC	Breitung	IPS	ADF
NPH	84.88***	-2.640***	-1.44*	-9.91***	21.41	2.52	-1.68**
PEC	79.82**	-1.78***	2.10	-5.53***	59.85	0.70	-0.75
PEE	80.20**	-1.94**	-1.31*	-8.02***	84.73**	-2.71***	-6.42***
PRP	106.29***	-2.60***	-0.90	-8.33***	128.78***	-4.94***	-10.87***
RP	92.57***	-2.35***	-0.01	-5.90***	60.90	1.75	-0.56

Note: ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.
Source: Research finding.

Table A2. Unit Root Test (1st Difference)

Variable	Constant			Constant and Trend			
	LLC	IPS	ADF	LLC	Breitung	IPS	ADF
POT	240.62***	-11.25***	-6.27***	-17.37***	303.72***	-15.11***	-19.08***
POG	223.45***	-11.33***	-7.23***	-18.20***	259.51***	-13.65***	-17.37***
CBI	223.45***	-6.57***	-4.45***	-8.60***	119.62***	-10.06***	-11.55***
DDR	100.50***	-3.31***	-4.22***	-11.12***	148.56***	-7.57***	-12.82***
DGN	156.18***	-3.93***	-2.72***	-19.10***	175.27***	-7.56***	-14.41***
ECTR	184.85***	-9.20***	-7.15***	-13.10***	254.25***	-12.64***	-14.46***
EOW	106.56***	-4.18***	-2.47***	-7.60***	156.11***	-7.40***	-9.38***
FCEH	126.50***	-5.70***	-7.99***	-9.33***	151.51***	-7.4***	-9.33***
GDP	101.27***	-3.17***	-4.40***	-8.99***	150.20***	-6.72***	-10.65***
GGE	244.91***	-12.45***	-9.35***	-17.51***	270.90***	-13.31***	-16.95***
HLY	146.87***	-3.26***	-3.44***	-20.08***	179.58***	-7.91***	-16.24***
LCC	218.40***	-7.40***	-5.03***	-17.98***	314.96***	-16.03***	-22.50***
NPH	113.80***	-3.09***	-3.81***	-14.70***	112.74***	-7.87***	-13.99***
PEC	277.83***	-15.01***	-5.84***	-19.30***	300.33***	-15.10***	-18.92***
PEE	95.21***	-2.32***	-4.00***	-9.22***	139.73***	-6.26***	-10.86***
PRP	114.32***	-2.28***	0.82	-9.92***	188.63***	-8.48***	-11.76***
RP	185.45***	-8.22***	-6.20***	-12.83***	253.24***	-12.36***	-14.13***

Note: ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.
Source: Research finding.

Table A3. Cointegration Test

Variable	POT				POG			
	RHO	**PP**	**ADF**	**KAO**	**RHO**	**PP**	**ADF**	**KAO**
CBI	2.02**	-3.70***	-3.85***	-2.14**	-0.13	-4.34***	-4.24***	-2.59***
DDR	-2.12**	-4.83***	-4.33***	-1.17	-2.20**	-5.37***	-4.30***	-1.35*
DGN	-0.57	-3.30***	-2.50***	0-.09	-0.70	-3.97***	-3.25***	-0.23
ECTR	-0.00	-4.65***	-3.70***	-1.15	-0.88	-3.12***	-2.85***	-1.28*
EOW	0.04	-480***	-3.62***	-1.80**	-.55	-2.75***	-3.07***	-2.00**
FCEH	-0.95	-3.30***	-2.62***	-0.80	-1.40*	-2.00**	-2.10**	-0.72
GDP	-0.34	-4.80***	-3.72***	-1.46**	-1.06	-2.73***	-2.90***	-1.75**
GGE	-0.55	-5.32***	-4.92***	-2.01**	-1.30*	-5.40***	-5.15***	-3.01***
HLY	0.17	-3.32***	-2.82***	-0.90	-0.57	-4.94***	-4.03***	-1.05
LCC	-1.09	-5.00***	-4.42***	-2.13**	-1.52*	-4.34***	-3.43***	-1.55*
NPH	-0.54	-3.34***	-2.98***	-1.16	0.51	-4.50***	-2.78***	-0.17
PEC	0.16	-5.22***	-4.68***	-1.92**	-0.45	-3.72***	-3.50***	-1.34*
PEE	-1.50*	-5.43***	-4.92***	-1.19	-0.80	-3.16***	-2.10***	-0.82
PRP	-0.07	-3.47***	-3.03***	-0.75	0.06	-2.73***	-2.21***	-0.38
RP	-0.15	-3.76***	-3.11***	-1.43*	-0.70	-2.97***	-3.31***	-2.02**

Note: ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.
Source: Research finding.