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The relationship between accounting information and the performance of supplementary health care providers

La relación entre la información contable y el desempeño de los proveedores de atención médica suplementaria

A relação entre as informações contábeis e o desempenho das operadoras de saúde suplementar

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Abstract

Purpose: Analyze the relationship between accounting information and the performance of supplementary health care providers (OPS) based on economic and financial indicators. The study assessed operational, liquidity, profitability, and capital structure indicators in addition to the influence of the size and type of provider on the Supplementary Health Performance Index (IDSS), which is a proxy for the OPS performance.

Methodology: First, factor analysis was carried out on 18 economic-financial indicators of 568 OPS, which resulted in five factors (operational, liquidity, profitability, capital structure, and size). Finally, a model was developed in which ordinary least squares (MQO) and TOBIT regressions were applied to explain the IDSS, as a function of the five calculated factors plus four dummy variables for the types of OPS.

Results: The results showed that the OPS data and economic-financial indicators are jointly relevant to explain the IDSS, indicating that the accounting information can portray aspects of the supplementary health sector, which go beyond the purely financial dimension.

Contributions of the Study: The study contributes to the literature by bringing strong evidence that OPS accounting information is important to explain part of the supplementary health sector's economic environment, surpassing by more than twice its own informational content in the IDSS, which highlights the usefulness and relevance of such information to users of OPS.

Keywords: Economic-Financial Indicators. Regulation. Supplementary Health.

Resumen

Objetivo: Analizar la relación entre la información contable y el desempeño de los proveedores suplementarios de salud (OPS), con base en indicadores económicos y financieros. Para ello, se evaluaron indicadores operativos, de liquidez, rentabilidad, estructura de capital, además de la influencia que ejerce el tamaño y tipo de proveedor en el puntaje del Índice de desempeño de salud complementaria (IDSS), que es un proxy del desempeño del OPS.

Metodología: Primero, se realizó una Análisis Factorial sobre 18 indicadores económico-financieros de 568 OPS, que resultó en cinco factores (operacional, liquidez, rentabilidad, estructura de capital y tamaño). Finalmente, se desarrolló un modelo en el que se aplicaron los mínimos cuadrados ordinarios (MQO) y regresiones TOBIT para explicar el IDSS, en función de los cinco factores calculados más cuatro variables ficticias para los tipos de OPS.

Resultados: Los resultados mostraron que los datos e indicadores económico-financieros de las OPS son conjuntamente relevantes para explicar el IDSS, indicando que la información contable tiene la capacidad de retratar aspectos del sector suplementario de la salud, que van más allá de la dimensión puramente financiera.

Contribuciones del Estudio: El estudio contribuye a la literatura al traer evidencia sólida de que las informaciones contables de OPS son importantes para explicar parte del entorno económico de salud suplementaria, superando en más del doble su contenido informativo propio contenido en el IDSS, lo que resalta la utilidad y relevancia de dicha información para usuarios de OPS.

Palabras clave: Indicadores Económico-Financieros. Regulación. Salud Suplementaria.

Resumo

Objetivo: Analisar a relação entre as informações contábeis e o desempenho das operadoras de saúde suplementar (OPS), com base em indicadores econômico-financeiros. Para tanto, foram avaliados indicadores operacionais, de liquidez, rentabilidade, estrutura de capital, além da influência exercida pelo tamanho e o tipo de operadora sobre a pontuação do Índice de Desempenho da Saúde Suplementar (IDSS), que é uma *proxy* para o desempenho das OPS.

Metodologia: Primeiramente foi realizada uma Análise Fatorial em 18 indicadores econômico-financeiros de 568 OPS, que resultaram em cinco fatores (operacional, liquidez, rentabilidade, estrutura de capital e tamanho). Por fim, foi elaborado um modelo em que se aplicou regressões por Mínimos Quadrados Ordinários (MQO) e TOBIT para explicar o IDSS, como função dos cinco fatores calculados mais quatro variáveis *dummies* para os tipos de OPS.

Resultados: Os resultados mostraram que os dados e indicadores econômico-financeiros das OPS são relevantes em conjunto para explicar o IDSS, indicando que a informação contábil possui capacidade de retratar aspectos do setor de saúde suplementar, que vão além da dimensão puramente financeira.

Contribuições do Estudo: O estudo contribui com a literatura ao trazer fortes indícios de que as informações contábeis das OPS são importantes para explicar parcela do ambiente econômico da saúde suplementar, superando em mais de duas vezes seu próprio conteúdo informacional contido no IDSS, o que evidencia a utilidade e a relevância de tais informações para os usuários das OPS.

Palavras-chave: Indicadores Econômico-Financeiros. Regulação. Saúde Suplementar.

1 Introduction

One of the most relevant research topics in accounting science concerns the quantity and quality of financial and non-financial information companies disclose to the market. The greater the level of disclosure, even if reporting bad news, the greater the people's trust (Levitt, 1988).

In the supplementary health sector, which is responsible for the care of entities and individuals who are willing to pay for differentiated health care services, Robinson and Brodie (1997) found that health plan users request information about the provider's performance (financial, operational, and customer satisfaction, for example), and there is a learning process in the interpretation of reports and indicators.

In this regard, Schneider and Lieberman (2001) consider that consumers or users of health services choose the plans with the best quality results after the disclosure of regulated information. This generates a positive reflection not only in terms of economic aspects but also in the health and well-being of part of the population.

