Fiscal Dependence and Spatial Spillovers in Public Healthcare Budget Allocation: Evidence from Vietnam

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ABSTRACT

This study employs the Spatial Durbin Model (SDM) to evaluate the impact of fiscal dependence and spatial spillover effects on public healthcare budget allocation decisions by provincial governments in Vietnam. Utilizing panel data of 63 provinces and municipalities over the 2015-2024 period, the empirical results indicate that fiscal dependence reduces the proportion of the budget allocated to local healthcare systems. Notably, the study provides empirical evidence of spatial spillover effects through the mechanism of inter-regional welfare burden sharing. When a locality faces fiscal constraints and limited healthcare provision capacity, the pressure from the influx of out-of-province patients forces neighboring localities to increase their healthcare expenditure shares to cope with localized overcrowding. Based on these findings. the study proposes reforming the budget allocation approach, emphasizing the necessity of an inter-regional fiscal coordination mechanism and the enhancement of local revenue autonomy.

Keywords: Fiscal dependence; Healthcare budget; Spatial Durbin Model; Spillover effects; Fiscal decentralization.

JEL Classification: H72; H77; I18; C21.

INTRODUCTION

In traditional quantitative analyses, provincial budget allocation decisions are typically estimated under the assumption that localities are independent entities, ignoring spatial interactions and externalities (Anselin, 2003; Elhorst, 2003). However, this study extends the conventional approach by examining the geographical and spatial linkages among provinces and municipalities in Vietnam. Economic activities, labor migration, and access to public services can transcend administrative boundaries, whereas budget management responsibilities remain organized locally within each jurisdiction. This discrepancy is particularly relevant to the healthcare sector: the location where the demand for medical services arises does not necessarily coincide with the location of economic activities that attract patients.

The context of this study stems from the interaction among fiscal conditions, population mobility and social welfare policies. Economic development and industrialization often induce labor migration, imposing substantial pressure on local governments to increase expenditure on infrastructure and essential public services (Zhang & Song, 2003; Zhuang, 2013). Furthermore, neighboring provinces are also affected when residents migrate or seek cross-border healthcare services. Conversely, when fiscal resources are constrained, local governments are compelled to restructure their budgets and these decisions can generate spillover consequences for adjacent regions due to yardstick competition and strategic interactions (Besley & Case, 1995; Brueckner, 2003). Although previous studies have highlighted the role of foreign direct investment (FDI) shocks on public expenditure structures (Kahn & Zimbalist, 2020) and their spatial spillover effects (Do et al., 2024; Wang et al., 2021), these models frequently overlook a critical constraint: the fiscal dependence of local governments. In practice, decisions to contract or expand local healthcare budgets are driven more by internal revenue autonomy than by external investment shocks. Moreover, under demographic pressures, these fiscal shortfalls not only impair local healthcare provision capacities but also

force residents to seek out-of-province medical services, thereby triggering strategic spillover effects to neighboring localities.

To address this literature gap, this study focuses on analyzing the impact of fiscal dependence and its spatial spillover effects on healthcare budget allocation shares. The central research question is: How does fiscal dependence affect healthcare budget allocation decisions within a locality and how do these effects spill over to neighboring provinces? To answer this, the study utilizes a panel dataset of 63 provinces and municipalities in Vietnam, applying the Spatial Durbin Model (SDM). The robustness of the model is also tested using an inverse distance spatial weight matrix.

The study provides three specific contributions to the field of inter-regional public finance. First, the study clearly disentangles intra-provincial impacts from spatial spillover effects across the geographic network. Second, the article evaluates fiscal dependence from the perspective of resource allocation shares rather than absolute expenditure figures, thereby clarifying how budget-constrained governments must trade off priorities. Third, the study contrasts findings derived from a contiguity matrix with those from a distance matrix to provide a comprehensive picture of healthcare burden sharing in Vietnam.

