Journal of Infrastructure, Policy and Development 2024, 8(1), 2566.
https://doi.org/10.24294/jipd.v8i1.2566

Article

Culturality index of Chile: A methodological approach to cultural materialism

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CITATION

Vergara-Perucich JF, Aguirre-Nuñez C. (2024). Culturality index of Chile: A methodological approach to cultural materialism. Journal of Infrastructure, Policy and Development. 8(1): 2566. https://doi.org/10.24294/jipd.v8i1.2566

ARTICLE INFO

Received: 9 August 2023
Accepted: 26 September 2023
Available online: 11 December 2023

Abstract: This article reports the development of an index of culturality in Chile. Fifteen quantitative variables indicative of local cultural development are used to measure the access to cultural opportunities in each Chilean district. This approach was adopted from the theoretical framework of cultural materialism theorized by Marvin Harris in the seventies. Using this framework, a ranking is developed among 164 districts to determine the degree of cultural development exists in each and the variables that are the influential on the enhancement of this indicator. The results showed that the districts of Rancagua, Providencia, La Reina, El Bosque, and Valparaíso have better cultural opportunities based on their material forms, which are mainly driven by obtaining funds for cultural projects, workers' salaries, civic activity, and public libraries. Based on the results of this ranking, a baseline is proposed to develop it using new data. In addition, recommendations are provided regarding public policies that have promoted cultural development in the communities with unsuccessful results. The article provides significant information for decision makers in Chile and a quantitative method for exploring cultural materialism in specific territories.

Keywords: cultural materialism; Marvin Harris; Mahalanobis; principal component analysis

1. Introduction

This study focuses on the creation of a method that can be repeated over time to determine the access of communities in Chile to cultural opportunities with a particular emphasis on material forms, such as cultural services and cultural activities. Based on official statistics, a ranking is created of communities where there is greater access to what Harris (1979) characterized as the components of cultural materialism based on an empirical approach to the science of culture. The results of this study are counter-intuitive, indicating that a high level of economic income does not necessarily account for a high level of access to culture. This indicator has not been previously developed in Chile. Therefore, the use of official sources and repeatable methodologies, and the consequent organization by districts will be key in developing a second version of the index in the future by updating and discussing the results obtained in this first version, the data for which were collected between 2017 and 2019.

The first part of the article presents a general characterization of cultural studies in general and particularly in Chile, including its challenges in terms of access to data, approaches to cultural studies, and the general framework of institutional culture in the country. The second part of the article discusses Marvin Harris's cultural materialism and how, based on its definitions of a science of culture, applied research methodologies can be developed. Specifically, it is proposed that based on a

broad data bank, a principal components analysis can be generated to allow the classification of variables in the material cultural assets/access of localities, such as infrastructure, structure, and superstructure factors. In order to organize these results as an index to trace the same measurement in the future, the Mahalanobis distance method is used, which is a statistical technique applied to determine the values of the factors under study according to their distance to an ideal point. In this case, the distance concerns how near or far the localities are from achieving the maximum scores in the factors of infrastructure, structure, and superstructure in what we have called culturality. Finally, the results of the index are ranked in order and an ordinary least square analysis allows to the identify the main variable that influence this index of culturalitiy.

Access to credit, leisure time, support for women entrepreneurs, increased cultural funding, and addressing discrimination are pivotal factors for enhancing a district's cultural development, as shown by the model. Positive correlations exist between the culturality index and both credit access and leisure time, emphasizing the importance of financial infrastructure and work-life balance. Additionally, districts with more women entrepreneurs and increased cultural funding have richer cultural indices. However, places with prevalent discrimination may face hindered cultural growth, underscoring the need for inclusive practices and appreciation of diverse cultures. These findings are useful for local governments and decision-makers can use this information to design policies that enhance the cultural vibrancy of districts. Also, it may help to inform where governments, Non-Governmental Organizations (NGOs), and financial institutions can allocate resources more efficiently, such as providing special loans or grants for cultural projects, based on the identified factors that influence cultural development. By understanding the negative impact of discrimination on cultural development, stakeholders can prioritize anti-discrimination measures, promoting inclusivity and celebrating diversity. By understanding the negative impact of discrimination on cultural development, stakeholders can prioritize anti-discrimination measures, promoting inclusivity and celebrating diversity.

2. Review of literature

2.1. Chile on cultural development

In the Latin American context, Chile has gathered a significant amount of data to conduct social studies that use quantitative approximations to produce analyses that determine the economic, social, and political aspects of the state. Periodic surveys are used to measure changes in social trends. Private and public parties usually make available their data for developing further analysis of results. In the case of surveys developed by private companies such as CADEM, CEP, CERC-MORI, and Criteria Research, different products are delivered to map the customer opinion, including politics and contingency. Among the surveys developed by the state, the best-known are National Socioeconomic Characterization Survey (CASEN), National Employment Survey (ENE), Family Budget Survey (EPF), National Health Survey (ENS), and National Environment Survey (ENMA). Three versions of the National Survey of Cultural Participation and Consumption have

been conducted at irregular intervals. Surveys that are conducted at regular intervals, such as CASEN (biannual) and ENE (annual), allow the registration and identification of socioeconomic and labor changes, which increases the possibility of generating diagnoses and public policies. In order to recognize cultural processes that require further observation, the registration mechanism that is presently applied is comprises scientific production in cultural studies, which have been conducted in the fields of sociology, anthropology, geography, and psychology, among others. However, previous studies of changes in cultural processes are based on fragments that are composed mainly of case studies and analyses of specific cultural aspects. Consequently, in Chile, no previous study has sought to generate a broad perspective on the state of affairs in the access to cultural assets and activities in Chile.

