

Article

Cost Analysis of Penitentiary Systems and Comparison Between the Countries of the Council of Europe

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Abstract: Background: The objective was to analyze the budgets invested in prisons by the member states of the Council of Europe (CoE) and the relationships between the global cost, the cost incurred per single inmate, the number of inmates per 100,000 inhabitants (PPR), the gross domestic product (GDP) and per capita GDP. Methods: The data relating to the variables considered for the year 2020 were obtained from the SPACE-I 2021 of the CoE, the World Bank/OECD, and Eurostat. Regression models were used to evaluate the relationships between the PPR and the GDP, the daily cost per prisoner and per capita GDP, and between the PPR and the per capita GDP. A multiple correspondence analysis was performed to evaluate associations between the PPR, EU membership, cost per day, cost rate, geographical area, and inmate gender. Results: The daily expenditure per inmate in northern European countries reaches very high values, respectively: EUR 330.6 (Norway) and EUR 303 (Sweden), while, in the eastern countries, the values drop sharply (EUR 6.50 in Bulgaria and EUR 8.08 in Azerbaijani). The lowest PPR values are found in northern European countries, and the highest in the following countries: Russia, Turkey, Georgia, and Azerbaijan. Conclusions: Countries with a higher GDP per capita tend to have lower prison population rates and to invest larger amounts of funds for prison systems.

Keywords: prison costs; prison population rate; Council of Europe



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1. Introduction

Penitentiary institutes are structures within which all aspects of the life of imprisoned people are managed, even for very long periods of time.

The European Prison Rules ([Council of Europe 2020](#)), with their basic principles, underline the importance of the social reintegration of prisoners and the maintenance of quality of life within prisons based on respect for the rights of the individual. These values are fundamental aspects for the establishment of the penitentiary systems of every democratic country. To put them into practice, governments and policy makers have the obligation to implement rehabilitation programs that allow them to maintain social security by allocating public funds in the most efficient way.

An only partial list of “essential” services necessarily includes the management and maintenance of structures and infrastructures. Operating costs include the following: (1) recreational, educational, and rehabilitation services; (2) maintaining adequate standards of security, custody, and administrative staff; and (3) food, medicines, and high levels of specialized healthcare for a population with significant levels of physical and mental health problems ([Moschetti et al. 2018](#)).

In addition to the aforementioned “essential” elements, the European Prison Rules underline that the rehabilitation process involves the possibility for prisoners to engage in activities such as education, work, and vocational training.

The amount spent on each prisoner varies widely internationally, and a lack of transparency often makes it difficult to define what is included in governments' declared prison budgets (Penal Reform International 2020).

Some studies have examined disease prevalence rates and comorbidity (Altobelli et al. 2023), disease prevention, and healthcare provided to prisoners (Fazel and Baillargeon 2011; Fazel et al. 2017), but the literature lacks information on the cost of health services.

The latest official data on European prison systems were provided by the Council of Europe in the 2021 annual report on penal statistics (Statistiques Pénales Annuelles du Conseil de l'Europe—SPACE) (Aebi et al. 2022).

However, the data published by the SPACE report did not take into account the differences in the cost of living and other economic indicators specific to each country.

Since high prison populations creates high costs, our study aimed to accomplish the following:

- (i) describe the distribution of the rate of imprisonment per 100,000 inhabitants and of the daily costs incurred for each inmate;
- (ii) analyze the costs incurred by the States of the Council of Europe for the maintenance of penitentiary institutions, examining the relationship between the following parameters: the global cost and the cost incurred per individual inmate with the number of inmates, the gross domestic product (GDP), the per capita GDP, and the incarceration rate.

2. Methodology

Data on the total number of prisoners, gender, number of prisoners per 100,000 inhabitants (prison population rate—PPR), daily costs per individual prisoner, and total costs by governments for the maintenance of prisons for the year 2020, were obtained from the SPACE I 2021 report. This project provides an overview of criminal sanctions and prison measures in the 46 member states of the Council of Europe (CoE), including the 27 countries of the European Union (EU). The data used in the SPACE I report were collected through a questionnaire approved by the CoE's Council for Penological Co-operation and sent annually by the research group of the University of Lausanne (UNIL) to the prison administrations of the member states of the Council of Europe.