THEORETICAL FOUNDATIONS AND RELATED EMPIRICAL EVIDENCE

Theoretical foundations

Rooted in fiscal decentralization theory (Oates, 1999), granting autonomy to local governments aims to optimize the efficiency of budget allocation based on the needs of residents. However, in developing countries, this decentralization process is frequently accompanied by vertical fiscal imbalance, commonly referred to as fiscal dependence. This condition arises when local revenue capacity is insufficient to cover the growing expenditure demands, compelling local authorities to rely on central government transfers (Goodspeed & Zhang, 2024).

This internal fiscal dependence acts as a fiscal bottleneck in budget allocation. When fiscal space is restricted, local governments are compelled to restructure public expenditure. Since healthcare and medical services are sectors that require substantial recurrent maintenance funding, highly fiscally dependent localities tend to restrict investment expansion or even reduce the expenditure share allocated to the primary healthcare system. This financial constraint is further exacerbated by the impact of demographic pressure. An increase in the intra-provincial population size strongly drives the demand for medical services, leading to localized overcrowding at public hospitals and diminishing local healthcare provision capacity (Kahn & Zimbalist, 2020).

According to the First Law of Geography (Tobler, 1970). entities that are closer to each other always have stronger connections. In public financial management, this law is expressed through strategic interaction and spatial externalities. A province's budget allocation decision never happens independently; instead, it is observed, mimicked, and influenced by neighboring provinces (Besley & Case, 1995; Brueckner, 2003). For the healthcare sector, this spatial interaction has a unique feature: the sharing of the inter-regional social security burden. When a locality faces high fiscal dependence and a reduced capacity to provide healthcare services, its residents tend to travel to neighboring provinces for medical care. This cross-border movement of patients creates a direct spatial externality. shifting the financial burden from a poorer (or deficit) province to surrounding provinces with stronger fiscal conditions. To handle the influx of these patients, the receiving localities must increase their healthcare budget share to prevent their systems from being overwhelmed. Therefore, from a spatial perspective, a province's fiscal shortfall is not just a local issue; it also acts as a trigger for increased healthcare spending across neighboring provinces.

Empirical literature

Regarding intra-provincial impacts on budget allocation decisions, empirical studies have documented substantial evidence of bias in the structure of public expenditure under economic pressure. Based on data from 272 prefecture-level cities in China from 2006 to 2016. Goodspeed and Zhang (2024) point out that

soft budget constraints and fiscal deficits are the primary causes leading to distortion in revenue and expenditure policies. Exploring the impact of external shocks. Kahn and Zimbalist (2020) analyze 31 states in Mexico and find that pressure from investment flows forces governments to cut recurrent public expenditures to make room for short-term economic priorities. Specifically for the healthcare sector. Immurana et al. (2023) demonstrate a positive relationship between income conditions, improved healthcare affordability and the resulting reduction in infant mortality rates across 39 African countries. These studies uniformly agree that financial capacity and the scale of the local economy are the determining factors of the budget ceiling for social welfare objectives.

When incorporating geographical factors into the model, econometric evidence confirms that budgetary behavior exhibits significant spatial dependence. By applying the Spatial Durbin Model (SDM) to 30 provinces in China. Wang et al. (2021) found that fiscal competition not only biases local resource allocation but also generates a crowding-out spillover effect on investment in adjacent provinces. In Vietnam, several recent studies have also begun to focus on spatial characteristics. Vu (2023) confirmed that public investment has a positive spillover effect on the economic output of neighboring provinces. From a labor perspective. Do et al. (2024) indicated that labor migration creates spatial effects, propagating inter-regional wage inequality. Approaching from a demographic perspective. Hong and Cong (2024) demonstrated that population concentration is a primary driver shaping the spatial economic structure.

Although previous studies have confirmed the existence of spatial spillover mechanisms, the majority still approach fiscal expenditure as an aggregate variable or focus solely on macroeconomic growth indicators. Very few studies have examined how fiscal dependence affects the allocation of public healthcare budgets among adjacent localities. Filling this gap, through the application of the Spatial Durbin Model, will provide important empirical evidence regarding the inter-regional welfare burden-sharing mechanism in transitional economies.