Some previous studies have made important contributions to producing a broad perspective on cultural studies in Chile. In 2012, based on sociological research, Andrea Azócar, Andrés Azócar, and Alberto Mayol published El Chile Profundo (Mayol et al., 2012). These researchers studied various social factors based on interviews, surveys, and focus groups, aiming to identify specific themes and discourses that would allow them to classify social groups in Chile according to how these groups were recognized by their specific identities. One of the most frequent topics in the national scientific literature concerns the presence of neoliberal ideology among social groups and individuals in Chile (Pérez, 2017; Pérez-Ahumada, 2014; Rodrigo and Atienza, 2014; Solimano, 2012; Vergara-Perucich, 2018). According to Araujo (2017), the neoliberal condition in Chilean society has produced contradictory effects, which explains the reason that an important group of the population rejects the neoliberal model but resists the idea of generating important political-economic transformations. One aspect recently identified as key in Chilean cultural studies concerns the increase in international migration (Stefoni et al., 2017), gender studies (Godoy Ramos, 2016) and discrimination against social groups associated with these cultural phenomena (Tijoux, 2016). Although these diverse approaches have been used in highly relevant lines of research, they have not managed to constitute a unified analysis of cultural changes in Chile. Because of the methodologies used in the social sciences in question, particularly in case studies, such research has tended to produce context-specific results that cannot be generalized which provide rich findings but difficult to use for influencing decision making about cultural investments in a positivist-oriented approach to public policies. Although the qualitative research in an anti-positivist approach is necessary to produce knowledge; in the Chilean case there is an absence of recent positivist views in cultural studies. According to Bengoa (2014), to advance in deep cultural studies, there is an important need to move toward critical anthropological studies because of the worrying conservativism in the discipline of social group studies in Chile, which is mainly reflected in teaching modes and recent scientific production. According to the same logic in the case study method, these contributions have been deemed great scientific efforts by outstanding researchers. However, they lack the temporal continuity that allows for identifying advances and changes in the trends observed during field work and data collection. In the case of Chile, most of the scientific articles that have reported cultural studies have an ethnographic or historical focus, so their contributions to the production of indicators or baselines of

cultural development are scarce.

In 2018, the Ministry of Culture and the Arts was established, which opened an opportunity to organize data and establish clear guidelines for public policies based on governmental authority. According to Subercaseaux (2016), in the 20th century, especially between 1970 and 1973, the role of the state in the successful promotion of cultural policies was fundamental in the burgeoning humanist and artistic disciplinary fields. In this regard, Chile's profound socioeconomic inequality (Rodríguez-Weber, 2017) has had important cultural repercussions that are reflected in the differentiated adaptation to global culture among high-income versus low-income socioeconomic groups, which has been a barrier to the expansion of a potential middle class (Gayo et al., 2016). Regarding the latter, the study of Gayo et al. (2016) study is an example of the application of a positivist cultural study methodology although it was aimed to establish potential correlations between cultural and economic aspects rather than provide an index of culture. Another interesting effort was made in 2011 in an extensive report by the National Council for Culture and the Arts (2016), which attempted to identify the contributions of cultural activities to the national economy. However, this report did not territorialize the information about cultural development in Chile. Instead, it provided a review of the effects of these activities on the gross domestic product indexes in an economistic understanding of the cultural affairs. Hence, the production of a baseline of the state of cultural development of the citizenry in Chile seems to be open to methodological proposals and the development of data and indicators that will allow for the generation of a point of comparison from which to begin to move forward, to territorially orient the targeting of cultural development resources, and to understand the contexts and conditions in which communities are more likely to become culturally complex and therefore enriched spiritually rather than materially; focusing more in humanistic approaches to culture rather than on its economics (Ros, 2008).

2.2. Cultural materialism

In 1979, Harris (1979) developed cultural materialism as an anthropological theory to generate a critical positivist approach to problems related to the cultures of social groups and communities (Lloyd, 1985). It is for this reason that Marvin Harris is considered the creator of a science of culture, generating methodological approaches to understand, index, and review cultural developments in case studies (Taylor et al., 1985). Cultural materialism began to emerge in 1968, when Harris presented a research strategy based on a new theoretical paradigm in social change studies. He reviewed its continuities, discontinuities, and historical causes, which, although inspired by Hegel's dialectics and Marx's dialectical materialism, sought to investigate the social facts that determine cultural changes (Harris, 1971). In his historical review, culture is considered a composite of actions that shape the customs, behaviors, and perceptions of individuals.

The epistemological roots of cultural materialism were defined in Harris's Cultural Materialism: The struggle for a science of culture. The main methodological problem that cultural materialism faces as a scientific method is how to transform subjects and their subjectivities into objects of study based on their behavior. To

solve this problem, Harris differentiated emic and ethical actions. Emic operations are definitions and descriptions that arise from the subject's own voice, which are charged with meanings. On the other hand, ethics is the organization of the information obtained from emic actions to systematize and incorporate it in methods of scientific analysis by interpreting the message of the emic action and subjecting it to techniques of analysis. Operationally, Harris described three factors that allow the organization of information that facilitates the cultural analysis of a community, which allows the study of social changes. These factors are infrastructural, structural, and supra-structural:

- Infrastructure: refers to productive and reproductive social processes. Specifically, it concerns technological developments applied to different aspects of social life, such as the construction of spaces for the development of activities and the production of instruments that have a broad impact on public life. Precisely, the infrastructural aspects are related to public life and the elements that frame the social relations.
- Structure: refers to the home and the state, with an emphasis on social and economic exchange relationships. In a neoliberal context, consumption patterns are relevant to this factor. Certain environments are influential, such as political organizations, war, religion, markets, work, schools, and universities, among other spaces of interaction where subjects decide and execute actions that help to understand their cultural behavior.
- Superstructure: refers to the observation of behavior and idea formation, reviewing subjective and behavioral aspects in terms of reasoning processes for decision making. The study of this factor is complex and difficult to frame within quantitative margins, so researchers seek to record material aspects that originate in behavior and ideas, which are influenced by several aspects, such as art, social and religious rituals, ideology, and opinions, among other potential aspects to be evaluated.

