Risk Management and Healthcare Policy

Dovepress
Taylor & Francis Group

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ORIGINAL RESEARCH

Transforming Healthcare Through Value: A Fiscal Perspective on OECD Countries

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Background: Escalating healthcare expenditures pose a significant challenge to global fiscal sustainability. Value-based healthcare offers a strategy to improve health outcomes while controlling costs. This study examines the fiscal impacts of value-based healthcare in OECD countries, providing evidence of its role in enhancing fiscal efficiency.

Methods: This study employs three key approaches. A value-based healthcare index was constructed using the entropy weight method to measure performance across 32 OECD countries from 2000 to 2019. Econometric analysis using panel data models explored the fiscal effects of value-based healthcare. Contextual examination further assessed the interactions between value-based healthcare and factors such as government health expenditure, population aging, and elderly disease burden.

Results: The results show that higher value-based healthcare performance improves budget balance, reduces debt burden, and enhances fiscal sustainability. Interaction effects highlight the importance of government health expenditure and demographic factors in influencing fiscal outcomes.

Conclusion: This study demonstrates the fiscal benefits of value-based healthcare, emphasizing its potential to address healthcare inefficiencies and promote sustainable public finances. Policymakers should integrate value-based healthcare principles into healthcare systems while considering country-specific contexts to maximize long-term impact.

Keywords: value-based healthcare, public finance, OECD countries, empirical analysis, health economics, fiscal effects

Introduction

Healthcare spending has grown faster in recent decades, resulting in a serious challenge to fiscal sustainability.[1] According to statistics, the world spent $7.8 trillion on health in 2017, reaching almost 10% of global GDP, and health spending increased an average of 6% faster than GDP during the 2000–2017 period.[2] Healthcare expenditure is an important part of the fiscal budget. Governments need to balance their budgets between different areas of public services, and an increase in healthcare spending may mean a decrease in other areas, which means the crowding-out effects of healthcare on other social investments, such as education and infrastructure.[3] Even more so, if healthcare spending exceeds government revenues over time, it may lead to an increase in public debt, which in the long run may pose a risk to the fiscal balance and economic stability.[4] Governments seriously consider whether the current allocation of health care resources is reasonable, whether it is able to meet public health needs, and whether there is any wastage or uneven distribution of resources. The issue of fiscal efficiency in healthcare is increasingly receiving sufficient attention. The COVID-19 pandemic has further intensified these concerns, as unprecedented healthcare spending during the crisis placed significant strain on public budgets and highlighted the need for more efficient and resilient healthcare systems.[5]

As one potential solution to balance healthcare outcomes and the fiscal outcomes, value-based healthcare has been broadly embraced by healthcare systems across the world. Value-based healthcare aims to ensure that the healthcare

Received: 2 November 2024
Accepted: 5 February 2025
Published: 13 February 2025

system remains focused on the health outcome per unit of healthcare cost.[6] It is used as a strategy for healthcare reform or cost crisis response to align all the stakeholders in the system, centered around delivering value to patients.[7,8] It is widely recognized that value-based healthcare has contributed to good economic and social benefits,[9] such as value-based payment in the USA, universal health coverage in Germany.[10] In addition to the other previous literature, a series of studies have also demonstrated the achievements of value-based healthcare, such as improvements in patient satisfaction,[11] shortening hospital stays,[12] reducing health costs,[13] and decreasing the number of patients accessing skilled nursing facilities.[14] Thus, it can be seen that many practitioners, policy makers, and researchers have taken increasing interest in value-based healthcare for exploring and achieving value in healthcare.

Starting from then on, budget constraints have always been taken into consideration in the economic analyses of healthcare issues. At the level of government budget, the fiscal analytic framework of healthcare expenditures was formalized to measure the fiscal consequences.[15] In the existing relevant literature, deficit, debt and fiscal sustainability are the three dominant perspectives of public finance.[16–18] They actually seem to be internally correlated, because fiscal policy causes fiscal deficits, which are supported by debt financing, and the sustainable status of public debt directly affects the fiscal sustainability, these three representations are the same as one whole. Therefore, the budget balance, debt burden and fiscal sustainability can serve as a reliable measure of fiscal effect.

Some studies focus on the influence of contextual factors on healthcare quality improvement.[19] Although the fiscal effects of value-based healthcare has been widely considered, few empirical studies have focused on discussing its quantitative effects under the contextual factors. Generally speaking, value-based healthcare in practice has emphasized either healthcare outcomes or costs, rather than both.[20] This may be related to the broader healthcare system, demographics, and social context. Much of the literature suggests that population aging and the burden of disease are important forces of rising healthcare expenditures, and the structural ratios of healthcare expenditures directly affect the healthcare quality and healthcare coverage.[21,22] Therefore, the fiscal effects of value-based healthcare need to be discussed in these considered social contexts.