The data relating to the 2020 GDP were obtained from the World Development Indicators (WDIs)—National account data (World Bank/OECD 2023)—and it was possible to calculate the percentage represented by the prison administration budget declared by the governments in relation to the overall GDP.

The per capita GDP was calculated by dividing the total GDP by the number of inhabitants on 1 January 2021, resulting from the data available on the Eurostat Database (European Union—Eurostat 2023).

The data relating to the prison population rate and the daily costs incurred by the various states for each prisoner were used to represent their distribution using maps.

Linear regression models were used to evaluate the following relationship: first, the detention rate per 100,000 inhabitants and percentage represented by the annual expenditure for penitentiary institutions with respect to the GDP. Monaco, Poland, Portugal and Switzerland were excluded from the analysis due to a lack of data and San Marino due to the smallness of the inmate population (9 individuals); second, the daily cost incurred for each prisoner and per capita GDP. Iceland, Monaco, Poland, Russian Federation, San Marino, and Switzerland, due to a lack of data, were excluded from analysis; third, the prison population rate and per capita GDP.

The coefficients of the regression model were determined using the least squares method. The significance of the coefficients was calculated using the F-test with $p = 0.005$.

Finally, multiple analyses of correlations occurred in order to evaluate associations considering the following variables: the membership of the European Union, the prison population rate, the average daily cost, the cost rate, the geographic area, and gender. To build the MCA models, the variables were categorized as follows:

- i. EU27—dichotomous variable indicating whether the nation belongs to the European Union;
- ii. Prison population rate—variable created on the quartiles of the ratio: the number of prisoners/population (per 100.000):
 - Low value < 67.83
 - Middle-low from 67.83 to 91.35
 - Middle-high from 91.36 to 160.33
 - High > 160.33;
- iii. Average cost per day—variable created on the quartiles of the average expenditure per day of detention per prisoner:
 - Low value < EUR 29.61
 - Middle-low from EUR 29.61 to EUR 66.50
 - Middle-high from EUR 66.51 to EUR 187.50
 - High > EUR 187.50;
- iv. Cost rate—variable created on the quartiles of the ratio: total prison expenditure/GDP (per 100):
 - Low value < 0.11
 - Middle-low from 0.11 to 0.16
 - Middle-high from 0.17 to 0.23
 - High > 0.23;
- v. Area—countries were divided into 6 areas:
 - Central: Andorra, Austria, Belgium, Czech Rep., France, Germany, Hungary, Liechtenstein, Luxembourg, Monaco, Netherlands, Poland, Slovak Rep., Slovenia, Switzerland
 - Nord: Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden, UK
 - Est: Armenia, Azerbaijan, Bosnia, Georgia, Moldova, Montenegro, North Macedonia, Serbia, Ukraine
 - Est-UE: Bulgaria, Romania
 - Mediterranean: Albania, Croatia, Cyprus, Greece, Italy, Portugal, San Marino, Spain, Turkey
 - Russian: Russian Fed.
- vi. Sex—variable obtained through the ratio: the percentage of male prisoners/female prisoners:
 - Low value < 16.24
 - Middle from 16.24 e 21.22
 - High > 21.22

Countries for which not all variables were available were excluded (Iceland, Monaco, Poland, Portugal, Russian Fed., Switzerland).

The MCA analysis and graphics were analyzed with R software; map graphics were accomplished with the Factor Miner R library and Excel.

3. Results

Figure 1a shows a geographical distribution of the prison population rate in the countries examined. It is much higher in the Russian Federation (328.1 prisoners per 100,000 inhabitants), Turkey (325.4), Azerbaijan (215.6) and Georgia (231.9). It is important to underline that, in the ex-Soviet countries, the values are between those of Central Europe and those of the Russian Federation (100–200 prisoners per 100,000 inhabitants). On the other hand, lower levels of the prison population rate (less than 100 per 100,000 inhabitants) were recorded in Central-Western Europe and in the Scandinavian countries, respectively, Finland 43.3 and Iceland 40.7 per 100,000 inhabitants.