Although widely recognized as a fundamental contribution to cultural studies, Harris's contributions have been found to moderate optimism in the face of these indicators. According to Taylor et al. (1985), Harris's contributions have allowed the move forward toward the development of matrices based on individual perceptions in relation to the world, which has produced specific diagnoses of ways of being in the world based on relationships of closeness and distance in the construction of identity. However, any generalization of the results of these analyses should be made with safeguards that are proper to the limitations of this methodology (Taylor et al., 1985). According to critics of Harris's cultural materialism, his technique of analysis is problematic because endogeneity exists in the dialogue between his epistemology and the determinism of his variables. Although the theory attempts to identify material causes of human behavior, it is assumed that ideological variables cannot produce changes in superstructures or in the environment. Evidence in the literature shows that ideas give form to space by transforming thought into materiality, which the method of cultural materialism does not adequately consider (Westen et al., 1984). Nevertheless, Harris's proposal includes an operative aspect, which aims to correlate environmental conditions with behavior, which can be measured, qualified, and quantified, thus generating the possibility of determining how the environment

affects social relations (Heinen and Harris, 1975). Although Harris's proposal has a certain grandiloquence, which appealed to a significant number of critics, one of his most valuable contributions is his creation of factors of cultural analysis to identify certain elements that allow for evaluating social changes and eventually prioritizing public policies that tend to generate change for the common good. Hence, Harris's approach assumes that a more complex society is culturally richer. Therefore, it can be said that Harris proposed a technical approach for the measurement of levels of social complexity, the latter being a desirable situation in this methodological framework.

In this study, we utilize Harris's contributions to develop a set of indicators derived from scientifically and officially validated surveys in Chile. In the initial phase, emic responses were obtained from the survey participants and subsequently organized into quantifiable data. This approach, applied to the official sources in Chile, is noteworthy as no prior studies have produced an indicator capturing the nuances of cultural materialism. Employing this method will facilitate insights into the vulnerabilities of social environments, aiming to enhance the cultural complexity of communities segmented into districts. This understanding can guide how public policies prioritize infrastructural, superstructural, and structural developments to further enrich these complexities.

3. Methodology

In this study, we construct the culturality index using a positivist methodological approach based on the analysis of data collected from secondary sources and primary sources of information in Chile about variables that affect the cultural development of the communities under study, which are distributed in districts at the national level. After a principal components analysis, the main components using the Mahalanobis distance measurement technique, a synthetic index of culturality by commune is created. The results are territorialized, which allows us to understand their implications at the national level of cultural development and identify the main shortcomings of the localities. Then, to determine the scope of this indicator, it is applied to the case of great Santiago, which comprises multiple communes with diverse characteristics within a limited territory.

Multiple data sources were used in this study, which could affect the uniformity of the results. One aspect to consider in the future is the application of a single methodology for collecting cultural data in Chile. The present study is based on mainly official secondary sources, from which data were directly obtained when inconsistency was identified. Much of the data was obtained from a request by the Transparency Law to the Ministry of Culture and the Arts of Chile to consult on the district distribution of libraries, theaters, cultural centers, cultural funds, and activities associated with these infrastructures. Because some municipalities do not have public libraries, the consultation had to be done directly via telephone by the researchers. It was determined that some districts have municipal libraries outside the circuit and registry of the Ministry of Culture and the Arts. A second source of data was the National Institute of Statistics, which provided open data for CENSUS, CASEN, and the National Survey of Employment. These sources are freely available

on the Instituto Nacional de Estadísticas (INE, 2017) website in different formats. Data were similarly obtained from the Electoral Service (SERVEL, 2023).

To conduct the analysis of cultural materialism, the data were organized according to the three factors proposed by Harris, as shown in the following **Table 1**:

Table 1. Components of factors of analysis of cultural materialism according to Harris' scheme.

Factors	**Variables**	**Sources**
Infraestructural	1) Population per district	INE, 2017
Availability of technology or access to get cultural access.	2) Libraries per district	Ministerio de la Cultura y Las Artes, 2020
	3) Cultural centres per district	
	4) Cultural funding assigned per district	
	5) Computer per household	MIDESO, 2018
	6) Mobile data per person	
	7) Sustainable mobility based on non-motorized ways of displacement	
Structural	8) Schooling	CENSO, 2017
Social relations between subjects in the geographical unit where they live at.	9) Wage per household	MIDESO, 2018
	10) Non-discriminated minorities per district	
	11) Residential segregation	MIDESO, 2018
	12) Women as head of the household	INE, 2020
Superstructural	13) Rate of voters per district	SERVEL, 2023
The relationship of the subjects with their environment in relation to the degree of freedom to decision making.	14) Book loans per person per district	Ministerio de la Cultura y Las Artes, 2020
	15) Leisure time per person at week	MIDESO, 2018

When the data were collected, cases (i.e., districts) were selected because of a methodological problem in the CASEN 2017 survey, which did not include all districts in Chile (MIDESO, 2018). It was decided to consider communes with more than 20,000 inhabitants to ensure a confidence level of 95% and a margin of error of 5% in the most critical cases. The final sample was comprised of 164 communes out of 346, which was highly representative of the communes with the largest surveyed populations.

In a principal component analysis (PCA), the measurements of the variables are optimized, and they undergo sedimentation to determine their relationships by calculating the correlations between them. This process ensures that the underlying dimensions to be analyzed in a specific study have high variability (entropy), which accounts for the existence of further information to increase the representativeness of the results (Cerdán, 2009; Lozares and Roldan, 1991; Wenden, 1981). It should be noted that the underlying dimensions were orthogonal to each other and therefore had no correlation.

Sedimentation is important to clean the statistical data. The measurement factors tend to be correlated, so double measurement can occur and some factors can be measured twice. We conducted a principal component analysis to establish clean metrics based on the factorial score generated by the analysis. The following **Table 2** shows the results of the PCA of the selected variables.

Table 2. Analysis of main components conducted with the assistance of SPSS software.