Although numerous studies have examined value-based healthcare from various perspectives, significant gaps remain in the literature. Existing research has largely focused on theoretical frameworks or case studies, with limited attention to the development of comprehensive measurement tools to assess value-based healthcare performance at a macro level. Additionally, the empirical investigation of the fiscal effects of value-based healthcare and its interactions with contextual factors, such as demographic changes and healthcare system characteristics, remains under-explored. To address these gaps, this study aims to construct a novel value-based healthcare index to evaluate its performance across OECD countries and to empirically analyze its fiscal implications. By incorporating macro-level contextual factors, this study provides a more comprehensive understanding of the mechanisms through which value-based healthcare influences fiscal sustainability, thereby offering new insights to inform policy design.

The remainder of this paper is structured as follows: Section 2 outlines the methodology, Section 3 presents the empirical results, Section 4 discusses the findings, and Section 5 concludes with implications and suggestions for future research.

Methods

In this study, we take three methods of index construction, econometric analysis and contextual examination to explore the relationship between value-based healthcare and fiscal consequences. The data sample is selected from 32 of 38 OECD countries during the period 2000 to 2019. Six countries (Colombia, Costa Rica, Estonia, Mexico, New Zealand, and Turkey) were excluded due to incomplete or unavailable data required for constructing the value-based healthcare index. The period from 2000 to 2019 was chosen to exclude the extreme impact of the COVID-19 pandemic on health care and fiscal trends.

Index Construction

Based on the value-based healthcare framework,[10] it has been proposed as a way to reduce healthcare costs and improve healthcare outcomes. It can therefore be expressed as Equation (1), in which *Healthcare Costs* can be directly measured by the single indicator of healthcare expenditures, while *Healthcare Outcomes* have multiple measures and need to be

represented by a synthetic index using multiple indicators.[23] Then we evaluate the value of different indicators of *Healthcare Outcomes* by the calculation steps of the entropy weight method as following.

$$Value\ based\ healthcare = \frac{Health\ care\ Outcomes}{Health\ care\ Costs} \tag{1}$$

Step 1. Collect the indicators. Recognizing quality, effectiveness, and accessibility as essential dimensions for measuring *Healthcare Outcomes*,[24] we selected specific measures within this theoretical framework in accordance with data availability and ability to quantitatively represent the underlying concept, as detailed in Table 1.

Step 2. Standardize the indicators. $Value_{i,j,t}$ is the original matrix to express every indicator, i is the ordinal number of countries, t is the time ordinal number, and j is the ordinal number of the eleven indicators ($1 \leq j \leq 11$). Finally, $C_{i,j,t}$ is for the standardized matrix, which is calculated by positive indicators as shown in Equation (2) and by negative indicators as shown in Equation (3).

$$C_{i,j,t} = \frac{Value_{i,j,t} - min\left(Value_j\right)}{max\left(Value_j\right) - min\left(Value_j\right)} \times 100 \tag{2}$$

$$C_{i,j,t} = \frac{max\left(Value_j\right) - Value_{i,j,t}}{max\left(Value_j\right) - min\left(Value_j\right)} \times 100 \tag{3}$$

Table 1 Descriptive Statistics of Healthcare Outcomes and Healthcare Costs

	Dimension	Indicator	Sign	(±)	Source	Obs	Mean	SD	Min.	Max.
Healthcare outcomes	Quality	Life expectancy at birth (years)	*LEX*	+	WDI	640	79.401	2.897	70.315	84.385
		Healthy life expectancy at birth (years)	*HLEX*	+	GHDx	640	68.757	2.267	61.280	73.843
		Adjusted net national income (current US$)	*GNI*	+	WDI	640	28,803	16,485	2,384	82,227
	Effectiveness	Neonatal mortality rate (per 1000 live births)	*NEW*	-	WHS	640	2.736	1.042	0.800	7.200
		Under-five mortality rate (per 1000 live births)	*CHD*	-	WHS	640	4.909	1.847	2.000	14.200
		Maternal mortality ratio (per100000live births)	*MAT*	-	WHS	576	7.386	5.954	2.000	35.000
		Disability-adjusted life years (years)	*DALY*	-	GHDx	640	29,768	5,067	19,530	49,226
	Accessibility	Universal health coverage index (0–100)	*UHC*	+	WHS	640	82.656	4.919	70.000	89.000
		Hospital beds (per 1000 people)	*BED*	+	WHS	601	5.006	2.706	2.040	14.690
		Physicians (per 1000 people)	*PHY*	+	WHS	564	2.805	1.263	0.892	6.353
		Nurses and midwives (per 1000 people)	*NUR*	+	WHS	523	7.382	4.760	1.747	19.461
Healthcare costs	Expenditure	Current health expenditure (% of GDP)	*CHE*		WDI	640	8.619	2.085	3.898	17.709