The Brazilian supplementary health care is regulated and supervised by the National Supplementary Health Agency (*Agência Nacional de Saúde Suplementar* – ANS), whose mission is to defend the public interest linked to the private actions of supplementary health

care providers (*operadoras de planos de saúde* – OPS) (ANS, 2020). Thus, to fulfill its mission, the agency created the Providers Quality Program (*Programa de Qualidade das Operadoras* – PQO) to carry out an annual assessment of the performance of OPS with the following objectives: a) to increase transparency, offering detailed information and periodic reports on the sector's performance; b) allow comparison between providers, inducing competition based on value and; c) reduce information asymmetry, which compromises the consumer's ability to make choices when contracting a health plan (ANS, 2019).

The main instrument used by ANS to implement the PQO is the supplementary health performance index (*Índice de Desempenho da Saúde Suplementar* – IDSS), which measures the global performance of health care providers and is composed of a weighted average of four other indices that assess different dimensions. In 2018, these indices were represented by the health care quality index (*Índice de Qualidade na Atenção à Saúde* – IDQS), the guarantee of access index (*Índice de Garantia de Acesso* – IDGA), the index of sustainability in the market (*Índice de Sustentabilidade no Mercado* – IDSM), and the management and regulation index (*Índice de Gestão e Regulação* – IDGR) (ANS, 2020).

As the IDSS measures the performance of the OPS according to the degree of significance of the evaluated companies' information, ANS uses this indicator to prepare a ranking of the best providers, seeking the public interest by assisting consumers in choosing their health plan (Jesus et al. 2019).

The Brazilian Federal Constitution of 1988 consolidates actions to foster human health, provided in articles 196 to 200 (CF/88). They encompass the participation of third parties such as individuals and businesses in providing health services. In this sense, the ANS's role through the IDSS is crucial to increase the dissemination of information from the OPS, leading to less information asymmetry, the possibility of comparing different OPS and, stimulating competition (Jesus et al. 2019).

However, no studies are trying to explain the IDSS as a function of the OPS economic and financial information. Most studies in the field of accounting have used the IDSS and its dimensions as explanatory variables in logistic regression models to try and measure the probability of an OPS suffering administrative intervention by the ANS, as in Sancovschi, Macedo, and Silva (2014) and Bragança, Bressan, Pinheiro, and Soares (2019). Therefore, the question that arises is: Is there a relationship between accounting information and the performance of supplementary health providers?

This article analyzes the relationship between accounting information and the performance of supplementary health care providers based on economic and financial indicators. Operational, liquidity, profitability, and capital structure indicators will be assessed, in addition to the effects exerted by the size and type of provider on the IDSS score (a proxy for the performance of OPS).

The justification for this work is related to the need to investigate whether economic-financial indicators contribute to explaining the OPS performance assessment, going beyond the financial portion of the IDSS. If this is proven, it will be possible to argue that accounting reports provide helpful economic and financial information to develop the Brazilian supplementary health market.

Thus, the study provides elements to say that the accounting information produced by health care providers is relevant to users, as they portray additional aspects of the supplementary health market beyond the financial aspect. This argument is based on the fundamental qualitative characteristics and improvement of accounting information, providing useful and quality information that allows stakeholders to carry out safe and reliable assessments of the OSP's economic, financial, and operational situation.

2 Literature Review

2.1 Regulation Theory

Regulation can be understood as a set of instruments to allow the state to control certain private and semi-public activities that meet society's needs (Pinheiro, Peleias, Silva, & Martins, 2015). Through these instruments, the state influences the behavior of certain economic agents to ensure that the public interest is served (Prosser, 1999).

Viscusi, Harrington Jr., and Vernon (2005) assert that regulation theory can be analyzed through three distinct approaches. The first is the public interest theory (PIT), for which the protection of society against economic abuse by certain agents is a state attribution. Based on this approach, the primary role of the regulatory state is to mitigate market failures such as those arising from natural monopoly, negative externalities, information asymmetry, and excessive competition to preserve the collective social interest.

Studies related to accounting regulation show that negative externalities and information asymmetry are the two main market failures of interest in this field (Leuz & Wysocki, 2016). As for negative externalities, the failure is related to the nature of the accounting information as a non-excludable public good. In this case, it is impossible to prevent access to such information once disclosed and, therefore, free riding reduces the incentive to produce it. The asymmetry of information, on the other hand, impairs the market's efficient operation, leading to higher costs of raising and allocating resources and to a) adverse selection, related to the difficulty of correctly evaluating the accounting information produced, and b) moral hazard, which deals with the complexities of investors monitoring managers in the absence of sufficient information (Carmo, Ribeiro, & Carvalho, 2018).

Although important, the PIT is widely criticized for not having empirical support, which led to the capture theory (CT). This theory focuses on the industry, which has the power to influence or capture the regulatory body to meet its demands (Stigler, 1971). The CT describes the regulator as a subservient figure destined to serve the interests of the regulated, taking an opposing view to PIT.

However, although CT considers that regulation favors the regulated industry, it cannot explain why some companies leave the market, as theoretically they benefit, or why some companies are against regulation (Viscusi, Harrington Jr., & Vernon, 2005).

Thus, to try to remedy the weaknesses of PIT and CT, Stigler (1971) created the theory of economic regulation (TER) or the interest group theory (IGT), which is the third approach observed in regulatory theories. The author observed the North American market and proposed two premises. First, the main asset of a regulator is coercive power, and groups that control this power can maximize their well-being. Second, as a rational agent, the regulator always seeks to maximize their well-being by gaining political support.

Subsequently, Peltzman (1976) adapted the analysis elaborated by Stigler (1971) for the TER, creating three premises: a) the main result of regulation is the redistribution of wealth among members of a group; b) the regulator wishes to remain in power and, thus, will conduct regulation to maximize political support and; c) interest groups compete to provide political support to the regulator in exchange for favorable regulation.