DATA AND METHODOLOGY

Data

This study utilizes a panel dataset comprising all 63 provinces and municipalities in Vietnam over a 10-year period from 2015 to 2024. The data are systematically compiled from national databases, including the General Statistics Office (GSO) and the Ministry of Finance (MOF). To eliminate the impact of inflation, all monetary variables are adjusted and expressed in constant prices.

Variable Definitions

The dependent variable, the healthcare budget allocation share, is measured by the ratio of recurrent healthcare expenditure to total local balanced budget expenditure. This ratio effectively assesses the relative fiscal priority that local governments allocate to the healthcare sector among competing expenditure needs. The main independent variable, fiscal dependence, is calculated as the difference between total budget expenditure and domestic revenue, divided by total budget expenditure. To capture the demographic pressure on local public service provision, the model incorporates provincial population size. The remaining explanatory variables include the natural logarithm of realized FDI to proxy for external investment shocks and the natural logarithm of gross regional domestic product to control for the economic scale of each province. For observations with zero FDI, the standard transformation ln(FDI + 1) is applied to preserve the data structure during logarithmic conversion.

Table 3.1. Description of variables used in the study

Variable Type	Variable Name	Symbol	Unit of Measurement	Source
Dependent variable	Healthcare budget allocation share	HEA	Percentage (%)	Calculated from MOF and GSO data
Independent	Fiscal	VFI	Ratio	Author's calculation

variable	dependence			
Control variable	Realized foreign direct investment	Ln (FDI)	Natural logarithm converted from VND at constant prices	GSO
	Local economic scale	Ln (GRDP)	Natural logarithm of local economic scale at constant prices	GSO
	Provincial population size	Ln (POP)	Natural logarithm of provincial population size	GSO

Source: Author's compilation

Spatial weight matrices

To capture spatial interactions and fiscal spillover effects among the 63 provinces and municipalities, this study employs two types of row-standardized spatial weight matrices. The baseline matrix is the contiguity matrix, where $W1_{ij} = 1$ if province i and province j share an administrative border and 0 otherwise. This matrix assumes that fiscal interactions, policy mimicry and patient mobility are most pronounced among directly adjacent localities. To test the robustness of the results and verify whether spillover effects extend beyond contiguous borders, an inverse distance matrix is utilized. In this matrix, $W2_{ij} = 1/d_{ij}$,where d_{ij} represents the linear geographical distance between the administrative centers of province i and province j. The diagonal elements of both matrices are set to zero to eliminate self-correlation.

Research Methodology

To control spatial dependence in local fiscal behaviors, this study applies the Spatial Durbin Model proposed by LeSage (2008). The SDM is selected as the analytical framework because it simultaneously captures the spatial lag of the dependent variable (an endogenous interaction effect reflecting policy mimicry among neighboring provinces) and the spatial lags of the independent variables. The baseline SDM equation is specified as follows:

$$HEA_{it} = \rho \sum_{j=1}^{N} W_{ij} HEA_{jt} + \beta_1 VFI_{it} + \beta_2 ln(FDI)_{it} + \beta_3 ln(GRDP)_{it} + \beta_4 ln(POP)_{it} + \sum_{j=1}^{N} W_{ij} X_{jt}\theta + \mu_i + \lambda_t + \varepsilon_{it}$$

Where HEA_{it} is the healthcare budget share of province i in year t; W_{it} represents the elements of the spatial weight matrix; ρ is the spatial autocorrelation coefficient; X_{jt} denotes the vector of all explanatory variables in neighboring provinces j; β; θ are vectors of parameters to be estimated; μ_i and $\lambda_t$capture spatial and time fixed effects, respectively; and ε_{it} is the random error term.

Due to the presence of spatial feedback loops where a shock in province i affects province j and subsequently bounces back to province I, the point estimates of the SDM cannot be directly interpreted as marginal effects. Therefore, this study employs partial derivative matrices to decompose the estimates into three distinct components: direct effects, which measure the impact of a change in a local variable on the healthcare allocation of that same locality; indirect effects, which capture the influence of variables from neighboring provinces on the allocation of the observed locality; and total effects, which are the sum of the direct and indirect effects.