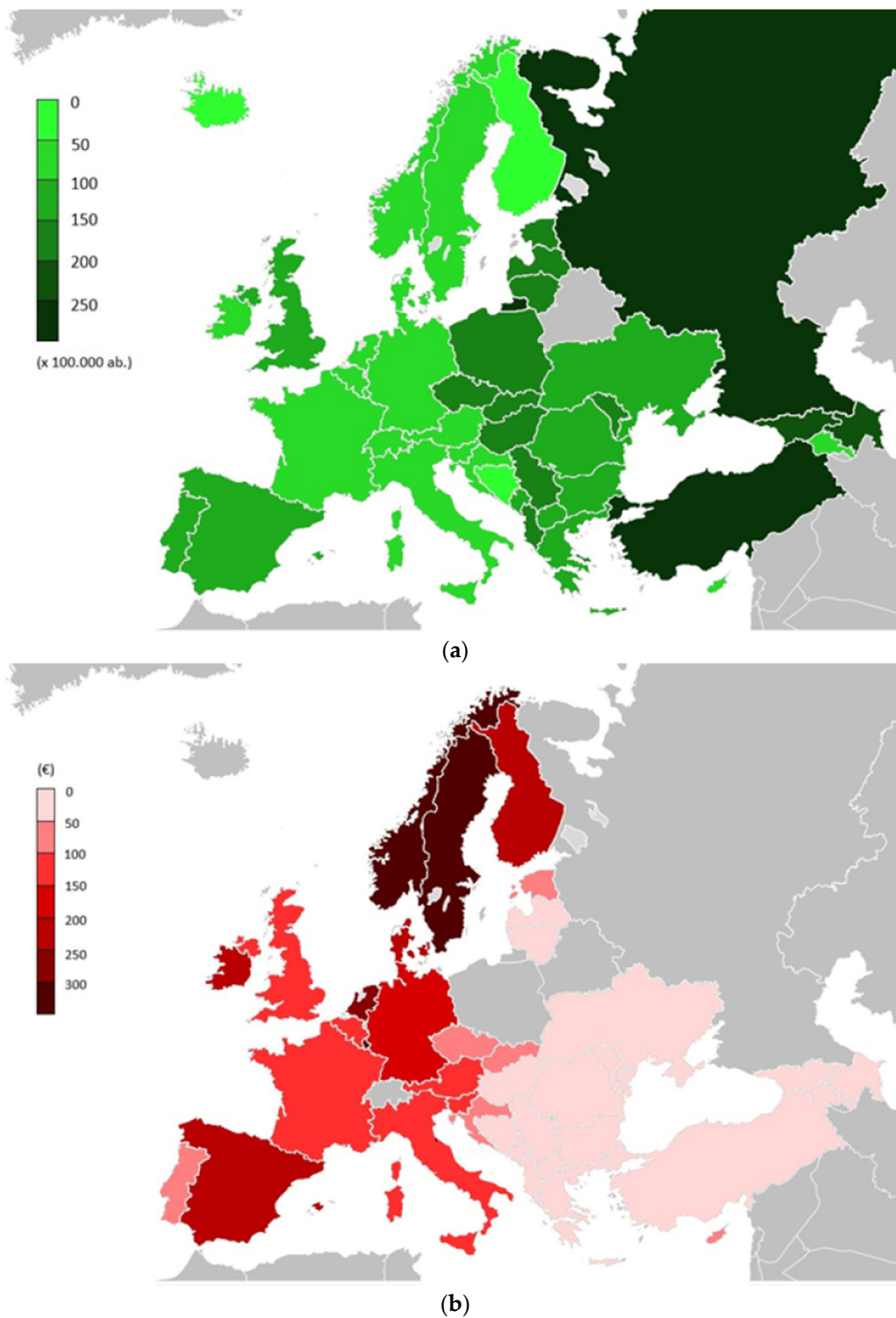


Figure 1. (a) Geographic distribution of prison population rate per 100,000 inhabitants in 2020. (b) Daily expenditure per inmate in 2020.

Figure 1b shows the daily expenditure per inmate. It is very high in Northern European countries, such as Norway and Sweden, with EUR 330.6 and EUR 303, respectively. On the contrary, in the eastern countries of the CoE, the values drop sharply, reaching minimums of EUR 6.50 in Bulgaria and EUR 8.08 in Azerbaijan. The case of San Marino is of little significance due to the small number, where the 9 prisoners recorded a daily cost of EUR 2031 per capita.

Figure 2 shows the relationship between the detention rate per 100,000 inhabitants and the percentage of annual spending on penitentiary institutions with respect to the GDP.