Finally, Becker (1983) complemented the work of Stigler (1971) and Peltzman (1976) by stating that the regulatory process is essentially the result of competition between different interest groups. Thus, the regulator's actions are the result of political power and pressure from

the most influential interest groups (resulting from financial contributions, technical elements, information, and ideological issues), which compete with each other.

Regardless of the theoretical approach, regulation to a greater or lesser degree provides opportunities to access the same public information, which means that, although not perfect, the accounting disclosure policies imposed by regulatory agencies help economic agents that have little information "leveling the playing field," which ends up increasing the market's economic efficiency (Dye, 2001).

2.2 Economic-Financial Indicators

Simply accessing the information in financial statements does not guarantee that users will be able to use them as a) the statements present aggregated data about a particular company (Stickney & Weil, 2001); b) individuals have limited rationality to process a lot of information (Eisenhardt, 1989; Macedo, & Fontes, 2009) and; c) people effectively assess cost-benefit regarding time and effort, obtaining results from interpreting different financial and non-financial information (Kulviwat, Guo, & Engchanil, 2004).

Thus, one of the best ways to assess the performance of a given entity is through economic-financial indicators (Jacintho & Kroenke, 2021). In this regard, Marquezan, Rossato, Ely, and Fogaça (2019) argue that the literature on financial statement analysis techniques presents evidence of the applicability of economic-financial indicators such as assessment tools for users, analysts, and investors. These indicators are a means of reducing uncertainty (Klann & Beuren, 2011).

Feng and Wang (2000) consider that an economic-financial indicator can be obtained by dividing one accounting item by another. Jacintho and Kroenke (2021) reinforce this idea stating that indicators are usually mathematical ratios between two accounting quantities.

It is possible to state that both internal and external users of accounting information use economic and financial indicators with the same objectives (to identify the efficiency and effectiveness in the use of corporate resources) (Gartner, 2010). The main groups of indicators used to analyze companies operating in regulated sectors are capital structure (debt), liquidity, profitability, and operational (Bomfim, Macedo, & Marques, 2013).

Indebtedness or capital structure refers to funds raised from third parties to finance the asset base, reflecting the company's ability to obtain capital to maintain its operations (Mirza, Saeed, & Rizvi, 2013). Indicators in this group typically relate assets and liabilities to sources of funding (Ross, Westerfield, & Jordan, 2010).

Liquidity refers to the organization's ability to settle its financial commitments within the contracted period, which is essential for business continuity (Gitman, 2010). For example, the company will have liquidity if it turns more assets into cash than necessary to meet its liabilities in a given time frame. Otherwise, the company will be forced to renegotiate with suppliers and creditors.

Profitability has to do with the financial return from the company's activities (Daneberg & Decourt, 2021). In this regard, Ross, Westerfield, and Jordan (2010) understand that profitable organizations are those that manage to obtain net income through the use of their assets, generating returns for their investors.

The operational indicators relate to the company's productivity and quality of products and services offered, linked to the structure of the sector to which it belongs. These indicators are typical of regulated environments and essential to represent specific characteristics of a certain segment (Ribeiro, Macedo, & Marques, 2012).

Finally, part of the studies dealing with regulated environments has sought to use accounting variables to capture the effect of "size," either through indicators or through proxies, to assess the potential scale gains arising from the size of the entities. Among some recent Brazilian works are Macedo and Cavalcante (2011) in the insurance sector; Cardoso, Campos, Dantas, and Medeiros (2019) in the banking sector and; Teixeira and Rodrigues (2021) in the closed private pension sector.

Additionally, particular aspects of firms must be dealt with somehow when evaluating entities from the same segment of activity, under penalty of loss of performance in the adopted model (Marquezan et al., 2019). Thus, the use of dummy variables to differentiate companies by modality or type, for example, is recommended (Bragança et al., 2019).

Thus, the logic of this research rests on evaluating the contribution of economic-financial indicators to define whether the accounting information regulated by ANS is relevant to capture the performance of supplementary health care providers (OPS) through the supplementary health performance index (IDSS), which measures the efficiency of these entities in society.

2.3 Previous Studies

Concerning the use of economic and financial indicators in supplementary health, Silva and Loebel (2016) analyzed the supplementary health care providers' (OPS) economic and financial performance to identify the impact of the factors provider, year, modality, size, and region on performance through the analysis of variance method. Seven indexes operationalized performance: return on total assets, operating return on total assets, return on equity, general indebtedness, short-term indebtedness, current liquidity, and loss ratio. The results showed that the factor 'provider' had greater explanatory power in performance variance. In addition, sixteen providers outperformed in more than one index, whose most frequent characteristics were: self-management; small size; act in the southeast region and; highlighted when observing financial indices.

Silva and Loebel (2017) compared the economic-financial performance of private health plan providers between 2008 and 2012, based on univariate statistics and the median test, for the indexes of return on total assets, operating return on total assets, return on equity, current liquidity, short-term indebtedness, and claims. The authors concluded that causes internal and external to the OPS are responsible for the results' heterogeneous performance.

Bragança et al. (2019) analyzed the influence of regulation and interventions of the National Supplementary Health Agency (ANS) on the OPS continuity through a logit model, considering data from 2007 to 2015. The authors used 26 economic-financial variables from the OPS accounting information to construct indicators and categorical variables and differentiate providers by region, modality, size, and segmentation. The authors found that all indicators developed and all dummy variables adopted were significant in explaining the probability of insolvency of OPS.

Xavier, Souza, and Avelar (2019) analyzed Brazilian OPS economic and financial performance from 2010 to 2015, considering operational, liquidity, indebtedness, and profitability indicators. The authors also analyzed non-financial indicators such as region, size, and type of provider. They used the Kolmogorov-Smirnov test and the Kruskal-Wallis test. As a result, strong evidence was found that economic-financial indicators are related to the type of OPS, indicating that health care providers should be evaluated by modality.