The estimation procedure follows a sequence of diagnostic tests. First, Moran's I statistics are employed to confirm the existence of global spatial autocorrelation. Next, the Hausman test is conducted to determine the appropriate choice between fixed effects and random effects models. Finally, Likelihood Ratio (LR) and

Wald tests are utilized to verify whether the generalized SDM can be reduced to either the Spatial Autoregressive (SAR) model or the Spatial Error Model (SEM) without compromising model fit.

RESEARCH RESULTS AND DISCUSSION

Research results

Table 4.1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
HEA	630	0.053	0.019	0.012	0.115
VFI	630	0.139	0.871	-5.306	0.907
Ln(FDI)	630	6.384	2.800	0.000	10.909
Ln(GRDP)	630	10.728	0.912	8.666	13.973
Ln(POP)	630	6.524	0.580	4.942	8.467

Source: Extracted from STATA 17

Table 4.1 presents the descriptive statistics of the variables in the model with 630 observations. The healthcare budget allocation share (HEA) has a mean value of 0.053, ranging from 0.012 to 0.115. The fiscal dependence variable (VFI) has a mean value of 0.139, with a maximum of 0.907 and a minimum of -5.306. The natural logarithm variables of foreign direct investment (Ln(FDI)), local economic scale (Ln(GRDP)) and population size (Ln(POP)) have mean values of 6.384, 10.728 and 6.524 respectively.

Table 4.2: Correlation matrix and multicollinearity

Variable	HEA	VFI	Ln (FDI)	Ln (GRDP)	Ln (POP)	VIF
HEA	1.0000					
VFI	0.351*** (0.0000)	1.0000				2.74
Ln (FDI)	-0.456*** (0.0000)	-0.568*** (0.0000)	1.0000			2.21
Ln (GRDP)	-0.460*** (0.0000)	-0.765*** (0.0000)	0.740*** (0.0000)	1.0000		6.78
Ln (POP)	-0.186*** (0.0000)	-0.459*** (0.0000)	0.574*** (0.0000)	0.781*** (0.0000)	1.0000	2.92
Mean VIF						3.66

Note: ***; **;* represent statistical significance at the 1%; 5%; and 10% levels respectively.

Source: Extracted from STATA 17 software

Table 4.2 presents the correlation matrix and multicollinearity test among the independent variables. The results indicate that the variables VFI; Ln (FDI); Ln(GRDP) and Ln (POP) all exhibit a linear correlation with the dependent variable HEA at the 1% statistical significance level. The mean Variance Inflation Factor (VIF) of the model is 3.66 with the highest VIF values observed for the VFI (2.74) and Ln(GRDP) (6.78) variables. All VIF coefficients are below 10, demonstrating that multicollinearity is not a severe issue and does not compromise the reliability of the estimation model.

Table 4.3: Moran's I spatial autocorrelation test results

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
HEA	3.57* (0.059)	6.84*** (0.009)	3.73* (0.053)	12.19*** (<0.001)	8.17*** (0.004)	4.5** (0.034)	2.93* (0.087)	3.62* (0.057)	4.73** (0.030)	12.73*** (<0.001)

Note: ***;**; * represent statistical significance at the 1%; 5%; and 10% levels respectively.

Source: Extracted from STATA 17 software

Table 4.3 presents the Moran's I spatial autocorrelation test results for the HEA variable over the 2015-2024 period. The test results indicate that the Moran's I statistics are positive and statistically significant across all years. This confirms the existence of positive spatial autocorrelation regarding the healthcare budget allocation share among localities throughout the study period. Therefore, applying spatial econometric models to control this effect is necessary and appropriate.