Notes: In the (±) column, + represents positive and - represents negative; In the Source column.
Abbreviations: WDI represents the World Development Indicators, WHS represents the World Health Statistics, GHDx represents the Global Health Data Exchange.

https://doi.org/10.2147/RMHP.S504275

Step 3. Transform the standardized results. Furthermore, transform the standardized matrix $C_{i,j,t}$ into the specific gravity variable $Q_{i,j,t}$ as shown in Equation (4), where m is the total number of sample countries and k is the total number of sample years.

$$\mathrm{Q}_{i,j,t} = \frac{\mathrm{C}_{i,j,t}}{\sum_{i=1,t=1}^{m,k} \mathrm{C}_{i,j,t}} \tag{4}$$

Step 4. Calculate the information entropy. is determined by Equation (5).

$$F_j = -[ln(mk)]^{(-1)} \sum_{(i=1,t=1)}^{(m,k)} Q_{(i,j,t)} ln Q_{i,j,t}, 0 \leq F_j \leq 1 \tag{5}$$

Step 5. Calculate the indicator weight. w_j is the weight of the indicator calculated by information gain d_j, as in Equation (6).

$$w_j = \frac{d_j}{\sum_{j=1}^{11} d_j}, d_j = 1 - F_j \tag{6}$$

Step 6. Calculate the value of *Healthcare Outcomes*. $HealthcareOutcomes_{i,t}$ is the measured scores of *Healthcare Outcomes* calculated according to Equation (7).

$$Health\ care\ Outcomes_{i,t} = \left(\sum_{i=1,t=1}^{m,k} C_{i,j,t}\ w_j \right) \times 100 \tag{7}$$

Step 7. Calculate the index *Value-based Healthcare*. The index *Value-based Healthcare* is calculated by substituting the results from Equation (7) into Equation (1).

Econometric Analysis

Based on the theoretical framework of fiscal sustainability and value-based healthcare,[25] we constructed a general econometric model to examine the relationship between value-based healthcare and fiscal outcomes.

The general econometric model was constructed as in Equation (8), where Y represents fiscal outcomes, X represents value-based healthcare, and Z represents the control variables. Meanwhile, β and γ denote the coefficient terms, α denotes the constant term, and ε is the error term.

$$Y = \alpha + \beta X + \gamma Z + \varepsilon \tag{8}$$

Contextual Examination

The emergence of value-based healthcare is rooted in fundamental shifts in global demographic and economic structures. Specifically, population aging has led to a rising burden of age-related diseases, which in turn has necessitated a transformation in healthcare financing models.[26] To further explore the role of contextual factors in shaping the relationship between value-based healthcare and fiscal outcomes, we extend our analysis by incorporating interaction terms for population aging, elderly disease burden, and health financing.

A separate econometric model incorporating interaction terms was further developed to examine the influence of contextual factors, as specified in Equation (9), where M represent the contextual factors, β'denotes the coefficient term of the contextual factors, the other parameters are consistent with those of Equation (8).

$$Y = \alpha + \beta'(X \times M) + \gamma Z + \varepsilon \tag{9}$$

Variable Explanation

The explained variable is fiscal outcomes, which has three measures in this study: Budget balance (*BLA*) represents the annual surplus of revenues and expenditures of the general government as a percentage of GDP. Debt burden (*DEB*) represents the gross debt of the general government as a percentage of GDP. Fiscal sustainability (*SUG*) represents

a sustainable government fiscal status that future revenues are able to finance future expenditures plus future interest payments on current public debt as in Equation (10),[27] where i denotes interest rate and t denotes year.

$$SUG_t = BLA_t + DEB_t - (1+i)DEB_{t-1} \tag{10}$$

The explanatory variable is value-based healthcare, which is measured by the calculated index *Value-based Healthcare* (*VBH*).

