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# Modeling the political corruption in Spain

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## 1 Introduction

Political corruption is a universal problem, but it affects countries very differently, because it is influenced by culture and religion, the political system and the parties' law, the time in political office, the professional experience of politicians, the highly protectionist legal system, the type and structure of the public administration, the short democratic tradition, the economy, the proportion of women participating in politics, the lack of independence among the judiciary and the media among others [15].

The effect of political corruption is corrosive because it deteriorates the image of the country, the confidence of foreign investors, the quality of life of citizens, and worsens the future of the country. The lack of trust in institutions generates a moral disengagement, which makes it easier for citizens to excuse the corruption of the political class, considering it as alien but at the same time using it as an excuse to commit it themselves. A kind of contagion is very counterproductive because of its social, economic and moral impact on society [1, 14]. The concept of political corruption is susceptible to ambiguity, so we must specify it. Political corruption is any act or omission, legal or illegal, of a person who, based on a public office (elected or appointed) embracing political position but also a position in a labor union or business association favors a particular interest causing public harm (not necessarily monetary) [8, 9].

The cases of demonstrated political corruption that have been echoed by the media in recent years due to their economic, judicial and social significance, are just the tip of the iceberg of a problem hidden by many interested parties and the shortage of means in the fight against it. The most important factors that explain the current situation are the party system and its laws, where political offices do not respond to the citizen, but to the political chief who has appointed him, where there is a lack of self-criticism, transparency, and accountability. Imperfect judicial and media independence does not favor the end of the problem, much less when political parties

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are not able to make decisions against their partisan interests, even when these decisions are for the good of society Spanish and the economic and social future of the country. Likewise, an intoxicating and generalized state of moral relaxation has been established in Spanish society that excuses the phenomenon of political corruption as inevitable and inherent to the political class and therefore irremediable. This thought not only does not slow down, but it perpetuates and amplifies the dimension of the problem [1, 3].

In this work we quantify the level of risk of committing political corruption of the population residing in Spain between 16 and 70 years old. In addition to classify the population according to their level of risk of committing political corruption, we also take into account their employment situation at the time of the analysis. Thus, we study the evolution of subpopulations over time during the period 2015-2023, taking into account the annual dynamic transits. The external variables that determine the transits of individuals between populations during the period of study are: elections, time in office, gender, moral disconnection, economy, religion and the effect of "revolving doors" [11]. The relevance of this study relies on reporting the problem to public authorities responsible for addressing policies to stop this trend.

# 2 Model

The dynamic population model [6, 7, 10, 12] quantifies the amount of people from 16-70 years old in risk to commit political corruption in Spain. Four levels of risk of committing political corruption are established: zero risk (people who do not hold or are in contact with public office), low risk (less than 10%), individuals likely to collaborate with public office (member of political parties, unions or business associations); medium risk (up to 25%) people who are public representatives directly elected, or indirectly and manage public budget; high risk (more than 50%) high positions that handle large budgets and/or decision-making capacity, remaining in office since previous Administration.

Thus, 5 types of work situation have been considered: $j = 1$ pre-labour (young people up to 26 years old); $j = 2$ unemployed (26,70); $j = 3$ employed by a private company aged (26,70); $j = 4$ employed by a public company or administration aged (26,70); and $j = 5$ civil servant (26,70). Hence, the target population is divided into 20 subpopulations, taking into account their level of risk of committing political corruption and their alternative or complementary professional life to hold public office.

$\rightarrow$ $Z_j(n)$= zero risk subpopulation.

$\rightarrow$ $B_j(n)$= Low-risk subpopulation.

$\rightarrow$ $M_j(n)$= Medium-risk subpopulation.

$\rightarrow$ $A_j(n)$= High risk subpopulation.

The individuals transit to lower or higher levels of probability to commit political corruption by the conjunction of factors; those factors are explained by vector transits: demography (birth & death rates), time in office, contagion effect, elections, fear to loss the office, revolting doors effect but also by environmental factors: gender, culture & religion, economy, lack of political

transparency, controlled press, lack of independent justice.

Regarding the demographic transit, the variables considered are the birth rate ($I_{ij}$), the death rate ($d_{ij}$), and the retirement rate, individuals who retired or become over 70 years old, ($R_{ij}$). (Spanish Statistics Institute). These transit coefficients are assumed constant for the period of study (2015-2023).

Following is the economic transit explained by the political disenchantment, which drives to the loss of members of traditional political parties and unions. $\gamma = 0.81 \cdot 0.01 = 0.0081$. This transit coefficient affects $B_j(n)$ subpopulation that transit to $Z_j(n)$. This transit is assumed constant for the period of study. Next it is the change in election results $\mu$, which explains the $A_j(n)$ individuals transit to $B_j(n)$ but also $B_j(n)$ individuals transit to $M_j(n)$ because of the emergence of new political parties [4]. This transit only takes place the next year after general elections (2016, 2020). It is assumed 40% position remain in office [11]. Related to the time in office of politicians, its effect is double: politicians who do not keep their seat (60%) transit from $A_j(n)$ to $B_j(n)$ but 50% politicians who keep their seat transit to higher categories $M_j(n)$ to $A_j(n)$. The transit coeffiecient increases progressively to the closer time to elections.