Table 4.4: Spatial model testing and selection results

Test type	Statistical criteria	Healthcare budget allocation share
Hausman test	$\chi 2$ value	60.62
FE vs RE model selection	p-value	0.0000
Conclusion		Select FE
LR test (SDM vs SAR)	LR $\chi 2$ value	12.28**
	p-value	0.0154
Conclusion		Reject SAR
LR test (SDM vs SEM)	LR $\chi 2$ value	8.24*
	p-value	0.083
Conclusion		Reject SEM
Overall conclusion		SDM (Fixed effects)

Note: ***;** ; * represent statistical significance at the 1%; 5% and 10% levels respectively.

Source: Extracted from STATA 17 software

Table 4.4 presents the diagnostic steps for selecting the appropriate spatial model. First, the Hausman test yields a p-value of 0.0000 (less than 0.01), rejecting the null hypothesis and thereby confirming that the fixed effects (FE) model is more suitable than the random effects (RE) model. Next, the Likelihood Ratio (LR) test is employed to compare the Spatial Durbin Model (SDM) with two reduced models, SAR and SEM, The LR statistics are 12.28 (p-value = 0.0154) and 8.24 (p-value = 0.083), respectively, allowing for the rejection of the SAR model at the 5% significance level and the SEM at the 10% significance level. Based on these results. the SDM with fixed effects is selected as the optimal model for analysis.

Table 4.5: Baseline estimation results of the Spatial Durbin Model

Variable	Healthcare budget allocation share
VFI	-0.008*** (0.000)
Ln (FDI)	0.0006 (0.177)
Ln (GRDP)	-0.022*** (0.000)
Ln (POP)	0.0008 (0.725)
Wx VFI	0.0115*** (0.001)
W x ln (FDI)	0.0003 (0.608)
W x ln (GRDP)	0.0076 (0.156)
W x ln(POP)	- 0.0002 (0.968)
ρ	0.2221***

	(0.000)
Observations	630
R^2	0.2046
Wald test (Spatial terms)	28.75 (0.000)

Note: ***;**; * represent statistical significance at the 1%; 5%; and 10% levels respectively.

Source: Extracted from STATA 17 software

Table 4.5 presents the baseline estimation results of the SDM model. The Wald test is statistically significant at the 1% level (p = 0.000). affirming the suitability of incorporating spatial factors into the model. The spatial autocorrelation coefficient ρ has a positive value (0.2221) and is statistically significant at the 1% level, demonstrating the existence of a positive spatial spillover effect: a province's healthcare budget allocation share is positively influenced by the budget allocation decisions of neighboring provinces.

Regarding the spatial interaction effects of the independent variables, the Wx VFI variable has a positive coefficient (0.0115) and is statistically significant at the 1% level.

Table 4.6: Test results of the SDM model

Variable	Direct effect	Indirect effect	Total effect
VFI	-0.0073*** (0.000)	0.0120*** (0.006)	0.0047 (0.324)
Ln (FDI)	0.0006 (0.164)	0.0006 (0.494)	0.0012 (0.265)
Ln (GRDP)	-0.0219*** (0.000)	0.0034 (0.528)	-0.0185*** (0.000)
Ln (POP)	0.0008 (0.728)	0.0000 (0.995)	0.0008 (0.880)

Note: ***;** ; * represent statistical significance at the 1%;5% and 10% levels respectively.

Source: Extracted from STATA 17 software

Due to the characteristics of the SDM model, the effects of the variables are decomposed into direct, indirect and total effects. For fiscal dependence (VFI): The direct effect is negative (-0.0073) at the 1% significance level, meaning that the higher the intra-provincial fiscal dependence, the more the healthcare budget allocation share shrinks within that locality. Conversely, the indirect spillover effect of VFI is positive and statistically significant at the 1% level. This confirms the inter-regional burden-sharing mechanism: the fiscal shortfall of neighboring provinces creates externality pressure, forcing the observed locality to increase its healthcare expenditure share. For economic scale (Ln(GRDP)):

This variable has a direct effect (-0.0219) and a total effect (-0.0185), both of which are negative at the 1% significance level, reflecting the tendency that provinces with larger economic scales often allocate a relatively lower share to the healthcare budget. Other factors: Foreign direct investment (Ln(FDI)) and population size (Ln(POP)) do not show statistically significant impacts on the healthcare expenditure share.