Xavier and Souza (2020) studied the OPS economic-financial efficiency, based on data from 2010 to 2015, using the Kruskal-Wallis test and the data envelopment analysis (DEA).

The health care providers were grouped by modality using the financial variables indebtedness, debt composition, claims, a combined operational index, and the average receipt period as DEA inputs. As outputs, the authors used the rate of return on assets, return on equity, the EBTIDA margin, and general liquidity. In general, the authors concluded that the provider's modality could be decisive in its efficiency, while some indicators showed possibilities for improvement in most OPS, regardless of their modality.

Regarding the works that addressed the importance of the supplementary health performance index (IDSS) as a measure of the OPS performance regarding accounting and administration, Sancovschi, Macedo, and Silva (2014) examined the relationship between the classification of providers through logistic regressions based on the IDSS and the probability that some of these OPS were subjected to special regimes (interventions) by the ANS in 2009. The results revealed that evaluations of the providers based on the IDSS and its dimensions explain the ANS interventions.

Leucas, Messias, Menezes, Komatsuzaki, and Braga (2017) compared the performance and efficiency levels of a group of 60 healthcare providers operating in the Brazilian state of Minas Gerais, based on the IDSS and 59 financial and non-financial variables. The methodologies used were factor analysis, data envelopment analysis, and the Kruskal-Wallis test. The results showed that the IDSS is a reliable parameter to assess the level of efficiency of OPS.

Finally, Jesus et al. (2019) studied the relationship between the financial indicator and the non-financial indicators of the IDSS in force from 2011 to 2014, based on three regression models by ordinary least squares (OLS). All results showed that the financial indicators could explain part of the non-financial indicators. For the authors, this phenomenon demonstrates the importance of the financial dimension in the OPS operational performance.

2.4 Performance of Brazilian Supplementary Health Care

In Brazil, the regulation of health plan providers started with Law 9961 of January 28, 2000, which created the National Supplementary Health Agency (ANS). After that, the market was divided into eight categories: self-managed provider, medical cooperative, dental cooperative, philanthropic provider, benefits administrator, insurance company specialized in health, group medicine, and group dentistry.

The main objective of ANS is to develop the supplementary health market, transforming health plan providers into health managers; service providers in health care producers; and beneficiaries in health-conscious users (ANS, 2004; 2020). However, this is not an easy mission, as health is one of the most complex sectors of society, executed among different interests and organizations. Also, financial resources are generally insufficient to create substantial changes (Rodrigues, Coelho, Nascimento, & Florenceno, 2016).

The supplementary health performance index (IDSS) created by ANS aids the comparison of the different types of OPS that operate in the Brazilian supplementary health market. This is a global performance indicator used to establish a ranking among different providers, which helps to promote transparent and effective regulation with all stakeholders (Nunes, Brandão, & Rego, 2011).

The IDSS is an index that mathematically varies continuously in the interval [0, 1], formed by four dimensions, composed of 28 variables. These four dimensions were represented in 2018 by the health care quality index (IDQS), the guarantee of access index (IDGA), the index of sustainability in the market (IDSM), and the management and regulation index (IDGR).

Each of the dimensions that make up the IDSS also has a score limited to the closed continuous range between 0 and 1, receiving a weight as defined in Art. 12 of Normative Resolution ANS 423, of May 11, 2017. Table 1 shows the composition of the IDSS in 2018.

Table 1
Composition of IDSS in 2018

Dimension	Total variables	Weight	Score range	Maximum weighted score
IDQS	11	30%	Between 0 and 1	0.30
IDGA	6	30%	Between 0 and 1	0.30
IDSM	6	30%	Between 0 and 1	0.30
IDGR	5	10%	Between 0 and 1	0.10
Accredited providers	1	Extra score*		0.15
IDSS	**28**	**100%**	**Between 0 and 1**	**1.00**

Note: IDQS = *Índice de Qualidade na Atenção à Saúde* (health care quality index); IDGA = *Índice de Garantia de Acesso* (guarantee of access index); IDSM = *Índice de Sustentabilidade no Mercado* (index of sustainability in the market); and IDGR = *Índice de Gestão e Regulação* (management and regulation index). *The extra score to be added to IDSS depends on the maximum value of this indicator (=1).
Source: Adapted from ANS (2019)

It is worth noting that providers participating in the Provider Accreditation Program can receive an extra score of up to 0.15 in the final IDSS calculation. There are other bonuses within the scope of the four dimensions, which were created to induce the sector to adopt best practices (ANS, 2019). However, the extra scores are conditioned by the maximum value of this indicator, which is one. Thus, even if a certain provider complies with all the requirements imposed by the ANS and receives all possible extra scores, its IDSS will be limited to one.

Each IDSS dimension captures an aspect of supplementary health. The IDQS assesses the set of actions that contribute to meeting the health needs of beneficiaries, with an emphasis on promotion, prevention, and health care provided. IDGA analyzes the health plan providers' service coverage observing the network of service providers available to beneficiaries. IDSM monitors the health providers' sustainability, considering the economic and financial balance, the beneficiary's satisfaction, and commitments with service providers (doctors, for example). Finally, the IDGR measures compliance with technical and registration obligations of providers with the ANS (ANS, 2020).

The ANS created five score bands for the IDSS. Band 5 is the lowest and has a score ranging from 0.00 - 0.19; band 4 has a score ranging from 0.20 – 0.39; band 3 considers a score of 0.40 – 0.59; in band 2, the score goes from 0.60 – 0.79 and, finally; band 1 has a score of 0.80 – 1.00.