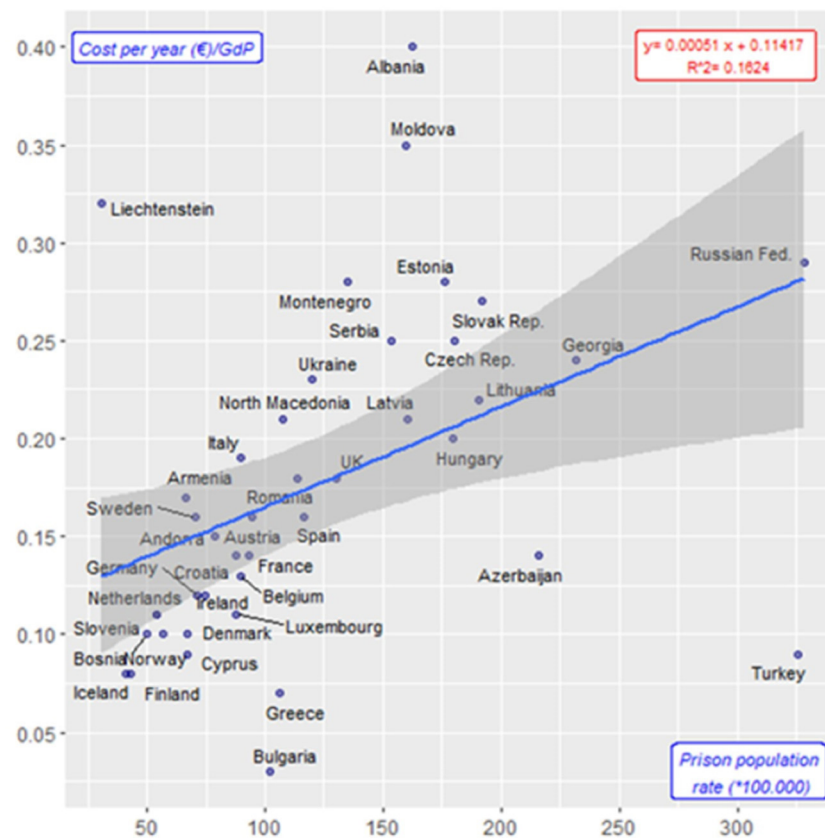


Figure 2. Linear regression model: it reports on the ordinate data relating to the percentage of GDP; the PPR values on the abscises. Data referring to 2020. (F-statistic: 8.756 on 1 and 39 DF, p -value: 0.005224).

The graph shows the relationship between the number of prisoners in a country and the ratio of expenditure incurred in relation to the GDP, assuming a variation in expenditure linked to the number of prisoners.

Our results suggest that an increase in the prison population rate corresponds to an increase in the annual cost of the GDP. It can be seen that very similar prison population rates can present large differences in the percentage of the GDP dedicated to prisons. In fact, Turkey and the Russian Federation have PPRs of 325.4 and 328.1 per 100,000 inhabitants, but they invest, respectively, 0.09% and 0.29% of the GDP in penitentiary institutions.

From our results, two opposing groups emerge in the intermediate range of PPR values (100–165 prisoners per 100,000 inhabitants): the first includes countries with expenditures compared to GDPs exceeding 0.3% (Albania 0.4% and Moldova 0.35%) and, at the extreme opposite, countries with percentages lower than 0.07% (Greece 0.07% and Bulgaria 0.03%).

The regression model shows that, for an increase in the PPR of 100 prisoners per 100,000 inhabitants, there is an average increase in the prison expenditure of 0.05% with respect to PIL.

Figure 3 represents the relationship between per capita GDP and the daily cost per inmate. From the graph, it is possible to highlight that the states with a per capita GDP of less than EUR 20,000 declare a daily expenditure per inmate that progressively decreases from EUR 77 in Estonia to 10.60 in Moldova, 10.35 in Georgia, EUR 8.08 in Azerbaijan, and EUR 6.50 in Bulgaria.

