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THE EFFECT OF INCENTIVES FOR LAND AND BUILDING TAX ON RURAL AND URBAN AREAS TO BUDGET SOLVENCY DURING DISASTERS IN INDONESIA REGENCIES

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Abstract

The recent publication of the World Risk Index placed Indonesia as the third country with the highest disaster risk worldwide. The valuation formulates a risk index according to the country's exposure to natural disasters and coping abilities to hazards. Indonesia is appraised as the fifth country with the highest exposure to natural disasters, with a medium coping ability. The condition could worsen if the subnational government as first responders during a disaster do not have available fiscal capacity. Indonesia's central government focuses on strengthening disaster resilience through the implementation of the Disaster Risk Financing and Insurance Strategy. One of the main strategies is to promote household insurance. However, the role of subnational government is yet to be explored. The policy alternative is to provide incentives on property taxes. This research aims to describe the correlation between property tax incentives and subnational government fiscal conditions as an answer to the possibility of using property tax incentives to promote disaster resilience while maintaining fiscal balance. The novelty of this research resides in the aggregate analysis of property tax incentives in 21 municipalities in relation to its disaster resilience policy scope. Based on the analysis, property tax stimulus is not endangering the subnational fiscal condition. Hence is a safe policy alternative to further used as a disaster resilience policy.

Keywords: Disaster Resilience; Fiscal Health; Property Tax.

Introduction

The geographical condition of Indonesia has been a spotlight on the disaster risk management discourses . Indonesia's acknowledged ring of fire geographical position predominantly bears the risk of natural disaster, even more so with the rising uncertainty related to climate change. The recent publication of the World Risk Index placed Indonesia as the third country with the highest disaster risk worldwide (Bündnis Entwicklung Hilft Ruhr University Bochum – Institute for International Law of Peace and Conflict, 2022). The valuation formulates a risk index according to the country's

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exposure to natural disasters and coping abilities to hazards. Indonesia is appraised as the fifth country with the highest exposure to natural disasters, with a medium coping ability.

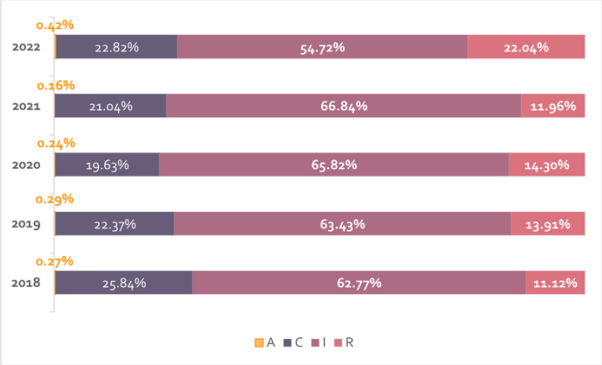
The economic performance of Indonesia has been affected significantly by earthquakes. (UNDRR, 2020) reported around US$11.7 billion in losses from 97 earthquakes between 1970 to 2015 in Indonesia. Notable disasters among others are the Yogyakarta earthquakes in 2006 resulted in US$ 3,1 Billion appraised losses, the West Sumatra earthquakes burden the economy with around US$ 2,2 Billion losses in 2009, and the Lombok earthquakes contribute to US$ 530 Million in economic losses. Indonesia has spent approximately US$ 300-500 million annual budget on disaster-related reconstruction. Furthermore, the spending can reach 0,3 percent of the Gross Domestic Products (GDP). Focusing on micro-economic impact, disasters also bring notorious effects on household economies. (UNDRR, 2020) mentioned the potential disruptions in education, infrastructures, markets, hospitals, and livelihood. These disruptions contribute to rising poverty and malaise. (UNDRR, 2020) reports the improvement in Indonesia's capacity and planning to prepare better responses after disaster strikes. The improvement in preparing on-call funds (dana siap pakai) in the national budget is considered the right proactive risk financing system. Yet the timing alignment of budget preparation and disaster events could bring fragility to the reliance on such mechanisms. To complicate more, there are still discrepancies between the average cost and the availability of the on-call funds in the budget. The Ministry of Finance of Indonesia stated between 2000-2016, average losses on disasters reach Rp22,8 trillion annually, yet the on-call budget was only available around Rp3,1 trillion annually. (UNDRR, 2020) also mentioned that there are differences between national and local capacities to respond to disaster events. The level of risk exposure in Indonesia varies between local communities and geophysical conditions. There are also challenges in coordination between inter-level of governments and international organizations. Each level of governments has their disaster management organizations, policies, and budgets. Another issue arises with the disparities in financing capacities between the National Disaster Management Agency and local governments. (UNDRR, 2020) reported that municipalities are the first responders to disasters, unless the events categorized as exceeding their capacities. Such arrangements bring heavy reliance on budget allocations to the central government.