Variables	**Components**						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Population	0.743	0.222	−0.509	−0.167	−0.011	−0.007	0.169
Voters	−0.412	−0.027	0.428	−0.187	−0.176	−0.207	0.255
Women as head of household	0.048	0.192	−0.172	−0.271	0.337	0.531	−0.215
Residential segregation	−0.195	−0.245	−0.68	0.565	−0.036	−0.169	−0.041
Concentration of richest 20%	0.218	0.217	0.688	−0.533	−0.01	0.22	0.01
Number of libraries	0.494	0.517	0.246	0.522	−0.035	−0.125	−0.059
Libraries per person	0.579	−0.046	−0.606	−0.328	−0.024	0.052	0.241
People per library	0.494	0.517	0.246	0.522	−0.035	−0.125	−0.059
Book loans registered by libraries	0.476	0.314	0.041	0.441	0.108	0.417	0.313
Book loan per person	−0.057	0.143	0.445	0.583	0.162	0.297	0.131
Cultural funding assigned per person	0.387	0.095	0.358	−0.217	−0.005	−0.208	−0.493
Cultural funds assigned per district	0.807	0.278	−0.118	−0.265	−0.036	−0.161	−0.042
Cultural centres per district	0.502	0.275	0.064	−0.165	−0.108	−0.183	−0.109
Theatres per district	0.028	0.049	0.196	−0.255	0.396	−0.122	0.653
Schooling	0.396	−0.812	0.159	0.051	0.133	0.149	−0.066
Wages	0.329	−0.755	0.152	0.076	0.2	0.009	−0.032
Leisure time	0.067	−0.071	0.144	−0.017	−0.768	0.064	0.274
Sustainable mobility	−0.098	0.193	0.037	0.028	0.578	−0.436	0.005
Non-discrimination	−0.271	0.391	−0.203	−0.074	−0.069	0.422	−0.207
Computer at home	0.47	−0.777	0.165	0.043	0.032	0.121	−0.04
Mobile data per person	0.405	−0.595	0.152	0.222	−0.119	−0.049	0

As shown in **Table 2**, variables that presented less variance by component are included for the matrix of analysis. Based on this result, we decided which variables to incorporate in the definitive calculation. From the initial total of 21 variables, 15 were selected to include in the statistical analysis, which facilitated the work of classifying the variables among the infrastructural, structural, and superstructural factors.

In order to transform these factors into an indicator, we applied a technique based on distance measurements between the variables and the objectives to be measured, which in this case were the optimal situations for each cultural factor. This technique allowed us to detect communes where there was less access to the culturality measured in this study and, therefore, where there should be a greater concern to promote these aspects. The technique also allowed us to identify communes where the cultural situation was more complex, and, therefore, where greater cultural wealth existed. To unify the indicators used in each case, a logarithmic function was applied to build a matrix of comparable data (Domínguez Serrano et al., 2011). To determine the distances between cases, the Mahalanobis generalized distance measurement technique was applied. The Mahalanobis statistical technique allows for measuring the distances between variables to determine syntheses between statistical data in multivariate relationships (Pérez and Medrano, 2010). In this case, the application was developed on the distance in a covariance matrix, which was calculated as follows:

$$DM(x) = \sqrt{((x-y)^T S^{(-1)}(x-\mu))}$$

where S is the standard deviation over the data set composed of x and y and their medians μ. The Mahalanobis distance calculations were performed using R software, based on the following code:

```
# Means and covariances
mean <- colMeans (data[, -1])
covariance <- cov (data[, -1])
# Calculating Mahalanobis distances per district
mahalanobis <- apply(data[, -1], 1, function(x) Mahalanobis(x, mean, covariance))
```

The results were further represented in cartographies performed in the QGIS software. Furthermore, an ordinary least squares calculation is applied to the results. Ordinary least squares (OLS) is a statistical method for fitting a linear regression model to data. The goal of OLS is to minimize the sum of squared residuals between the observed values of the dependent variable and the predicted values from the regression model.

In the case of culturality index, we can use OLS to model the relationship between a set of independent variables and a culturality index. The independent variables can be any factors that we believe are associated with culturality, such as education, income, or social class. The OLS regression model for culturality index can be expressed as follows:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_p x_p + \epsilon$$

where: y is the culturality index; β_0 is the intercept; β_i is the coefficient for the i-th independent variable; x_i is the i-th independent variable; ϵ is the error term

The OLS regression model will help to identify the factors that are most strongly associated with culturality index and estimate the impact of a change in an independent variable on the culturality index.

4. Findings

Of the 164 communes studied, the 20 with the highest scores are presented in **Table 3**, which shows the communes with the highest culturality index.

Table 3. Ranking of the communes with the highest culturality index based on Mahalanobis, with their respective summary of the model indicating more incidental variables.

Ranking	District	Culturality index
1	Rancagua	1
2	Providencia	0.921500371
3	La Reina	0.489045046
4	El Bosque	0.418049729
5	Valparaiso	0.363469124
6	Ñuñoa	0.347967044
7	La Florida	0.3343927
8	Quellón	0.277943097
9	Santiago	0.274332129
10	Conchalmó	0.24065975
11	Mostazal	0.235735938
12	Loncoche	0.215550757
13	Río Bueno	0.215230405
14	Talca	0.206922724
15	Calbuco	0.202783429
16	San Bernardo	0.199473359
17	Concón	0.195094101
18	Vitacura	0.194698357
19	Panguipulli	0.184435967
20	Las Condes	0.183694557

With regard to the variables that had the greatest effect on the model, **Table 4** indicates, the results. The r^2 value is 0.770657, indicating that approximately 77.07% of the variability in the dependent variable is explained by the independent variables in the model. This suggests that the model explains a significant amount of variability in the dependent variable. The *F*-statistic is 37.51508 with a highly significant *p*-value (8.73×10^{-43}), indicating that at least one of the predictors is significantly related to the dependent variable. Variables such as 'absence of discrimination', 'access to credit', 'leisure time', and 'women entrepreneurs' are notable significant predictors of the dependent variable. However, not all variables contribute significantly to the model, suggesting potential redundancy or irrelevance

of some variables. On the significant variables' interpretation, first an increase in the discrimination score is associated with a significant decrease in the culturality index, thus, more tolerable districts are likely to be better performed in relation to cultural development. Districts with better access to credit tend to have a higher culturality index, which may be related to the fact that easier access to credit might enable individuals and institutions to invest more in cultural activities, events, and infrastructure; and also, with access to credit, individuals might venture into cultural businesses like galleries, theaters, music studios, and more, fostering cultural growth. An increase in leisure time is associated with a rise in the culturality index, which may imply that more free time may lead to higher participation and engagement in cultural activities, thereby enriching the cultural fabric of a district. Leisure might allow for both the creation (by artists, writers, etc.) and consumption (by the general public) of cultural content. A district with more women entrepreneurs tends to have a higher culturality index. This may be indicative that women entrepreneurs may be more inclined to initiate or support cultural ventures, either because of personal interests or seeing the value in cultural investments. Finally, although a bit marginal, an increase in cultural funds obtained is related to a slight increase in the culturality index. An increase in cultural funds obtained is related to a slight increase in the culturality index. Obviously, with more funding, there might be better promotion, training, and exposure for cultural activities, making them more mainstream and increasing overall culturality.