Table 4.7: Robustness test results of the SDM model

Variable	Direct effect	Indirect effect	Total effect
VFI	-0.0067*** (0.000)	0.0357** (0.019)	0.0290* (0.060)
Ln (FDI)	0.0006 (0.169)	0.0052 (0.206)	0.0058 (0.168)
Ln (GRDP)	-0.0195***	-0.0089	-0.0285***

	(0.000)	(0.331)	(0.000)
Ln (POP)	0.0016 (0.476)	-0.0224 (0.257)	-0.0209 (0.303)

Note: ***,**, * represent statistical significance at the 1%,5% and 10% levels, respectively.

Source: Extracted from STATA 17 software

Table 4.7 presents the robustness test results of the SDM model by substituting the baseline matrix with an inverse distance matrix (W2). The impact decomposition results demonstrate high consistency with the baseline model (W1): the VFI variable maintains a negative direct effect of -0.0067 at the 1% significance level and a positive indirect effect of 0.0357, with a p-value = 0.019. The Ln(GRDP) variable continues to exhibit a negative direct effect of -0.0195 (p-value = 0.000) and a negative total effect (-0.0285. p = 0.000). This confirms that the impact mechanisms of fiscal dependence are robust and remain unaffected by the method used to define spatial distance.

DISCUSSION OF RESEARCH RESULTS

The estimation results from the Spatial Durbin Model provide important empirical evidence, shedding light on the provincial healthcare budget allocation mechanism in Vietnam from the perspective of spatial interaction. These findings not only contribute to the theory of local public finance but also profoundly reflect the practical context of a transitional economy.

First, fiscal dependence acts as a barrier to the intra-provincial healthcare budget space. The results indicate that the fiscal imbalance ratio has a negative direct effect, statistically significant at the 1% level, on the healthcare budget allocation share. This finding is entirely consistent with the hard budget constraint theory. In Vietnam, many localities have a weak domestic revenue capacity, relying heavily on central government transfers to ensure recurrent expenditure mandates. When facing internal fiscal deficits, local governments are forced to restructure their spending priorities. Because healthcare is a sector requiring substantial and continuous maintenance resources, highly fiscally dependent provinces tend to reduce the allocation share for their grassroots healthcare networks. This reflects the financial capacity constraints of many localities in upgrading medical examination and treatment infrastructure when their fiscal space is limited.

Second, healthcare burden-sharing occurs through spatial spillover mechanisms. The indirect effect of VFI is positive and highly statistically significant in both the contiguity and distance matrix structures. This result provides robust quantitative evidence of spatial spillover effects, which may be partly explained by inter-provincial patient mobility. In practice in Vietnam, when a province's healthcare provision capacity is weakened due to budget constraints, residents tend to bypass local facilities and travel to provincial or regional hospitals in neighboring localities with better infrastructure to seek medical services. This influx of out-of-province patients creates externality pressure, forcing the receiving localities to increase their healthcare budget share to prevent overcrowding and maintain the system. This mechanism confirms that, from a spatial perspective, the weakness in healthcare finance of one province is never isolated; rather, it continuously translates into a fiscal burden for the entire network of adjacent provinces. Although inter-provincial patient mobility represents a plausible mechanism explaining the positive spatial spillover effect of fiscal dependence, this mechanism has not been directly examined due to the unavailability of patient flow data. Future research could incorporate actual inter-provincial patient mobility data to provide further empirical validation of this mechanism.

Third, the shift in priorities during economic growth. The negative direct and total effects of economic scale indicate that as the local economy expands, the proportion allocated to healthcare within the total budget tends to shrink relatively. This does not imply a decrease in the absolute amount spent on healthcare but rather reflects a structural shift in resource allocation. On the one hand, during the rapid growth phase, localities often prioritize budgets for hard infrastructure projects to attract investment, thereby squeezing the share for healthcare. On the other hand, this relative decline also stems from the robust development of the private healthcare sector in provinces with large economic scales. As living standards rise, citizens

increasingly opt for private or socialized healthcare services, which in turn alleviates the direct pressure on the public healthcare provision system and state budget space.