The issues of variative exposure, capacity, and coordination bring difficulties for the local government to deliver their disaster risk management-related responsibilities. The ideal recovery is expected to not only restore the conditions before disaster strikes. It also needs to develop improvements in physical systems as much as institutions and governance to further improve accountability. Hence the focus on the ability to counter the negative impacts of disaster should be considered thoroughly, not only for the institutions of the central government but also in the local hierarchy. (UNDRR, 2020) mentioned several issues to be addressed including information utilization in the local context to provide more background data for vulnerability analysis. The other issue is the funds' limitation which concentrated on the reconstruction and rehabilitation. The quality and enforcement of infrastructure and building codes are needed in adjustment to disaster

risk unique to local characteristics. The interconnected responsibilities of disaster risk reduction are also an area to be improved.

On a national level, Indonesia published the Disaster Risk Financing and Insurance (DRFI) Strategy during the IMF-WBG Annual Meeting 2018 to achieve disaster risk resilience. DRFI Strategy combines instruments to fine-tune the disaster risk financial resilience by formulating milestones for an enhanced financial resilience dimension of disaster risk management. Such milestones include risk retention mechanisms such as national and local budget refining, providing contingent financing sources, and forming a Disaster Pooling Fund or Pooling Fund Bencana (PFB). The Risk Transfer mechanism is also planned by formulating mechanisms for state-owned assets disaster insurance and promoting household disaster insurance. The possibility to form catastrophic insurance or financing is also included. During years of implementation, the DRFI Strategy has already been implemented by reformulating budget tagging on disaster risk management, piloting projects on state-owned assets insurance, and the formation of Pooling Fund Bencana (PFB). Up to the present time, the promotion of household insurance mechanisms is still in process. Based on Earthquake Insurance Statistics published by PT Reasuransi MAIPARK (2022), disaster insurance especially earthquake insurance in a rebound position based on the exposure of insurance policies. During the underwriting year of 2018 to 2020, earthquake insurance exposures are declining as the COVID-19 pandemic hit Indonesia. The rebound happened in the 2021 underwriting year with an 11,8% increase in exposure and 12,65% premiums. However, the industrial sector occupancy is still dominating the earthquake insurance exposure. The residential and agriculture sectors which consist of the most vulnerable only occupied 22,26% and 13,31% respectively. These conditions depict the need for more effort to incorporate household exposure in earthquake insurance.

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Earthquake insurance exposure based on sectors in Indonesia



Source: (PT Reasuransi MAIPARK Indonesia, 2022)

The development of household insurance mechanisms through consequential incentives is yet to be a mainstream study in Indonesia. There are significant research gaps on the issue of catastrophe risk finance and insurance (Adhasara et al., 2022).