The control variables Z include a series of influencing factors for fiscal outcomes, such as labor force (*LAB*), gross capital formation (*CAP*), total factor productivity (*TFP*), urban population (*URB*), trade value (*TRD*), and employment population (*EMP*), were selected in the similar literature from social, economic, and demographic perspectives.[28–30]

The contextual factors M are referred to population aging, elderly disease burden, and health financing. Population aging (*OLD*) is included due to its direct impact on healthcare demand and costs, which can modify the effectiveness of value-based healthcare.[31] Elderly disease burden (*DALY65*) is a critical factor as it shapes the health system's priorities and resource allocation under value-based healthcare strategies.[32] Health financing (*GHE*) represents the commitment of public resources to healthcare, which interacts with value-based healthcare performance to influence fiscal sustainability.[4]

Table 2 Descriptive Statistics Indicators for Variables

	Variable	Indicator	Sign	Source	Obs	Mean	SD	Min.	Max.
Explained variable	Budget balance	General government deficit (% of GDP)	*BLA*	OECD data	640	−1.855	4.373	−32.100	18.500
	Debt burden	General government debt (% of GDP)	*DEB*	OECD data	640	75.989	42.339	11.376	234.801
	Fiscal sustainability	Fiscal sustainability gap (% of GDP)	*SUG*	Own	608	−3.287	6.763	−47.812	40.811
Explanatory variable	Value-based Healthcare	Value-based Healthcare index (0–100)	*VBH*	Own	640	4.453	1.278	1.500	9.933
Control variable	Labor	Labor force (% of total population)	*LAB*	WDI	640	66.824	2.445	59.425	73.414
	Capital	Gross capital formation (% of GDP)	*CAP*	WDI	640	23.070	4.251	10.217	43.821
	Technology	Total factor productivity index (0–100)	*TFP*	PWT 10.0	640	83.671	17.444	49.560	145.014
	Urbanization	Urban population (% of total population)	*URB*	WDI	640	76.633	11.657	50.754	98.041
	Trade	Trade (% of GDP)	*TRD*	WDI	640	97.485	58.730	19.798	408.362
	Employment	Employment population (% of total population)	*EMP*	WDI	640	55.863	6.398	38.010	76.850
Contextual variable	Health financing	Domestic general government health expenditure (% of current health expenditure)	*GHE*	WDI	640	6.049	1.647	1.962	9.927
	Population aging	Population ages 65 + (% of total population)	*OLD*	WDI	640	15.989	3.373	7.186	28.002
	Elderly disease burden	DALYs ages 65 + (% of DALYs all ages)	*DALY65*	GHDx	640	44.340	5.694	27.377	61.916

Notes: In the Source column, Own represents the original calculations for this study.
Abbreviations: WDI represents the World Development Indicators, PWT 10.0 represents the Penn World Table 10.0, GHDx represents the Global Health Data Exchange.

https://doi.org/10.2147/RMHP.S504275

The balanced panel data were collected from cross-country public databases such as the World Development Indicators (WDI) for economic metrics, the World Health Statistics (WHS) for health-related data, and the OECD data for healthcare system indicators. A summary of all variables, indicators, and their sources is provided in Table 2.

Results

The Measurements of Value-Based Healthcare

According to the steps of the entropy weight method as shown in Equations (2) to (7), the results of value-based healthcare index were calculated. Based on the results, we have constructed a scatter-plot with healthcare expenditures as the independent variable on the horizontal axis and the healthcare outcomes index as the dependent variable on the