The IDSM is the only dimension that directly measures the contribution of accounting information to the composition of the IDSS. This can be demonstrated by the unfolding of this dimension, which is composed of six variables that have scores restricted to the closed interval between 0 and 1, namely: own resources index (health plan solidity); proportion of product registration technical notes with an atypical monthly fee (health plan price); preliminary intermediation notification resolution rate (resolution of customer complaints); general complaints index (general customer complaints); beneficiary satisfaction survey (customer satisfaction) and; prior annual authorization for moving the securities portfolio (financial management) (Table 2).

Table 2
Unfolding of IDSM in 2018

Variable	Score range	Weight	Accounting information
Health plan solidity	Between 0 and 1	5%	Yes
Health plan price	Between 0 and 1	5%	Yes
Resolution of customer complaints	Between 0 and 1	5%	No
General customer complaints	Between 0 and 1	5%	No
Customer satisfaction	Between 0 and 1	5%	No
Financial management	Between 0 and 1	5%	No
IDSM	**Between 0 and 1**	**30%**	

Source: *Research data*

Of the six variables that make up the IDSM, only the first two (a third) have a direct relationship with the accounting information of the supplementary health care providers (OPS). This means that accounting information is directly present in only 10% of the IDSS (30% of the IDSM multiplied by a third).

It is also worth emphasizing that the last variable of the IDSM, despite being known as "financial management," is nothing more than a prior authorization by the ANS for the OPS to move its securities portfolio. Thus, it does not capture the practical effects of accounting information.

In this sense, as the accounting content is represented in the IDSS by a portion of the IDSM, in theory, an efficient regulation should influence the production of accounting information in such a way that its users could rely on it to assess the OPS performance. This means that if the disclosed accounting information is useful and relevant to OSP users, it needs to explain part of what happens in the economic environment, going beyond the purely financial aspects of IDSS.

Thus, in practical terms, if the regulated accounting information is relevant enough to contribute to supplementary health in Brazil, it is expected that the OPS economic-financial indicators explain more than the 10% of accounting content present in the IDSS (or a third of the 30% weight of the IDSM). This situation would confirm the capacity of regulated accounting information to act as an instrument to reduce information asymmetry, providing benefits to its users. Thus, the following research hypothesis is proposed:

H1: OPS accounting information goes beyond the purely financial dimension, thus capturing part of these entities' economic and institutional environment.

3 Methodology

The study used public data available on the National Supplementary Health Agency's (ANS) website referring to the supplementary health performance index (IDSS) in 2018 (data from 2017) and the accounting statements of health providers for 2017. The health plan providers that do not take assistance risk and do not need to report their accounting information to the ANS were not considered in the analysis. From a total of 883 supplementary health care providers (OPS), 66 with missing data and 249 that exclusively operate dental plans were excluded – as noted by Soares (2006) OPS operating dental plans cannot be directly compared with the others. In addition, it was necessary to exclude an OPS that presented negative equity,

which would make the construction of two indicators unfeasible. Thus, the final sample was formed with 568 entities.

The first step consisted of selecting 22 independent variables, twelve of which were formed by economic-financial indicators that were suggested by authors such as Silva and Loebel (2016), Silva and Loebel (2017), and Bragança et al. (2019), which dealt with the supplementary health area. Four variables referred to the type of provider, following Sancovschi, Macedo, and Silva (2014) and Bragança et al. (2019). Finally, six variables were selected since they captured the effect of the OPS size. The use of the latter was inspired by work from other regulated sectors, such as Macedo and Cavalcante (2011), who studied the insurance sector, Cardoso et al. (2019) for the banking sector, and Teixeira and Rodrigues (2021) for the closed private pension sector. Table 3 summarizes the variables used in the study.

Table 3
Independent variables

Variable	Indicator	References
Claims retained divided by premiums paid (CR/PP) Administrative Expenses divided by premiums paid (AE/PP)	Operational	Silva and Loebel (2016); Silva and Loebel (2017); Bragança et al. (2019)
Current asset divided by current liability (CA/CL) Assets* divided by liabilities** [(CA+LTA)/(CL+NCL)] Availabilities divided by current liabilities (A/CL)	Liquidity	Silva and Loebel (2016); Silva and Loebel (2017); Bragança et al. (2019)
Net return per capita (NRPCRLpc) Net return divided by total assets (NR/TA) Net return divided by net equity (NR/NE)	Profitability	Silva and Loebel (2016); Bragança et al. (2019)
Liabilities** divided by total assets [(CL+NCL)/TA] Liabilities** divided by net equity [(CL+NCL)/NE] Current liabilities divided by total assets (CL/TA) Current liabilities divided by total liabilities (CL/TL)	Capital structure	Bragança et al. (2019)
Dummy self-managing (SelfM) Dummy medical cooperative (MCoop) Dummy philanthropy (PhilaT) Dummy insurance company specialized in health (InsurH)	Type of provider	Sancovschi, Macedo, and Silva (2014); Bragança et al. (2019)
Total population served by the OPS (Pop) Total assets (TA) Total expenses (TE) Administrative expenses (AE) Total revenues (TR) Premiums retained (PR)	Size	Macedo and Cavalcante (2011); Cardoso et al. (2019); Teixeira and Rodrigues (2021)

Note: * The term assets refers to the sum of current and long term assets
**The term liability refers to the sum of current and noncurrent liabilities
Source: *Research data*

Descriptive statistics of all variables were prepared, except for the dummy variables (Table 4). The highlight is the dependent variable to be evaluated, the IDSS. Its average value was 0.6283, indicating that Brazilian OPS tend to be in the second-highest band proposed by the ANS (0.60 - 0.79), with this value ranging from a minimum of 0.0283 to the highest possible score of 1.00.