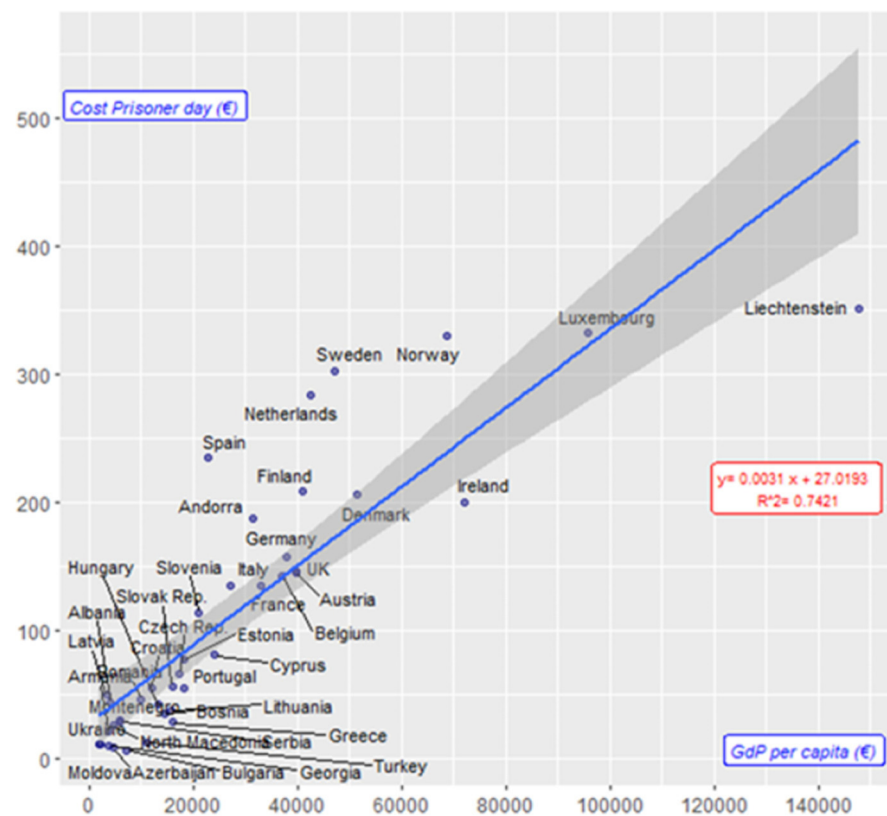


Figure 3. Linear regression model: daily cost per inmate. Data referring to 2020. (F-statistic: 113.2 on 1 and 38 DF, p -value: 5.923×10^{-13}).

Countries with a per capita GDP between EUR 20,000 and EUR 40,000 identify two groups: the first includes the countries of Central-Western Europe with a declared daily expenditure between EUR 157.72 (Germany) and EUR 114 (Slovenia), the second including Spain and Andorra with expenditures of EUR 234 and EUR 187.5, respectively.

Among the nations with per capita GDPs of more than EUR 40,000, the highest values declared by the northern European states stand out: EUR 330.6 in Norway, EUR 303 in Sweden, EUR 284 in the Netherlands, and EUR 332.6 in Luxembourg.

The regression model shows that a EUR 1000 increase per capita GDP corresponds to an average increase in EUR 3.1 in daily spending per inmate.

Figure 4 represents the relationship between per capita GDP and the prison population rate, which allows us to visualize a negative correlation between the country's wealth and the rate of prisoners per 100,000 inhabitants.

From the graph, it is possible to highlight that the states with a per capita GDP of less than EUR 20,000 have highly variable PPRs: a first group, made up of the Russian Federation, Turkey, Georgia, and Azerbaijan, have PPRs between 200 and 328.1 per 100,000 inhabitants, the highest in the CoE; a second group, made up of some ex-Soviet republics (Hungary, Poland, Lithuania, Estonia, the Czech Republic, and the Slovak Republic) has PPRs between 175 and 200 per 100,000 inhabitants; a third group has decreasing PPR values, from 162.4 to 49.6 per 100,000 inhabitants, Albania and Bosnia, respectively.

Countries with a per capita GDP between EUR 20,000 and EUR 40,000 have PPR values consistently below 100 inmates per 100,000 inhabitants, with the exception of Spain (116.3) and the United Kingdom (130.9).

Finally, the countries with a per capita GDP greater than EUR 40,000, concentrated in Northern Europe, have the lowest PPR values, constantly below 75 prisoners per 100,000 inhabitants, down to the lowest values in the Netherlands (53.9), Finland (43.3), and Iceland (40.7). Only Luxembourg, despite having a per capita GDP close to EUR 100,000, shows a PPR of 87.8.