Table 4. Regression results between Mahalanaobis scores and the rest of the variables studied.

Variables	**Coeficient**	**Std. dev**	**t-statistic**	***p*-value**	**Relevance**
Constant	39.2526	28.113	1.396	0.1647	-
AD: Discrimination	−70.0813	9.39475	−7.460	<0.0001	***
AC: Access to credit	20.1647	4.52719	4.454	<0.0001	***
LT: Leisure time	0.84266	0.220774	3.817	0.0002	***
WE: Women entrepreneurs	8.84028	2.80551	3.151	0.002	***
CFO: Cultural funds obtained	0.00280467	0.000534875	5.244	<0.0001	***
PPL: People per library	5.56×10^{-5}	1.89×10^{-5}	2.942	0.0038	***
AS: Average salary	3.58×10^{-5}	6.89×10^{-6}	5.2	<0.0001	***
SM: Sustainable mobility	15.9328	6.32413	2.519	0.0128	**
LE: Level of education	−2.21701	1.14738	−1.932	0.0552	*
CC: Cultural centers	0.683637	0.375873	1.819	0.071	*
MDP: Mobile data plan	−9.09303	5.59741	−1.625	0.1064	
RS: Residential segregation	7.13513	8.1506	0.8754	0.3828	
VT: Voters	8.99667	15.2715	0.5891	0.5567	
NLP: Natural logarithm of population	−0.371232	1.43179	−0.2593	0.7958	
ACH: Access to computer at home	0.730606	10.7376	0.06804	0.9458	

Mean dependent variable (Mahalanobis distance) = 16.89634; $r^2 = 0.77$; *p*-value on $F = 8.73 \times 10^{-43}$. Relevance: *** = high statistical significance; ** = medium statistical significance; * = low statistical significance.

As shown in **Table 5**, communes with lower cultural levels according to the measurement, tend to be located near mountainous sectors rather than coastal or valley areas, where there the results showed a higher index of culturality. Moreover, in these communes, the salary factor is ostensibly lower than in the others, and there is an absence of cultural funds and fewer libraries per person. A synthesis of the results for the whole country is presented in **Figures 1–3**.

Table 5. Ranking of the districts with the lowest culturality index based on Mahalanobis.

Ranking	District	Culturality index
1	Coihueco	0.038412563
2	Monte Patria	0.039016895
3	Cañete	0.040451818
4	Mariquina	0.040797802
5	Bulnes	0.041072844
6	Maule	0.042769647
7	Mulchén	0.043584365
8	Purranque	0.04387384
9	Vicuña	0.043906686
10	La Cisterna	0.044055482
11	Nacimiento	0.044385079
12	La Calera	0.044483974
13	Hualqui	0.045393834
14	Collipulli	0.045721482
15	San Clemente	0.046003951
16	Isla de Maipo	0.046286758
17	Chimbarongo	0.046408358
18	Las Cabras	0.046632411
19	Requínoa	0.046786342
20	Laja	0.046939193

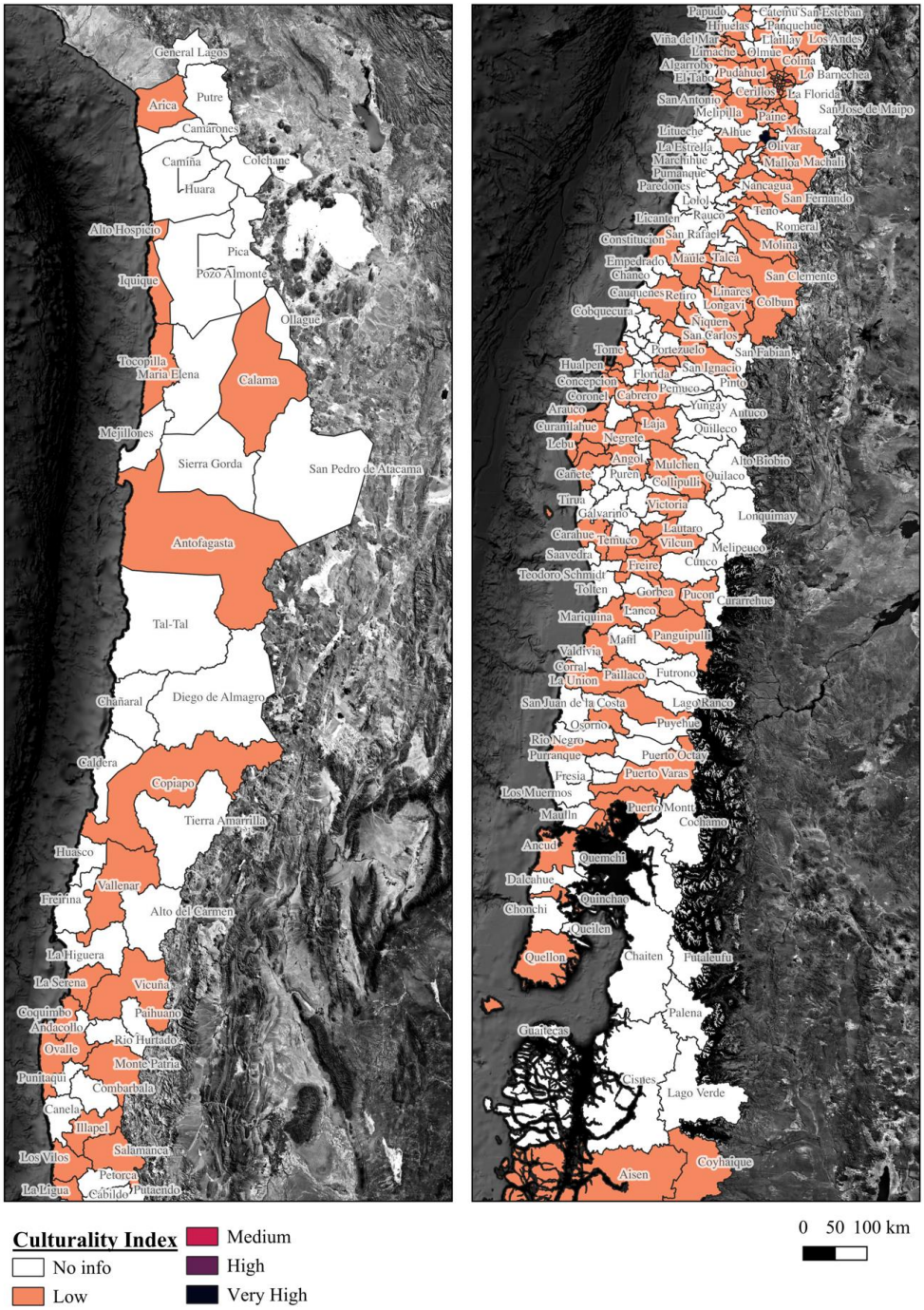

Figure 1. Map of cultrality index in each comuna in the North and Centre of Chile.