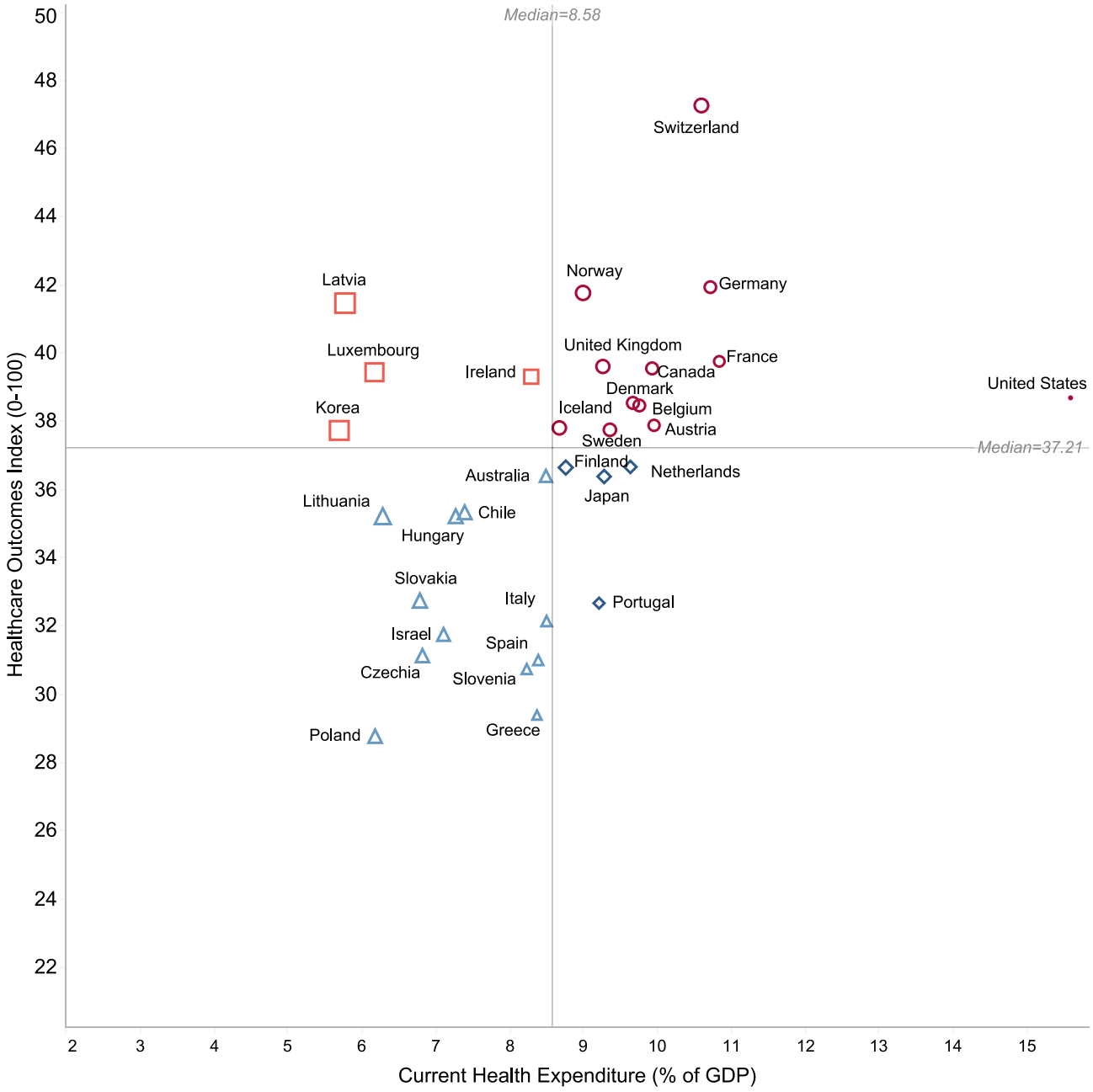

Figure 1 Classification of value-based healthcare by OECD countries.

vertical axis as shown in Figure 1. Each data point corresponds to a country, plotted based on its respective healthcare expenditure and outcomes. The size of the shape of the scatter represents the value-based healthcare index, reflecting the extent of the value-based healthcare in each country.

Based on the median values of both the horizontal (Current Healthcare Expenditure = 8.58) and vertical (Healthcare Outcomes Index = 37.21) coordinates, we can broadly categorize countries into four quadrants, each representing a different combination of healthcare costs and healthcare outcomes:

- Quadrant 1 (High costs, High outcomes): This category includes Austria, Belgium, Canada, Denmark, France, Germany, Iceland, Norway, Sweden, Switzerland, United Kingdom, and United States. These countries allocate substantial financial resources to achieve high health outcomes, indicating highly efficient yet resource-intensive systems.
- Quadrant 2 (Low costs, High outcomes): Countries such as Ireland, Korea, Latvia, and Luxembourg fall into this quadrant. They demonstrate strong healthcare efficiency by maintaining high health outcomes while keeping costs relatively low.
- Quadrant 3 (Low costs, Low outcomes): This group includes Australia, Chile, Czechia, Greece, Hungary, Israel, Italy, Lithuania, Poland, Slovakia, Slovenia, and Spain. These countries operate under resource-constrained healthcare systems where limited investment may lead to challenges in access, quality, and overall effectiveness, potentially resulting in unmet healthcare needs and poorer population health.
- Quadrant 4 (High costs, Low outcomes): Countries in this quadrant include Finland, Japan, Netherlands, and Portugal. Despite significant healthcare expenditures, these systems exhibit inefficiencies in resource allocation or systemic issues that prevent spending from translating into proportional health improvements.