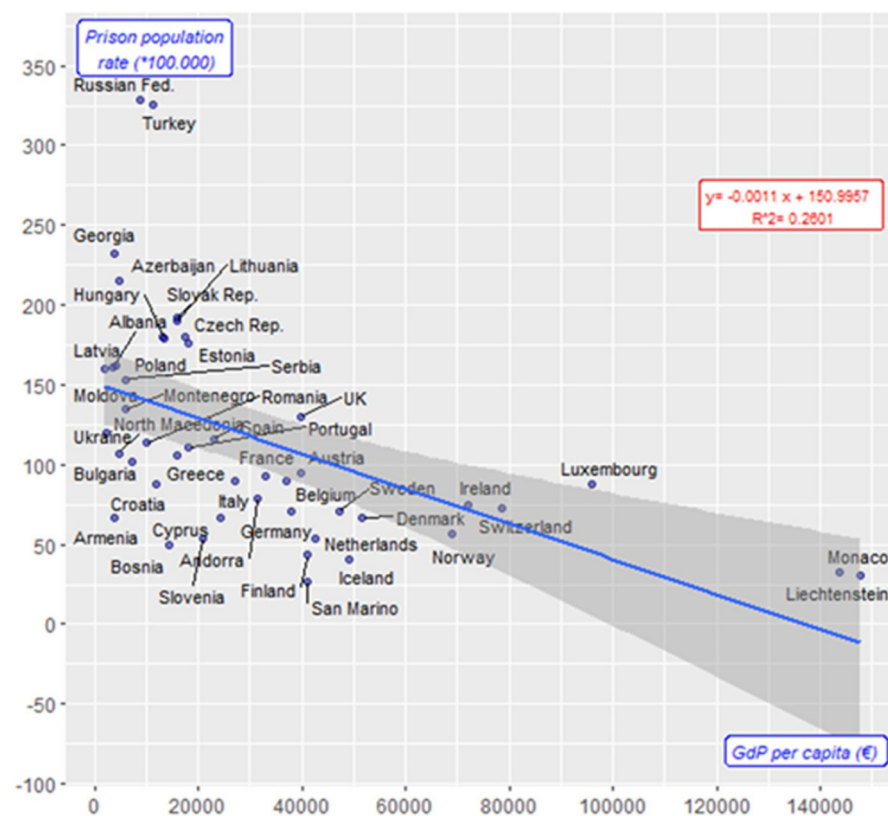


Figure 4. Linear regression model: the PPR values vs. the GDP per capita. Data referring to 2020. (F-statistic: 16.82 on 1 and 44 DF, p -value: 0.0001746).

Monaco and Lichtenstein are placed at the maximum limit of the graph for per capita GDP value (more than EUR 140,000), but the smallness of the prison population (12 and 9 people, respectively), makes a comparison with the other CoE countries difficult.

Finally, Figure 5 shows the possible associations evaluated using multiple correspondence analysis. Multiple correspondence analyses allowed the values of the variables to be associated with respect to two dimensions that explain, overall, 33.1% of the explained variance. The values of the variables have different colors depending on the distance from the center of the axes. There are six country groupings, and all six are represented in the MCA graph.

From the graph, based on the distribution on the axes of the variables represented, it is possible to identify three groups of aggregations. The three clusters include only some of the six areas, that is, those that most identify with the characteristics of the cluster to which they belong. The three groupings were identified with respect to the values of the variances of the variables and their position on the axes considered.

The first group, identifiable in the lower right quadrant, outlines countries with the following characteristics: a geographical location in the east of the CoE, with a low daily expenditure per prisoner, a high cost rate, high or middle-high prison population rate values, non-EU members, and with a high proportion of male prisoners compared to women.

A second group of variables, in the lower left quadrant, identifies the nations belonging to the European Union, in the central area of the CoE, with a medium-high daily cost per inmate, a medium-low PPR and cost rate.

The third group of variables, in the upper left quadrant, includes Northern European and Mediterranean countries, with a high cost per day, a low PPR and cost rate, and a middle proportion between male and female prisoners.