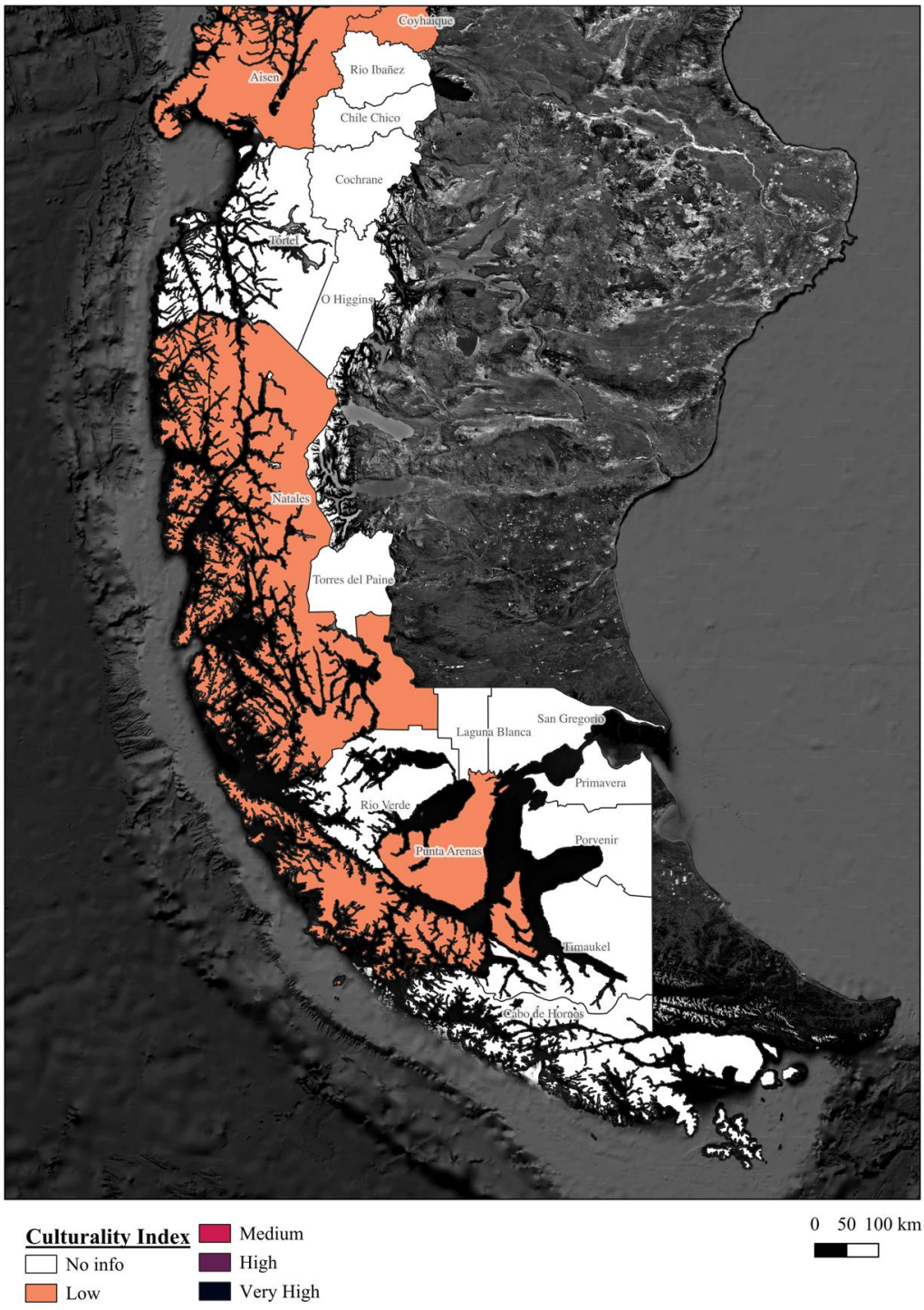

Figure 2. Map of cultrality index in each comuna in the South of Chile.