(Dubelmar et al., 2021) proposed that community participation in insurance could be increased by subsidies for the insurance premium. Such subsidies can be introduced in the form of tax instruments such as allowances on income tax for the demand side, and incentives for the industry supply side to increase financial inclusion. Furthermore, (Dubelmar et al., 2020) also propose that the tax allowance on donations and zakat as stipulated in law no. 36 of 2008 on income tax may be adopted. Another financing option such as PBB P2 (land and building tax on rural and urban areas) could also have a probability to be utilized as an option for natural disaster financing. The nature of the Land and Building Tax on Rural and Urban Areas as a local tax could overcome the differences in the level of natural disaster risks in several regions in Indonesia. Although the readiness of the local tax authority and regulation systems would provoke challenges. The use of the local tax mechanism to be embedded with disaster risk insurance has already been implemented by the Japan Government through incentives to household who has property insurance. Since the enactment of Income Tax Law Article 77 in 2007, Japan Government provided allowances for earthquake insurance premiums in exchange for the prior system of allowances for damage insurance premiums. Furthermore, since 2008 individuals' local residence tax can also be deducted with allowances of up to 25.000 yen (Watanabe, 2015).

Recent initiatives by the local government to respond to disasters can be seen in the tax incentives provided in response to the COVID-19 Pandemic. The regency of Bogor enacted Regency Regulation number 38 2020 introducing 10% land and building on rural and urban areas tax incentives for early payment of the fiscal year 2020 starting in July to August 2020. The initiatives were also adopted by the government of DKI Jakarta Province as regulated in provincial regulation number 23 2022 with total exemptions of land and building on rural and urban areas tax for Rp2 Billion tax base (NJOP-PBB P2). For the tax base beyond Rp2 Billion, the tax exemptions reach 10% of unpaid taxes.

Further reference to land and building tax incentives provided by (Safitra & Hanifah, 2022) with at least 21 subnational governments provided stimulus on land and building tax since the decentralization of such taxes. The reference describes most of the motives to provide such incentives as to down-take society's tax incidence and lower the possibilities for social turmoil. However, the effect of the aforementioned stimulus on disaster mitigation is yet to be in the interest of research.

Though the potential of tax incentives is available, the sustainability of the government should also be considered. Burnside (2005) argues fiscal sustainability concept relates to the ability of a government to maintain a consistent set of policies while remaining solvent. Hence, the concept of fiscal sustainability is related to the solvency of the government. The goal of the sustainability concept can be achieved only if monetary and fiscal policies are formulated and implemented in a coordinated manner. The sustainability of the local government is possibly one of the drivers of a different approach to addressing disasters with recent examples in the COVID-19 pandemic-related policies. The problem of overusing incentives is a possible threat to the government's solvency

during a disaster. Disasters can strain fiscal balance due to a decrease in the local government's own-source revenue (Wiyanti & Halimatussadiah, 2021). Hence the enactment of local tax incentives should also be considered for this risk.

Based on the conditions developing in Indonesia's Disaster Risk Reduction, this research aims to see the possibility of local property tax incentives to boost household disaster insurance through government fiscal balance with the end goal of further developing Indonesia's Disaster Risk Resilience. Topic about property tax usually focuses on revenue evaluation and contribution to local-owned revenue. The inclusion of disaster severity variables and incentives is yet to be a mainstream focus. This research tries to offer an analysis to fill the gap with analysis in both regulator and market development as a reference to facilitate disaster resilience through the utilization of land and building tax incentives.

Building the local government's disaster resilience requires identifying the vulnerability condition and coping capacity. Saliterer et al. (2021) mentioned healthy financial condition is key to the local government's ability to deliver services in a stable and uninterrupted manner. However, disaster events expose vulnerability risks to the stability of both national governments and local governments' financial conditions.

Botzen et al., (2019) identifies disaster brings negative direct and indirect effects on growth which increases over time and is strongest in developing countries. Furthermore, Benali et al., (2019) analyzed six high- and middle-income countries throughout 1990-2013 using the panel VAR approach. Their study found that disaster has caused an increase in government debt and government expenditures. Hence disaster could pose a negative impact on the budgetary situation and coping ability to manage vulnerability. In high-income countries, the increasing government expenditure caused by disasters has a bidirectional causal relation to economic growth.