Table 4
Descriptive statistics

Variable	Obs.	Mean	Standard deviation	Min.	Max.
IDSS	568	0.6283	0.1714	0.0283	1.0000
CR/PP	568	0.7861	0.1629	0.0266	2.0471
AE/PP	568	0.2639	0.8609	0.0131	15.0198
CA/CL	568	2.2818	2.9502	0.4672	55.6243
(CA+LTA)/(CL+NCL)	568	2.5999	3.4532	0.9732	53.2986
A/CL	568	0.1194	0.3794	0.0000	5.0141
NRPC	568	338.49	2,826.53	-6,691.93	63,968.80
NR/TA	568	0.0862	0.1416	-0.9858	1.1970
NR/NE	568	0.1602	0.8455	-14.1106	3.7567
(CL+NCL)/TA	568	0.5291	0.191	0.0188	1.0274
(CL+NCL)/NE	568	1.8446	3.2504	0.0204	47.5824
CL/TA	568	0.3942	0.1586	0.0177	1.0398
CL/TL	568	0.3941	0.1564	0.0189	0.9258
Pop	568	72,565	275,049.1	44	3,580,765
TA	568	1.97E+08	1.14E+09	6.24E+05	1.75E+10
TE	568	2.93E+08	1.40E+09	4.25E+05	2.12E+10
AE	568	2.74E+07	1.05E+08	3.14E+04	1.90E+09
TR	568	3.08E+08	1.45E+09	3.84E+05	2.20E+10
PR	568	2.71E+08	1.37E+09	7.72E+04	2.05E+10

Note: IDSS = *Índice de Desempenho da Saúde Suplementar* (supplementary health performance index). For the other variables, see Table 3
Source: *Research data*

However, as practically all the independent variables within each group of indicators were strongly correlated with each other – except for availabilities divided by current liabilities (liquidity) and net return per capita (profitability) – it was necessary to carry out factor analysis by principal components, with the variables of each group being combined into a single variable, which took the name of the group (i.e., operational; liquidity; profitability; capital structure; and size).

The goal of factor analysis is to group many variables correlated with each other. The factors combine the original variables, eliminating the correlation problem (Hair, Black, Babim, & Anderson, 2009). Furthermore, the main advantages of factor analysis are synthesizing variables that are strongly correlated with each other in a single factor and ensuring that the different factors created are weakly correlated, which eliminates multicollinearity (Fávero & Belfiore, 2017).

The second step was constructing an ordinary least squares econometric model, in cross-section, with the IDSS explained by the factor analysis variables, plus the control dummies for the type of OPS.

Subsequently, as the dependent variable is continuously expressed in an interval from zero to one, estimating a TOBIT model by maximum likelihood was necessary. This model is

used to solve restrictions in the sampling process that prevent the observation of the variable of interest in part of its domain, adopted for situations where there are accumulations of observations at a single point (Wooldridge, 2010).

This procedure is important because when there is more than one OPS in at least one of the two extremes of the IDSS (zero or one), what is known in econometric literature as the censored dependent variable problem may occur. According to Wooldridge (2010), censorship refers to a limitation imposed on the measurement of the dependent variable, preventing the observation of lower values (left censorship) and/or higher values (right censorship). This is the case for providers who obtained a maximum score on the IDSS without extra points.

In other words, if it were possible for an extra point to enter the IDSS calculation, some of the OPS could have a score greater than one (censored to the right). In this scenario, if there is a severe censorship problem, the TOBIT model is the most appropriate, as OLS estimates are biased and inconsistent (Wooldridge, 2010).

Thus, after the construction of the independent variables, Equation 1 summarizes the version of the exploratory regression model proposed to explain the IDSS:

$$IDSS_i = \beta_0 + \beta_1 Oper_i + \beta_2 Liq_i + \beta_3 Prof_i + \beta_4 CapStr_i + \beta_5 SelfM_i + \beta_6 MCoop_i + \beta_7 PhilaT_i + \beta_8 InsurH_i + \beta_9 Size_i + \varepsilon_i \quad (1)$$

where, the variables summarized by factor analysis were tested: operational (Oper); liquidity (Liq); profitability (Prof); capital structure (CapStr); size and; dummies self-managing (SelfM), medical cooperative (MCoop), philanthropy (PhilaT), and specialized health insurers (InsrH). As for the factors created by factor analysis, it is important to emphasize that they were all standardized, which eliminates any problems of different scales of the variables.

The estimated coefficients for the operational and capital structure variables are expected to be negative and significant, indicating that OPS with higher operational expenses and indebtedness or capital structure reflects inefficiency in the IDSS. The variable profitability is expected to be positive and significant, which would show that OPS economically and financially healthy tend to be in the IDSS highest bands.

In turn, the liquidity variable can be both positive and negative, and statistical significance is expected. Based on the classic definition of working capital, it can be positive, with current assets partially financed by noncurrent liabilities. It can be negative in cases where companies have negative working capital, and their long-term needs are partially financed with third-party capital. In this regard, Fleuriet, Kehdy, and Blanc (2003) observe this characteristic in companies from sectors with small margins, where having negative working capital would be seen as highly beneficial.

The variable size is expected to be positive and significant, indicating that the scale effect raises the score of the largest OPS in the IDSS compared to the smallest, reflecting customers' attraction and loyalty.

Regarding the dummy variables of the type of providers, we decided to adopt the providers in group medicine as the base category, as these had the lowest mean value for the IDSS calculated in 2018 (IDSS = 0.5399). Therefore, it is expected that the dummies included in the model should be positive and significant.

In short, verifying the coefficients of the variables described above is relevant to show which economic-financial indicators effectively contribute to portraying the informational capacity of financial reports in the Brazilian supplementary health sector.