In addition, the fear to loss the seat of individuals impacts negatively on their probability to commit political corruption for $j = 2, 3, 4$. ($\rho_{ij}$). This transit affects to $B_j(n)$ individuals who transit to $M_j(n)$ but also $M_j(n)$ individuals who transit to $A_j(n)$. The transit coeffiecient increases progressively to the closer time to elections. Other transit coefficient is the moral disengagement ($\alpha_i$) experienced by individuals which makes them transit to a higher risk category. $\alpha_Z = 0.005 \cdot 0.9 = 0.0045$; $\alpha_B = \alpha_M = 3\alpha_Z = 0.135$. This transit affects 90% population [1, 2, 5, 15].

Finally, it is considered the revolting doors effect ($D_{A_j}$) explained by those politicians who leave their political seat and join a board corporation, mainly belonging to the IBEX35. This transit affects $j = 2, 3, 4$. Approximately represents 23 positions per year transit [11].

Following, the compartment dynamic model to quantify the precarious population is expressed:

$$\begin{aligned}
Z_j(n+1) - Z_j(n) = {} & (I_{Z_1} - R_{Z_j}) - d_j(n)Z_j(n) - \alpha_Z Z_j(n) + \gamma B_j(n) \\
B_j(n+1) - B_j(n) = {} & (I_{B_1} - R_{B_j}) - d_j(n)B_j(n) - \alpha_B B_j(n) + \alpha_Z Z_j(n) \\
& - \rho_{B_j} B_j(n) + D_{A_j} - \gamma B_j(n) + \mu A_j(n) \\
M_j(n+1) - M_j(n) = {} & -R_{M_j} - d_j(n)M_j(n) + \alpha_B B_j(n) - \alpha_M M_j(n) - \tau_j M_j(n) \\
& - \rho_{M_j} M_j(n) + \rho_{B_j} B_j(n) \\
A_j(n+1) - A_j(n) = {} & -d_j(n)A_j(n) - \mu A_j(n) + \tau_j M_j(n) + \alpha_M M_j(n) \\
& + \rho_{M_j} M_j(n) - R_{A_j} - D_{A_J}
\end{aligned} \tag{1}$$

# 3 Results

By computing the model, the subpopulation values are estimated for each year. Table 1 shows the results at the beginning of the study, $n = 1$ after the political renovation occurred in 2016

(general elections were in 2015). Table 2 shows the results at the end of the study, $n = 8$ (2023).

| | **TOTAL** | $j = 1$ | $j = 2$ | $j = 3$ | $j = 4$ | $j = 5$ |
|---|---|---|---|---|---|---|
| $\boldsymbol{Z_j}$ | 20,648,347 | 4,206,758 | 5,291,150 | 10,355,955 | 228,273 | 566,212 |
| $\boldsymbol{B_j}$ | 2,901,249 | 97,178 | 28,352 | 1,067,261 | 795,750 | 912,708 |
| $\boldsymbol{M_j}$ | 346,885 | 1,051 | 0 | 249,704 | 67,587 | 28,543 |
| $\boldsymbol{A_j}$ | 33,930 | 0 | 0 | 7,904 | 25,739 | 287 |
| **TOTAL** | 23,930,412 | 4,304,987 | 5,319,502 | 11,680,824 | 1,117,349 | 1,507,749 |

Table 1: Subpopulations forecast at $n = 1$, (2016).

| | **TOTAL** | $j = 1$ | $j = 2$ | $j = 3$ | $j = 4$ | $j = 5$ |
|---|---|---|---|---|---|---|
| $\boldsymbol{Z_j}$ | 20,250,555 | 3,329,507 | 5,900,978 | 9,382,973 | 1,136,106 | 500,991 |
| $\boldsymbol{B_j}$ | 2,684,850 | 127,717 | 250,884 | 1,036,815 | 599,419 | 670,015 |
| $\boldsymbol{M_j}$ | 441,168 | 8,039 | 16,038 | 233,271 | 103,937 | 79,882 |
| $\boldsymbol{A_j}$ | 174,554 | 609 | 742 | 110,872 | 47,910 | 14,420 |
| **TOTAL** | 23,551,127 | 3,465,872 | 6,168,643 | 10,763,931 | 1,887,372 | 1,265,309 |

Table 2: Subpopulations forecast at $n = 8$, (2023).

Results show how the population at high risk to commit political corruption grows for the period of study representing 0.7% of the Spanish population in 2023. Even when this percentage can seem low, the socio-economic and moral impact on the Spanish society is dramatic.

# 4 Conclusions

The study quantifies the population at risk of committing political corruption in Spain by identifying and quantifying the drivers explaining the political corruption. The stop to this social problem requires the policy makers' action. In concrete, it is advisable the change of the electoral law of parties to increase the transparency and the accountability of politicians. It should be much more controlled in hiring "advisers" in office but also regulating the wages of local administration (Small city councils).

Also, it is necessary to make cuts on public funding for entities of doubtful nature such as certain non-profit organizations and/or public companies. Finally, increase of funding for the judicial system (district attorneys and judges).

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