Finally, the neutrality of external investment shocks and local demographic pressures. Contrary to conventional perspectives, this study finds no statistically significant evidence regarding the impact of FDI and population size on the healthcare budget allocation share. In the context of Vietnam, FDI inflows are primarily channeled into the industrial manufacturing sector and are often accompanied by tax incentives and exemptions. Consequently, they do not immediately generate a sudden revenue surge that local governments can translate into healthcare budgets. Similarly, a large population size alone does not appear to carry sufficient weight to alter the expenditure structure if the locality itself has not yet resolved the issue of revenue autonomy.

CONCLUSION AND POLICY IMPLICATIONS

This study applies the Spatial Durbin Model (SDM) to analyze the impact of fiscal dependence on public healthcare budget allocation decisions across 63 provinces and municipalities in Vietnam during the 2015-2024 period. The empirical results confirm that intra-provincial fiscal dependence acts as a primary constraint, shrinking the local fiscal space for healthcare. More importantly, the study provides evidence of spatial spillover effects in social welfare burden-sharing: a fiscal shortfall and weakened healthcare provision capacity in one locality create an externality pressure, forcing neighboring provinces to increase their healthcare budget allocation share to cope with the influx of inter-provincial patient mobility.

Based on the empirical findings, this study proposes several policy implications to optimize healthcare budget allocation within the practical context and legal framework of Vietnam:

First, reforming the criteria and norms for budget allocation: Under current regulations, the allocation norms for recurrent healthcare expenditure are primarily based on intra-provincial population size. However, the research results indicate that healthcare pressure exhibits spatial spillover characteristics. Therefore, in subsequent budget stability periods, the National Assembly and the Government should incorporate the inter-regional patient volume criterion as an incremental coefficient when calculating budget allocation norms for localities hosting clusters of end-line hospitals (such as Hanoi, Ho Chi Minh City, Thua Thien Hue, Da Nang and Can Tho). This aims to compensate for the infrastructure costs these localities bear due to spatial externalities.

Second, flexibly utilizing the targeted transfers mechanism from the Central Budget: Because the 2015 State Budget Law does not allow localities to directly use their own budgets to finance the mandates of other localities, the Central Budget must play the primary coordinating role. Instead of an across-the-board allocation, the Central Government should prioritize targeted transfers to support healthcare investment in areas experiencing significant spillover pressure, creating healthcare buffer zones to relieve the burden on major medical centers. Simultaneously, there is a need for a mechanism to integrate resources between the State Budget and the Health Insurance Fund for reinvesting in infrastructure at cross-provincial patient mobility hotspots.

Third, expanding fiscal space coupled with revenue decentralization: In the long term, to address internal fiscal deficits that lead to the contraction of grassroots healthcare budgets, the upcoming revision of the State Budget Law should reconsider the sharing ratio of revenues distributed between the Central and local governments. Granting more stable revenue-generating space will help local governments reduce their fiscal dependence, thereby becoming more proactive and responsible in maintaining and expanding the expenditure ceiling for their local healthcare systems, effectively preventing the effect of pushing patients to neighboring provinces.

Despite achieving significant results, the study still exhibits certain limitations regarding the spatial approach. which simultaneously opens up avenues for future research. While the contiguity matrix and the linear geographical distance matrix reflect and control for basic physical interactions, they have yet to incorporate economic distance weight matrices or integrate actual data on inter-regional traffic flows. In

practice, fiscal externalities and patient mobility flows are transmitted not only through simple geographical borders but also depend on the degree of economic integration and the connectivity of transportation systems among provinces. Therefore, future studies could further refine the analysis by constructing and applying non-traditional spatial matrix structures or socio-economic matrices to more accurately and comprehensively measure the spillover mechanisms of provincial healthcare burden-sharing.

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