However, the focal point of the analysis proposed in the study is the R^2 statistic, which indicates whether the accounting information has sufficient relevance to explain more than 10%

of the IDSS accounting content. In other words, if the R^2 of the regression presents a value greater than one-third of the 30% weight of the IDSM, which is the dimension that monitors the provider's sustainability, considering, among others, its economic-financial situation in the IDSS, this will show that regulated accounting information has the capacity to impact the economic environment of OPS.

4 Results and Analyses

The factor analysis by principal components resulted in factors that represent the dimensions operational, liquidity, profitability, capital structure, and size, which were used instead of the set of original variables to explain the IDSS in the regression models. Table 5 summarizes the factors created, the original variables, and the evaluated statistics to detect the reliability of factor analysis.

Table 5
Construction of explanatory variables through factorial analysis

Factor	Variable	Commonality	Factorial Load	Total Variance Explained	KMO*	Bartlett (p-value)
Operational	CR/PP	0.650	-0.806	65.01%	0.500	53.41 (0.000)
	AE/PP	0.650	0.806			
Liquidity	CA/CL	0.907	0.952	90.70%	0.500	614.38 (0.000)
	[(CA+LTA)/(CL+NCL)]	0.907	0.952			
Profitability	NR/TA	0.739	0.860	73.92%	0.500	147.01 (0.000)
	NR/NE	0.739	0.860			
Capital structure	[(CL+NCL)/TA]	0.734	0.857	87.29%	0.671	2,524.34 (0.000)
	CL/TA	0.945	0.972			
	CL/TL	0.939	0.969			
Size	Pop	0.902	0.950	94.54%	0.858	11,033.74 (0.000)
	TA	0.909	0.953			
	TE	0.986	0.993			
	AE	0.907	0.952			
	TR	0.985	0.992			
	PR	0.983	0.992			

Note: Variables described in Table 3
Source: *Research data*

The first analyses were related to the KMO sample adequacy and Bartlett's sphericity tests. According to Hair et al. (2009, p. 121) and Fávero and Belfiori (2017), for intercorrelations between the variables and the factor analysis, the KMO statistic must present greater values than or equal to 0.5, which occurred in the elaboration of all factors. In turn, Bartlett's sphericity test assesses the null hypothesis that the correlation matrix of variables is equal to the identity matrix, which is a more reliable statistic than the KMO test (Fávero & Belfiori, 2017). Thus, it can be observed that all the factors rejected the null hypothesis of this test at 5% significance.

According to Hair et al. (2009, p. 121), the commonalities should result in values greater than 0.5 for the factor solution to represent a significant portion of the variables' variance. The

commonalities in this study met this requirement for practically all the variables in the factors that emerged[1]. Furthermore, it was observed that the factor loadings were higher (in the module) than the value of 0.7, which according to Hair et al. (2009, p.119), reflects a well-defined structure – which is the goal of any factor analysis. Finally, all the factors had a total variance explained greater than 50%, which guarantees the quality of the factorial solution.

With factorial analysis ensuring the quality of the explanatory variables formed, it was possible to estimate Equation (1), firstly using the OLS technique and, later, using the TOBIT model, so that the results could be compared.

However, before reporting the results, it was necessary to analyze the behavior of the cross-section regression estimated by OLS for possible econometric problems inherent to the database, such as multicollinearity, normality, and heteroscedasticity.

About multicollinearity, the results for the VIF statistic indicated that none of the independent variables were correlated (VIF < 10), as expected by the definition of factor analysis. The VIF of the variables were as follows: operational (VIF = 1.12), liquidity (VIF = 1.44), profitability (VIF = 1.22), capital structure (VIF = 1.45), and size (VIF = 1.00).

Then, the Jarque-Bera test for normality was performed, revealing a p-value of 0.1078, which shows the impossibility of rejecting the null hypothesis of residuals normality at 5% significance. White's test to detect heteroscedasticity presented a p-value of 0.0601, making it impossible to reject the null hypothesis of homoscedasticity at 5% significance.

With all assumptions satisfied, we sought to verify through the OLS model whether the dependent variable IDSS can be explained to some extent by the independent variables obtained with the factors and dummies that portray the types of OPS. Table 6 presents the results.

When assessing the independent variables individually, it is possible to verify that all of them were positive or negative as expected and were statistically significant, except for profitability (not as significant) and the dummy for health insurers (InsurH) (different from what was expected, the dummy was negative and not as significant).

The negative operating expenses and capital structure shows that health care providers that show a lack of control in their operating expenses and a large indebtedness tend to have a lower IDSS than OPS that have greater operational discipline and lower indebtedness, which confirms the findings of Xavier, Souza, and Avelar (2019) and Bragança et al. (2019). While the former found that the decentralized action of the OPS increases operating expenses, the latter verified that the more indebted OPS are, the more prone they are to insolvency.

[1] The [(CL+NCL)/NE] was the only indicator not considered in the factor "capital structure" since the value of commonality, in this case, was 0.395.