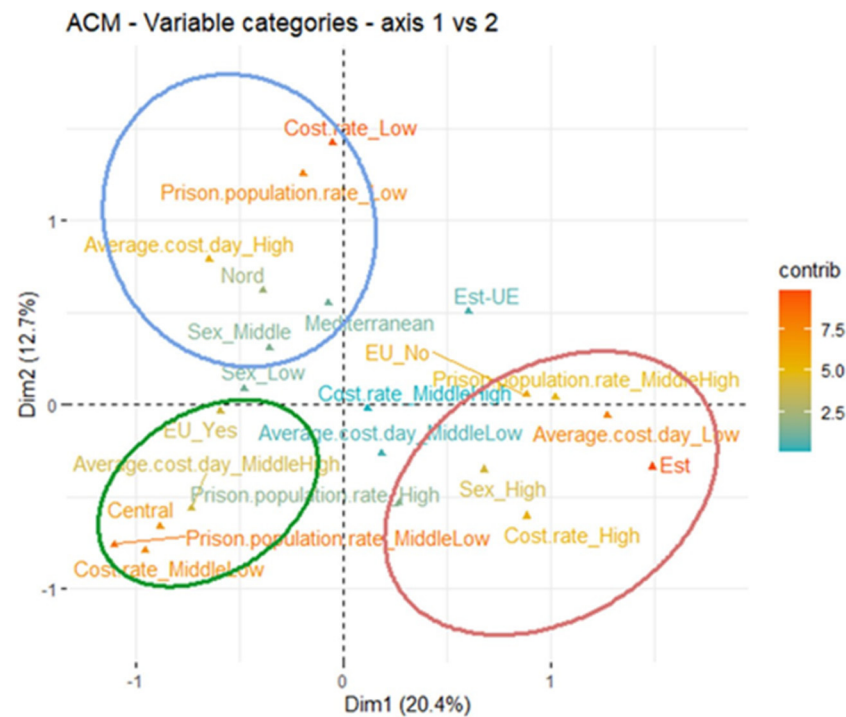


Figure 5. Multiple correlation analysis—description of three identified profiles.

4. Discussion

In the literature, there are publications relating to the costs of operating prisons since the 1950s (Alexander 1954). Even today, international reports have been drawn up on the expenses incurred by governments for the management of penal institutions (Farrell and Clark 2004). However, it was difficult to obtain data regarding variables, for example, daily costs for each inmate, total amounts spend, healthcare cost, prison population rates, ratios and percentages comparable between the various countries, due to the different methods of collecting information (Sridhar et al. 2018).

Studies of healthcare costs incurred by some governments for prisoners in prisons have been published, but it is not always clear in the reports which specific services are included in different definitions such as “physical health”, “healthcare”, and “medical care”. Many states also adopt considerably different ways to provide healthcare to prisoners, which can include agreements with private companies, universities, and hybrid public–private approaches (Morgan 2018; Pew Charitable Trust 2013). The study by Moschetti K. et al. (Moschetti et al. 2018), carried out in Switzerland in 2018, quantified the economic impact of the care provided in prisons and of the most common pathologies in prisoners, but the study considered only a single region of the state with numerically limited populations of inmates.

Healthcare in prison varies widely between countries, and differences in services provided affect morbidity, mortality, inside custody (Raimer and Stobo 2004), and on release (Young et al. 2015; Harvey et al. 2022) healthcare costs.

Although the scarcity of sources and the differences in the collection of data by the various governments can introduce “artificial” differences between the nations considered in this study, it was possible to highlight correlations between the variables analyzed. Our results shows that countries with a higher GDP per capita tend to have lower prison population rates and to invest larger amounts of funds for prison systems. These results agree with the evidence in the literature as regards the European reality (Kruze and Priede 2020).

A significant exception was represented by the United Kingdom, which has a prison population rate of 130.9 prisoners per 100,000 inhabitants (Figure 4). The UK has a per capita GDP of around EUR 40,000, which places it far above the average PPR value of other countries with a per capita GDP between EUR 20,000 and EUR 40,000, equal to 83.83. These

data must be related to the constant increase in the PPR value in the UK that has doubled in the last 25 years (Sturge 2022).

Some other “exceptions” emerge from the data relating to the rest of the world, probably due to factors that are not exclusively economic and which place the USA in first place for the prison population rate (655 prisoners per 100,000 inhabitant), despite a per capita GDP of USD 63,530.63 in 2020 (Fair and Walmsley 2021; World Bank/OECD 2023).