In addition to be seen from the Figure 1, the majority of countries are clustered in Quadrants 1 indicating that many countries have different levels of efficiency problem between healthcare expenditures and healthcare outcomes.[33] Countries in Quadrants 3, such as Italy and Greece, have faced prolonged fiscal austerity and significant cuts to health spending after the European debt crisis, highlighting inefficiencies requires further investigation.[34] Countries located in Quadrant 2 are exemplary countries for value-based healthcare, such as Luxembourg, Latvia, Korea, and Ireland, show a good balance of healthcare expenditures and healthcare outcomes.[35] Countries in Quadrant 4, such as Portugal, Japan, Netherlands, and Finland, could be potential risks and hazards of their healthcare system management and resource allocation.[36]

The Fiscal Effects of Value-Based Healthcare

In the process of basic regression analysis, we employed an Ordinary Least Squares (OLS) model to step-by-step examine how value-based healthcare affects the budget balance, debt burden, and fiscal sustainability of public finance. To ensure the robustness of our results, we conducted the Wooldridge test for autocorrelation and the Breusch-Pagan test for heteroskedasticity. The findings are presented in Table 3.

Columns (1) to (3) indicate that the positive influence of value-based healthcare on the budget balance (*BLA*) is significant, with coefficients ranging from 0.718 to 1.202 at the 1% statistical level. This suggests that countries with more advanced value-based healthcare tend to have healthier budget balances.

Columns (4) to (6) reveal that the estimation results of value-based healthcare on reducing debt burden (*DEB*) is also significant, with coefficients of −15.818 to −11.043 at the 1% statistical level. This implies that countries implementing value-based healthcare are likely to experience a decrease in their debt burden, thus easing fiscal pressure.

Columns (7) to (9) show that the association between value-based healthcare and fiscal sustainability (*SUG*) is significantly positive, with coefficients of 0.391 to 0.947. This means that a higher level of value-based healthcare is linked to better fiscal sustainability.

To sum up, by gradually adding control variables and year-specific fixed effects to our regression models, we observed that the key coefficients became more pronounced and the models fit the data better. Meanwhile, the Wooldridge test and Breusch-Pagan test both return significant p-values for model assumptions, suggesting that our

Table 3 Estimation Results of Basic Regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Budget Balance (*BLA*)			Debt Burden (*DEB*)			Fiscal Sustainability (*SUG*)		
VBH	0.718***	1.290***	1.202***	−15.818***	−13.688***	−11.043***	0.391**	0.905***	0.947***
	(0.123)	(0.136)	(0.166)	(1.058)	(1.144)	(1.265)	(0.174)	(0.250)	(0.314)
LAB		−0.128**	−0.044		−4.416***	−2.521***		0.076	0.133
		(0.058)	(0.059)		(0.817)	(0.867)		(0.093)	(0.121)
CAP		0.173***	0.116***		−1.567***	−1.671***		0.189**	0.140
		(0.042)	(0.039)		(0.412)	(0.464)		(0.079)	(0.086)
TFP		0.113***	0.089***		−0.517***	−0.334***		0.098***	0.086***
		(0.014)	(0.015)		(0.085)	(0.093)		(0.021)	(0.025)
URB			0.029**			0.416***			0.010
			(0.014)			(0.124)			(0.026)
TRD			0.001			−0.150***			−0.003
			(0.003)			(0.022)			(0.005)
EMP			0.130***			−0.889***			0.087
			(0.023)			(0.245)			(0.077)
Constant	−5.051***	−12.547***	−23.639***	146.428***	514.882***	391.116***	−5.012***	−27.729***	−34.777***
	(0.572)	(3.709)	(3.957)	(5.439)	(55.731)	(58.190)	(0.843)	(6.347)	(8.394)
Year FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
R^2	0.044	0.417	0.456	0.228	0.400	0.443	0.005	0.201	0.208
N	640	640	640	640	640	640	608	608	608
Wooldridge Test			24.214***			24.365***			1.112
Breusch-Pagan Test			14.950***			69.270***			9.390**

Notes: *** $p < 0.01$ and ** $p < 0.05$; robust standard errors are shown in parentheses.

baseline models are almost entirely free from autocorrelation and heteroskedasticity concerns. These results show that value-based healthcare has a positive impact on budget balance and fiscal sustainability, while it also has a negative effect on debt burden. These results are remaining significant after considering changes over time and other elements that affect fiscal outcomes, such as labor, capital, technological progress, urban development, trade levels, and employment rates.

The Influence of Contextual Factors on the Fiscal Effects of Value-Based Healthcare

To further explore the influence of contextual factors on the fiscal effects of value-based healthcare, we estimate the interactive effect to investigate how value-based healthcare interacts with various contextual factors to influence the budget balance, debt burden, and fiscal sustainability of public finance. The results are detailed in Table 4.