Table 6
Results of regressions

Dependent variable (IDSS)	OLS model			Tobit model		
Independent variables	**Coefficient**	**Standard error**	**t-value**	**Coefficient**	**Standard error**	**t-value**
Constant	0.5526***	0.0117	47.0	0.5530***	0.0118	46.94
Operational	-0.0314***	0.0079	-4.35	-0.0316***	0.0072	-4.38
Liquidity	-0.0186**	0.0079	-2.36	-0.0187**	0.0079	-2.37
Profitability	0.0107	0.0069	1.55	0.0106	0.0069	1.54
Capital structure	-0.0316***	0.0081	-3.91	-0.0319***	0.0081	-3.94
Size	0.0390***	0.0069	5.63	0.0395***	0.0069	5.69
Dummy SelfM	0.0651***	0.0226	2.88	0.0645***	0.0226	2.85
Dummy MCoop	0.1303***	0.0151	8.66	0.1311***	0.0151	8.68
Dummy PhilaT	0.1147***	0.0321	3.58	0.1168***	0.0322	3.63
Dummy InsurH	-0.0636	0.0605	-1.05	-0.0662	0.0606	-1.09
	N of observations		568	N of observations		568
	F(9.558)		17.87	LR χ^2 (9)		142.86
	R^2		0.2237	Log likelihood		249.02

Note: ***Significant at 1%; **significant at 5%; *significant at 10%.
Source: *Research data*

As for size, the results show positive values, confirming that the largest OPS manage to convert these characteristics into efficiency gains, in the same way as other regulated sectors such as insurance (Macedo & Cavalcante, 2011), banking (Cardoso et al., 2019), and closed supplementary pension entities (Teixeira & Rodrigues, 2021).

Regarding liquidity, the variable was commonly negative, showing that OPS are entities with negative working capital, which is a typical characteristic of companies that work with small margins, according to Fleuriet, Kehdy, and Blanc (2003). This result corroborates the study by Araújo and Silva (2018), who found that OPS have worked on average with low-profit margins, even in an environment where welfare costs grow above inflation.

When analyzing the coefficients of the dummies for each type of provider, all of them were positive and significant, except for health insurers (InsurH). Self-managing providers (SelfM), medical cooperatives (MCoop), and philanthropic entities (PhilaT) tend to have a higher IDSS than OPS operating in group medicine (base category), which was expected, as this category presented the lowest mean for the IDSS calculated in 2018. This result confirms the study by Xavier and Souza (2020), who concluded that the worst economic and financial indicators were found for the category of OPS in group medicine.

In turn, the most important results were provided by the R^2 and the F statistic. While the latter had an F value = 17.87 (Prob = 0.0000), confirming that the independent variables together are significant to explain the variable dependent, the R^2 revealed a value of 0.2237 (22.37%). In other words, considering that the economic-financial dimension of the IDSS has a 10% weight in its composition, it appears that the economic-financial indicators manage to explain more than would be expected for its dimension, suggesting that the accounting

information is relevant for measuring broader aspects of the supplementary health sector than its own content.

Finally, the TOBIT model regression was also statistically significant for the set of explanatory variables, according to the statistic $\chi^2 = 144.46$ (Prob = 0.0000). However, as the Jarque-Bera test pointed to a normal distribution of data, it is possible to state that there is no relevant accumulation of lower and/or higher observations or left and/or right censorship, which is an argument in favor of the OLS model vis-à-vis the TOBIT model. Another important issue lies in the interpretation of the TOBIT model coefficients. Although they are similar to those obtained by the OLS model, they are not comparable, as neither are linear models.

The findings show that the data extracted from the financial statements published by the OPS regulated by the ANS are relevant and useful, as practically all the regression coefficients were significant and positive or negative as expected. This fact is corroborated by the explanatory power of the indicators in predicting the IDSS, which was around 22.4%, representing more than double the 10% of accounting information contained in the IDSS.

In other words, the results show that the OPS data and economic-financial indicators were jointly relevant to explain the IDSS, indicating that the accounting information can portray aspects of the supplementary health sector that go beyond the purely financial dimension, which confirms hypothesis H1.

The IDSS is a complex indicator formed of four dimensions and 28 variables (for example, rate of hemodialysis sections in patients with chronic kidney disease, preventive prenatal consultations, customer complaints index, and financial management). However, it was possible to observe that, when portraying around 22.4% of the IDSS, it is undeniable that the OPS accounting information can represent, at least partially, the sector's performance.

5 Final Considerations

This article analyzed the relationship between accounting information and the performance of supplementary health care providers (OPS) based on economic and financial indicators. We evaluated operational, liquidity, profitability, and capital structure indices, in addition to the influence exerted by the size and type of provider on the IDSS score (a proxy for OPS performance).

The results revealed that the OPS economic-financial indicators could explain around 22.4% of the providers' performance, portraying more than double the 10% of the IDSS accounting part. This finding does not allow rejecting hypothesis H1 of the study – the OPS accounting information captures part of these entities' economic and institutional environment, going beyond the financial dimension.

The findings are even more substantial when considering the article by Jesus et al. (2019), which used the IDSS (former IDEF) economic-financial dimension to explain each of the operational dimensions in force at that time – the IDAS (health care), the IDEO (structure and operation), and the IDSB (beneficiaries' satisfaction), obtaining an R^2 for each of these analyses of 5.1%, 8.2%, and 1.7%, respectively.

This study deepens the work of Jesus et al. (2019) and contributes to the literature by bringing strong evidence that OPS accounting information explains part of the supplementary health economic environment, surpassing more than twice the information in the IDSS. This shows its usefulness and the relevance of such information to OPS users.

The results also show that operational, liquidity, profitability, and capital structure indicators, in addition to characteristics such as the providers' size and type, can help compare

the different OPS that compete in the market, providing users with opportunities to make better choices about their supplementary health providers.

The regulation carried out by the ANS has influenced the production of quality OPS accounting information, benefiting users who intend to assess the performance of the supplementary health sector. This means that the universalization of information positively affects the economic environment of supplementary health, reducing unproductive costs and leveling the knowledge of OPS clients resulting in more rational choices.

One limitation of the work is the simplistic assumption that the IDSS can adequately capture the economic and institutional environment of OPS. In this sense, a proposal for future research lies in assessing whether healthcare providers are practicing earnings management in their claims provisions. This assessment can provide clues about the regulator's influence on the regulated company.

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