The average prison population rate calculated for the CoE countries (116.81 per 100,000 inhabitants) is lower than the world prison population rate, based on United Nations estimates of national population levels, which is 140 per 100,000 people (Fair and Walmsley 2021). A study conducted in Latvia by Kruze and Priede in 2020 (Kruze and Priede 2020) analyzed the relationship between the PPR and per capita GDP, particularly in Europe. The conclusions of the authors are comparable to those emerging from our work, with evidence of negative relationships between the “wealth” of the country and the number of prisoners per 100,000 inhabitants. As a corollary of the analyses carried out, Kruze and Priede formulated the hypothesis of a link between PPR levels and climatic differences: the evidence would suggest that European countries closer to the equator have lower incarceration rates. This relationship has been ascribed to the tendency of the homeless to commit crimes punishable by imprisonment in order to have shelter from the elements (Abadi 2020). However, this hypothesis has not found geographically detectable (Figure 1a) nor numerically significant (Figure 4) confirmation in the data processing carried out in our study. Even the analysis of multiple correspondences (Figure 5) did not reveal any association between geographic latitude and prison population rate. Instead, our results underline an association between low PPRs and Northern European countries, while higher levels are associated with a geographical position located on the eastern borders of the Council of Europe (Russia, Turkey, Georgia, and Azerbaijan). As regards the analysis of the daily cost per prisoner, the figures declared by the governments of the CoE countries vary from values of EUR 6.50 in Bulgaria and EUR 8.08 in Azerbaijan, to figures relating to Luxembourg and Norway (EUR 332.63 and EUR 330.60), without considering the extreme cases of Monaco and Lichtenstein (EUR 2030.99 and EUR 352) due to the aforementioned small number of prisoners. In this sense, it is worth analyzing the case represented by Norway, whose high daily expenditure per prisoner is linked to a series of reforms of the penal system that began in the 1990s. In Norway, the rehabilitation aspect, education, social and occupational reintegration of convicts has been privileged, for example, by making the figures of educators coincide with those of the supervisory personnel. The investment supported by the Norwegian government has led to a reduction in the recidivism rate of released prisoners from 70% to 20% (Giertsen et al. 2019; Kruze and Priede 2020).

On the contrary, the countries of the former Soviet Union or countries linked to it have high costs (Figure 2). We could assume that they mainly use detention prison, which requires a higher financial commitment, compared to alternative educational models to prison detection.

Finally, our study shows that the budget invested in penitentiary systems by the CoE countries is, on average, 0.17% of the GDP, a value confirmed by the data released by Eurostat (European Union—Eurostat 2023) but which appears significantly lower than the existing global data found in the literature (Penal Reform International 2020), which shows an average expenditure calculated for 54 countries of just under 0.3% of the GDP.

Our study has some limitations. The main studies are linked to the aforementioned discrepancies in the data collection, carried out by each country of the CoE, for the transmission and creation of the SPACE-I report. Some of the differences between nations are due to the categories of prisoners included in the total population of inmates (inmates held in police stations, minors, persons with drug addictions, persons with psychiatric disorders, asylum seekers, undocumented immigrants, under electronic monitoring, in preventive detention) or in the items included in the budget spent by the various Prison Administrations (Aebi et al. 2022; Gifford 2019).

It was also necessary to exclude from some of the analyses the countries that did not provide complete data for each variable considered.

5. Conclusions

High incarceration rates vary from country to country. High PPRs evidently denote the inability to find effective and sustainable answers to problems such as poverty, lack of schooling, substance abuse, psychiatric pathologies, unemployment, family break down, disabilities, and homelessness (Heard 2016).

The prison cannot be seen as an exclusive place of punishment, which leads to an increase in the incidence rate of penitentiary spending on the GDP. According to the most modern vision, as also confirmed by (Manconi et al. 2022), prison is not an effective instrument of punishment as it does not reduce the general crime rate since many inmates, once they have served their sentence, commit new crimes. Furthermore, prison is confirmed as a place of aggregation of criminal figures and therefore an ideal location for illegal alliances.

Nations with a more solid economy, able to invest more resources in the maintenance of penal institutions and in reform policies aimed at the rehabilitation of prisoners and the reduction in recidivism (Norway), show lower prison population rates without weighing significantly higher on the GDP.

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Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

CoE: Council of Europe; PPR: number of inmates per 100,000 inhabitants; GDP: gross domestic product.

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