Columns (1), (4), and (7) display the interaction effects of value-based healthcare with government health expenditure (*VBH*×*GHE*) on budget balance (*BLA*), debt burden (*DEB*), and fiscal sustainability (*SUG*), respectively. It is indicated that the integration of value-based healthcare with government health expenditure positively reinforces the budget balance and fiscal sustainability of countries.

Columns (2), (5), and (8) present the interaction of value-based healthcare with population aging population (*VBH*×*OLD*). The significant positive coefficients suggest that the implementation of value-based healthcare becomes increasingly important for maintaining budget balance and fiscal sustainability.

Columns (3), (6), and (9) show the interaction effects of value-based healthcare with disability-adjusted life years for individuals aged 65 and above (*VBH*×*DALY65*). The statistically significant impact is positive on budget balance (*BLA*) and fiscal sustainability (*SUG*), but negative on debt burden (*DEB*). It is implied that addressing the health concerns of the elderly through value-based healthcare has a substantial improving on budget balance and fiscal sustainability while reducing debt burden.

The regression analysis with interaction effects reveals that value-based healthcare not only directly impacts fiscal indicators but also interacts with contextual factors to influence budget balance, debt burden, and fiscal sustainability. The

Table 4 Estimation Results of Interactive Effect

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Budget Balance (*BLA*)			**Debt Burden (*DEB*)**			**Fiscal Sustainability (*SUG*)**		
VBH×OLD		0.063***			−0.119			0.070***	
		(0.010)			(0.102)			(0.015)	
VBH×DALY65			0.034***			−0.113***			0.031***
			(0.005)			(0.040)			(0.007)
VBH×GHE	0.013***			−0.031			0.012***		
	(0.002)			(0.019)			(0.004)		
LAB	0.045	0.172***	0.115**	−3.505***	−3.755***	−3.716***	0.202*	0.339***	0.265**
	(0.055)	(0.055)	(0.053)	(0.929)	(0.923)	(0.920)	(0.118)	(0.121)	(0.117)
CAP	0.143***	0.135***	0.111***	−2.276***	−2.287***	−2.119***	0.153*	0.134	0.125
	(0.039)	(0.038)	(0.037)	(0.473)	(0.469)	(0.467)	(0.087)	(0.084)	(0.085)
TFP	0.076***	0.086***	0.088***	−0.160*	−0.175*	−0.207**	0.077***	0.090***	0.088***
	(0.014)	(0.014)	(0.014)	(0.093)	(0.093)	(0.093)	(0.022)	(0.023)	(0.023)
URB	0.034**	0.054***	0.043***	0.257*	0.212*	0.242*	0.011	0.031	0.020
	(0.014)	(0.014)	(0.013)	(0.133)	(0.127)	(0.127)	(0.025)	(0.023)	(0.024)
TRD	−0.001	0.004	−0.001	−0.207***	−0.221***	−0.195***	−0.006	−0.003	−0.006
	(0.003)	(0.003)	(0.003)	(0.026)	(0.023)	(0.025)	(0.005)	(0.005)	(0.006)
EMP	0.135***	0.161***	0.147***	−0.926***	−0.975***	−0.967***	0.091	0.121	0.102
	(0.024)	(0.023)	(0.023)	(0.259)	(0.266)	(0.257)	(0.077)	(0.076)	(0.076)
Constant	−28.185***	−40.387***	−36.953***	429.073***	451.924***	459.035***	−38.622***	−52.505***	−46.460***
	(3.981)	(4.539)	(4.127)	(60.787)	(61.436)	(60.903)	(8.379)	(9.190)	(8.640)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.447	0.452	0.477	0.394	0.393	0.401	0.212	0.222	0.221
N	640	640	640	640	640	640	608	608	608

Notes: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$; robust standard errors are shown in parentheses.

significant interaction effects emphasis the importance of aligning value-based healthcare strategies with demographic and health-specific considerations.

Discussion

The findings from our empirical analysis provide valuable insights into the complex relationship between value-based healthcare and fiscal outcomes. Based on the value-based healthcare framework, we used the entropy method to develop a value-based healthcare index. This allowed us to systematically examine both the direct effects and contextual influences of value-based healthcare on budget balance, debt burden, and fiscal sustainability across OECD countries.