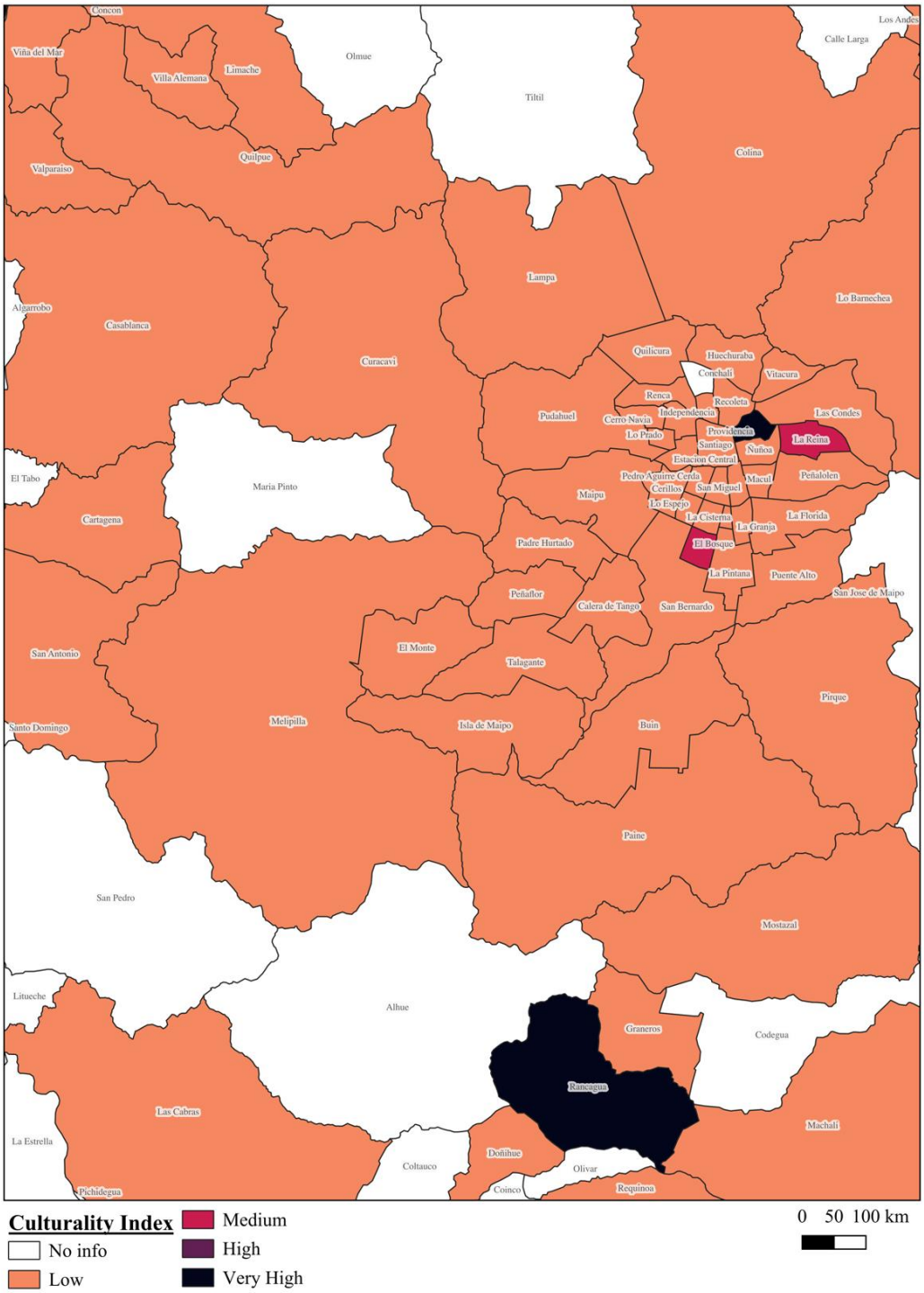

Figure 3. Map of cultrality index in each comuna in the Central Valley of Chile.

5. Discussion and conclusions

In this study, we developed our index of culturality and applied it to 164 municipalities in Chile to identify communes with greater access to infrastructural, structural, and supra-structural factors of material culture. Our methodology was based on the theoretical orientation suggested by Marvin Harris in creating a science of culture that allows for measuring its progress. The results indicated the following key factors are required to promote the best cultural development of a locality.

Promote access to credit: The model showed a positive correlation between access to credit and the culturality index. To advance in this area, it is desirable to develop and strengthen local banking and financial institutions. Additionally, offering specialized loans or grants for cultural projects, events, and infrastructure, and encouraging partnerships between financial institutions and cultural organizations can provide mutual benefits.

Increase leisure time: A greater amount of leisure time is associated with a higher culturality index, likely because it allows individuals to engage more with cultural activities. Accordingly, it's relevant to advocate for flexible work hours and balanced work-life policies. Developing public spaces, such as parks, libraries, and recreational centers where people can spend their free time and immerse themselves in cultural activities, is also crucial. Furthermore, organizing regular cultural events, workshops, and festivals will engage the local community.

Support women entrepreneurs: Districts with a higher number of women entrepreneurs tend to have a higher culturality index. Therefore, it's important to create and promote women-centric entrepreneurship programs and resources, and to encourage networks and support systems for women entrepreneurs.

Increase cultural funding: An increase in cultural funds correlates with a rise in the culturality index. Allocating a significant portion of the local budget to cultural activities and infrastructure can be beneficial. Additionally, seeking partnerships with private entities, NGOs, and other government departments for co-funding cultural initiatives, and creating platforms to attract international cultural grants or sponsorships, can further support cultural growth.

Address discrimination: The model indicates an inverse relationship between discrimination and the culturality index, suggesting that places with prevalent discrimination might experience diminished cultural evolutions. It's essential to implement and enforce anti-discrimination policies and practices, and to promote cultural events that celebrate diversity and inclusivity, especially in areas with poorer performance on this front. Moreover, education and awareness about the value of different cultures are critical, with the goal being cultural appreciation over mere tolerance.

In this study, we developed an analytical method for working with statistics based on secondary data which would allow for maintaining this measurement over time and observing intertemporal variations. In addition, we showed that the use of the Mahalanobis distance technique was relevant to working with these statistics as well as other positivist approaches to complex social phenomena. One aspect that was not included in this study is the role that private cultural services play in this indicator. However, we used variables in the public sector because of the possibility that the state influences and plans the cultural development of localities.

Improving wages and the overall quality of life is undeniably a vital component of any holistic development approach. When people experience a higher quality of life and have increased disposable income, they generally have greater access to cultural opportunities, education, and leisure activities. They can afford to purchase books, attend cultural events, or enroll in educational programs, which in turn can boost cultural development. However, it's important to recognize that cultural development isn't solely tied to individual income. State-sponsored initiatives, such

as public libraries, art programs, cultural festivals, and grants for artists and scholars, play a crucial role in fostering a vibrant cultural environment. These initiatives can provide platforms for emerging talents, preserve traditional arts and practices, and ensure that culture remains accessible to everyone regardless of their income level. While it's true that a population with better wages and quality of life may not depend heavily on state-sponsored cultural initiatives, these initiatives still have their unique value. They can be instrumental in ensuring equitable access to culture and in promoting and preserving a nation's cultural heritage.

Author contributions: Conceptualization, FVP and CAN; methodology, FVP and CAN; software, FVP; validation, CAN; formal analysis, FVP and CAN; investigation, FVP and CAN; resources, FVP and CAN; data curation, FVP and CAN; writing—original draft preparation, FVP and CAN; writing—review and editing, FVP and CAN; visualization, FVP and CAN; supervision, FVP and CAN; project administration, FVP and CAN; funding acquisition, FVP and CAN. All authors have read and agreed to the published version of the manuscript.

