Proposal for an econometric model for inter-federative apportionment of the costs of litigation of medicines not covered by the Unified Health System

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INTRODUCTION

The growing litigation of access to medicines, especially in Brazil, has been the subject of broad debate by the justice system, federated entities and society.



To estimate an econometric model for the apportionment of costs related to the litigation of medicines not covered by the Unified Health System among the federated entities of Brazil.

METHOD

The analysis was based on the method developed by the National Treasury of Brazil to assess the fiscal situation of subnational entities, based on indicators of debt, current savings and liquidity, known as "Payment Capacity" (acronym in Portuguese CAPAG), categorized as high, medium, low, and very low. The econometric method used was multivariate ordinal logistic regression, using CAPAG for each federated entity as a dependent variable. The preselected independent variables were GDP, GDP per capita, population, Social Vulnerability Index (IVS), Human Development Index (HDI), debt, current savings, and liquidity, with 2022 data obtained from government sources and UNDP. To select the most appropriate model, the stepwise method and the R software were used.

There is a major discussion related to the creation of mechanisms for the distribution among federated entities of the costs generated by judicial determinations involving medicines not covered by the Unified Health System (acronym in Portuguese SUS).

RESULTS

The statistical tests applied to the set of independent variables showed that some variables in the model (GDP, GDP per capita, IVS, HDI, and Population) presented multicollinearity evidenced by the Variance Inflation Factors (VIF) and the tolerance measures. Furthermore, these variables did not present statistical significance and did not increase the explanatory power of the CAPAG variable, according to Nagelkerke's Pseudo-R² analysis. The best adjustment of the model was achieved with the variables debt, current savings and relative liquidity, which were validated by absence of multicollinearity, low VIF values (≈1.000), high tolerance values (above 0.9), statistical significance ($p \le 0.05$), and adequate explanatory power (Nagelkerke's $Pseudo-R^2 = 0.783$).

Table 1. Results of the ordinal logistic regression model considering the pre-selected predictor variables. Analysis of Brazilian municipalities (n=417), 2022. Dependent variable: CAPAG

Independent	Estimate	Standard Error	Wald	df	p-value	95% Confidence Interval	
variables						Lower limit	Upper limit
[CAPAG_FINAL = 1]	-53,819	5,751	87,575	1	0,000	-65,091	-42,548
[CAPAG_FINAL = 2]	-48,367	5,517	76,871	1	0,000	-59,179	-37,554
GDP	-4,86E-09	5,290E-008	0,008	1	0,927	-1,085E-007	9,88E-08
GDP Per capita	5,212E-006	5,667E-006	0,846	1	0,358	-5,896E-006	1,63E-05
Population	2,155E-006	1,974E-006	1,191	1	0,275	-1,715E-006	6,02E-06
IVS	-0,858	2,349	0,133	1	0,715	-5,461	3,746
HDI	-0,426	4,301	0,01	1	0,921	-8,856	8,004
Debt	-2,595	1,270	4,176	1	0,041	-5,083	-0,106
Current savings	-56,607	4,799	139,135	1	0,000	-66,013	-47,201
Liquidity	-0,647	0,175	13,708	1	0,000	-0,989	-0,304

Note: Pseudo R-Square (Nagelkerke = 0.793)

Table 2.Results of the ordinal logistic regression model considering the variables of the proposed model. Analysis of Brazilian municipalities (n=417), 2022. Dependent variable: CAPAG

Independent	Estimate	Standard Error	Wald	df	p-value	95% Confidence Interval	
variables	Laumate			ui		Lower limit	Upper limit
[CAPAG_FINAL = 1]	-48,893	3,883	158,568	1	0,000	-56,503	-41,283
[CAPAG_FINAL = 2]	-44,110	3,619	148,578	1	0,000	-51,203	-37,017
Debt	t -2,832	1,312	4,660	1	0,031	-5,403	-0,261
Current savings	-51,933	4,206	152,434	1	0,000	-60,177	-43,689
Liquidity	/ -0,217	0,080	7,452	1	0,006	-0,373	-0,061

Note: Pseudo R-Square (Nagelkerke = 0.783)

Table 3. Results of the independent variables of the proposed ordinal logistic regression model in relation to the adjustment measures. Analysis of Brazilian municipalities (n=417), 2022. Dependent variable: CAPAG

Metrics	Debt	Current savings	Liquidity
Variance Inflation Factors (VIF)	1,001	1,001	1,000
Tolerance measures	0,999	0,999	1,000
p-value	0,000	0,000	0,019

CONCLUSIONS

The linear apportionment percentages of the costs related to the litigation of medicines among the federated entities were determined using the matrix of linear combinations of CAPAG, derived from the model's three explanatory variables. In this way, the proposed model can be used in planning public policies.





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