Our study reveals significant disparities in the efficiency of healthcare expenditures and outcomes among OECD countries. The clustering in Quadrant 1 highlights persistent inefficiencies in healthcare systems, potentially stemming from systemic issues such as inadequate resource allocation framework or the absence of outcome-based performance measures. Quadrant 2 countries, such as Luxembourg and Korea, demonstrate a balanced performance, which may be attributed to their strategic investment in preventive care and robust healthcare governance. In contrast, Quadrant 3 countries, including Italy and Greece, exhibit inefficiencies likely exacerbated by fiscal austerity measures post-economic crises. Our findings suggest that countries in Quadrant 4, such as Portugal and Japan, need to prioritize sustainable healthcare spending strategies to address potential risks in their system management. These findings align with previous studies emphasizing the impact of resource allocation efficiency,[37,38] while also highlighting unique risks faced by countries under prolonged fiscal constraints.[39,40]

Our results reveal that value-based healthcare is positively associated with both budget balance and fiscal sustainability, highlighting its role in promoting healthier fiscal positions and long-term stability. This supports the idea that value-based healthcare promotes more efficient resource allocation by reducing waste and optimizing healthcare expenditures.[41] These countries are likely to manage future healthcare costs and minimize inefficiencies more

effectively.[42] The negative association between value-based healthcare and debt burden highlights its potential to alleviate fiscal pressure by lowering overall debt levels.[43] Value-based healthcare is a crucial strategy for managing fiscal challenges arising from aging populations and rising healthcare costs.[44]

Our findings reveal a synergistic relationship between value-based healthcare and government health expenditure, suggesting that public investment in healthcare not only supports the foundational infrastructure necessary for value-based healthcare implementation but also amplifies its fiscal benefits. This synergy likely stems from the alignment between government spending priorities and value-based healthcare emphasis on preventive care and efficient resource use.[45] Moreover, the significant interaction effects with population aging or elderly disease burden underscore the critical need to tailor value-based healthcare strategies to the unique challenges of aging populations.[46] Specifically, aging societies face increasing demands for chronic disease management and eldercare, areas where value-based healthcare can deliver substantial efficiency gains by focusing on outcome-driven and cost-effective interventions.

The policy implications of our findings range widely. First, it is highlighted that the need to adopt and strengthen value-based healthcare principles within healthcare systems to improve fiscal efficiency. Second, it is emphasized that countries should pay attention to the value in their healthcare system, and keep gonging to improve the performance based on value-based healthcare framework. Third, our findings caution against a one-size-fits-all approach, advocating for context-sensitive strategies that consider each country's distinct healthcare systems, demographic profiles, and economic conditions.

Conclusions

This study provides empirical evidence on the fiscal benefits of value-based healthcare by examining its interactions with healthcare expenditures, demographic trends, and health-specific factors across OECD countries. By advancing our understanding of value-based healthcare in shaping public finances, this study contributes to the growing body of literature on sustainable healthcare financing. It also provides actionable insights for policymakers aiming to optimize healthcare efficiency while addressing the challenges of aging populations and rising healthcare costs.

There are also some limitations in our work. Firstly, this study focuses exclusively on 32 of the 38 OECD countries, which limits the generalizability of our findings to non-OECD countries. Additionally, while the value-based healthcare index provides a robust quantitative measure, it does not account for qualitative dimensions such as healthcare equity or patient satisfaction. Furthermore, the datasets covering the period from 2010 to 2019 do not account for the significant changes in healthcare systems brought about by the COVID-19 pandemic. Finally, our study did not explicitly analyze how differences in governance and cultural factors influence the implementation of value-based healthcare strategies, which may impact the applicability of our findings across countries.

Future research could explore the fiscal impacts of value-based healthcare in non-OECD countries, providing insights into its effectiveness in diverse economic and healthcare settings. Adding qualitative measures, such as patient satisfaction and equity,[47] would give a more complete understanding of value-based healthcare index. Research is also needed to examine how value-based healthcare strategies adapt to post-pandemic challenges. Lastly, longitudinal and dynamic modeling approaches could offer deeper insights into the long-term sustainability of value-based healthcare strategies.

Data Accessibility

The data are publicly available from the official website of the database involved in this study and are attainable from the corresponding author upon reasonable request.

Ethical Approval

This paper does not require ethical approval because no patient interventions or private data protection issues were involved.

Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

Funding

This study was funded by Chongqing Social Science Planning Project "Study on the Generation Mechanism of Health Dividend and Its Development Strategy in the Aging Society" (2023BS016), Chongqing Municipal Education Commission Research Project of Humanities and Social Sciences in 2024 "Estimation of Health Human Capital Stock in the Rapidly Aging Process and Its Impact on High-quality Economic Development" (24SKGH407), and Scientific Research Project of Chongqing Vocational Institute of Engineering (2024RWA01003).

Disclosure

The authors report no conflicts of interest in this work.

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