Conflict of interest: The authors declare no conflict of interest.

References

Araujo K (2017). Subject and neoliberalism in Chile: Rejections and attachments (Spanish). New World New Worlds 1–14. doi: 10.4000/nuevomundo.70649

Bengoa J (2014). The trajectory of anthropology in Chile (Spanish). Revista Antropologías Del Sur 1(1): 15–42. doi: 10.25074/rantros.v1i1.769

CENSO (2017). Censo Nacional 2017 (Spanish). Instituto Nacional de Estadísticas. Available online: http://www.censo2017.cl/ (accessed on 17 September 2023).

Domínguez Serrano M, Blancas Peral FJ, Guerrero Casas FM, González Lozano M (2016). A critical review for the construction of synthetic indicators (Spanish). Revista de Métodos Cuantitativos Para La Economía y La Empresa 11: 41–70. doi: 10.46661/revmetodoscuanteconempresa.2094

Gayo M, Méndez ML, Teitelboim B (2016). Tertiarization in Chile: Cultural inequality and occupational structure (Spanish). CEPAL Review 2016(119): 187–207. doi: 10.18356/d08068b2-es

Godoy Ramos CG (2016). "We Are Not Feminist". Gender, Equality and Neoliberalism in Chile (Spanish). Revista Estudos Feministas 24(3): 871–889. doi: 10.1590/1806-9584-2016v24n3p871

Harris M (1971). The Rise Anthropological Theory, 4th ed. Thomas Y. Crowell Company.

Harris M (1979). Cultural Materialism: The Struggle for a Science of Culture. Random House.

Heinen HD, Harris M (1975). On cultural materialism, Marx, and the "Hegelian monkey." Current Anthropology 16(3): 450–456. doi: 10.1086/201584

INE (2017). Population and Housing Census 2017 (Spanish). Instituto Nacional de Estadísticas.

INE (2020). National Employment Survey (Spanish). Instituto Nacional de Estadísticas. Available online: https://www.ine.gob.cl/encuesta-empleo-contexto-covid-19/para-que-sirve (accessed on 17 September 2023).

Lloyd KE (1985). Cultural materialism: The struggle for a science of culture by Marvin Harris. Journal of the Experimental Analysis of Behavior 43(2): 279–287. doi: 10.1901/jeab.1985.43-279

Lozares CC, Roldan PL (1991). The analysis of principal components: Application to the analysis of secondary data (Spanish). Revista de Sociología 37: 31–63. Available online: https://www.raco.cat/index.php/papers/article/download/25101/58447 (accessed on 17 September 2023).

Mayol A, Azocar C, Azocar C (2012). El Chile Profundo: Cultural Models of Inequality and Their Resistance (Spanish). Liberalia Ediciones Ltda.

MIDESO (2018). Sample Design Methodology CASEN 2017 Survey (Spanish). Ministerio de Desarrollo Social.

Ministerio de la Cultura y las Artes (2020). Publicaciones. Available online: https://www.cultura.gob.cl/publicaciones/ (accessed

on 17 September 2023).

National Council for Culture and the Arts (2016). Update on the economic impact of the creative sector in Chile (Spanish). Available online: http://observatorio.cultura.gob.cl/index.php/tag/cuenta-satelite-de-cultura/ (accessed on 17 September 2023).

Pérez-Ahumada P (2014). Class consciousness in a mature neoliberal society: Evidence from Chile. Research in Social Stratification and Mobility 38: 57–75. doi: 10.1016/j.rssm.2014.06.002

Pérez M (2017). A new Poblador is being born: Housing struggles in a gentrified area of Santiago. Latin American Perspectives 44(3): 28–45. doi: 10.1177/0094582x16668318

Pérez RE, Medrano LA (2010). Exploratory factor analysis: Conceptual and methodological bases (Spanish). Argentine Journal of Behavioral Sciences (RACC) 2(1): 58–66.

Rodríguez-Weber JE (2017). The political economy of income inequality in Chile since 1850. Has Latin American inequality changed direction? Looking over the long run. Springer Open. pp. 43–64.

Rodrigo LM, Atienza M (2014). Migration and regional representations: speeches about the Antofagasta Region (Spanish). EURE, 40(120), 159–181. doi: 10.4067/S0250-71612014000200008

Ros M (2008). Cultural values and socioeconomic development: A comparison between cultural theories. Journal of Social Psychology 23(3): 347–365. doi: 10.1174/021347408785843024

SERVEL (2023). Open data statistics (Spanish). Available online: https://www.servel.cl/centro-de-datos/estadisticas-de-datos-abiertos-4zg/ (accessed on 17 September 2023).

Solimano A (2012). Chile and the Neoliberal Trap: The Post-Pinochet Era. Cambridge University Press.

Stefoni C, Leiva S, Bonhomme M (2017). International migration and labor precariousness. The case of the construction industry in Chile (Spanish). REMHU: Revista Interdisciplinar Da Mobilidade Humana 25(49): 95–112. doi: 10.1590/1980-85852503880004906

Subercaseaux B (2016). Cultural policies in Chile: A historical perspective (Spanish). Estudios Públicos 144: 205–232.

Taylor MK, Bunge M, Gaines AD, et al. (1985). Symbolic dimensions in cultural anthropology [and comments and reply]. Current Anthropology 26(2): 167–185. doi: 10.1086/203245

Tijoux ME (2016). Racism in Chile. The skin as a mark of immigration (Spanish). Universitaria.

Vergara-Perucich JF (2018). Neoliberalism (Spanish). Available online: http://www.lulu.com/shop/josé-francisco-vergara-perucich/neoliberalandia/paperback/product-23754939.html?ppn=1 (accessed on 17 September 2023).

Wenden AL (1981). Principal Component Analysis (no. 3). Department of Statistics UOC.

Westen D, Chibnik M, Diener P, et al. (1984). Cultural materialism: Food for thought or bum steer? [and comments and replies]. Current Anthropology 25(5): 639–653. doi: 10.1086/203201