Natural disasters' effect on the government budget can also be seen on the budget revenue. Miao et al. (2016) study on the United States state government stated disaster wields a small impact on local government's total own-source revenues. Conversely, natural disasters affect various levels of fluctuations in sales, incomes, and property tax revenues. The effects offset each other. Hence results in neutral tax revenue. Natural disasters also positively affect non-disaster-related intergovernmental transfers such as public welfare and safety net programs. In coherence, Noy & Nualsri (2011) found that developing countries tend to pursue a pro-cyclical fiscal policy. It results in a negative response on government revenues, along with government consumptions, government payments, and outstanding debt. On contrary, developed countries tend to increase spending and cut taxes in response to the disaster. In the case of Indonesia, Wiyanti & Halimatussadiah (2021) findings show that disaster increases the tension of fiscal balance at both the district and provincial levels. The decline in fiscal balance resulted from a negative growth in local-own-source revenue and a positive growth in social assistance expenditures. However, no specific types of local-own-source revenue are provided. With this type of vulnerability exposed to local government finances, it is deemed to be

necessary to increase the anticipatory capacity of the local governments, not only on the disaster monitoring system but also on the local government fiscal monitoring system.

Although deemed a minor revenue source at a national level, property taxes are important sources of subnational revenue, especially in developing countries. Even more so, property tax is important in OECD countries (Bird & Slack, 2004). The characteristics of an immovable tax base along with direct local services benefits associated with the property are deemed to fit the property tax as the main local revenue source. (Trasberg et al., 2021) elaborates that property tax on land and houses is considered an efficient revenue source because of its characteristics as an immovable and inelastic tax base. The immovable characteristic of property tax can also be linked to its close association with disaster vulnerability. Hence, the tax base is also being insured in the risk transfer strategy.

However, the implementation of property taxation is usually complicated. The taxation on property is usually implemented with exemptions in form of object exclusion based on ownership, the use of the property, or on characteristics of the owner or occupier. Property owned by the government is usually exempted from property taxes. Public usage of a property can also be exempted from taxation. Kelly et al., (2020) provided further explanations for tax exemption and tax abatement. Tax base exemptions are the decision to not include objects in the tax base. The property tax exemptions could be based on ownership or sectoral usage characteristics like agriculture, tourism, and state properties. Tax base exemptions on property tax are equivalent to a subsidy to a property. These subsidies can also be viewed as tax expenditures for the government. Such characteristics should be carefully evaluated and designed to achieve the intended government objectives while minimizing economic, administration, and compliance costs. The best practice suggested by Kelly et al., (2020) is to limit property tax exemptions to a minimum, with careful reviews of the intended objectives and actual costs and benefits.

The study on property tax incentives is not a mainstream field as a study topic. Recent measures use property tax incentives related to disasters usually to lessen the economic burden in crisis. Singapore implemented a 40% tax rebate during the 2009 recession for industrial and commercial property tax (Chow & Wilson, 2020). During the COVID-19 pandemic, Singapore implemented a 100% tax rebate for commercial property, 60% for resort property, and 30% for other commercial buildings (Chow & Wilson, 2020). The Minnesota State of the United States of America provides tax relief programs when the property has been damaged in a disaster (Swanson, 2022). In Indonesia, 21 local district-level government employs land and building tax on rural and urban areas incentives (Safitra & Hanifah, 2022).

The promising possibilities for property tax as a fiscal instrument to boost participation in disaster risk transfer strategy can also be reflected in the use of property tax to implement a non-financial disaster resilience strategy. The economic impact of property tax exemptions is provided by (Hutapea & Lidya Gultom, 2022). The implementation of property tax exemption in DKI Jakarta province in Indonesia positively correlates with the greater number of tax objects conducting certification

transactions and property transactions. (Hutapea & Lidya Gultom, 2022) argues that the implementation of property tax exemption motivates the population to impose legality status of their property even in flood-prone areas to increase the property value. Property tax incentives can also be used to promote certain building standards. To implement certain green building standards, property tax incentives are implemented in Spain, the United States, and Canada (Safitra, 2022).

The implementation of property tax incentives could be the basis to build local government disaster resilience capacity in terms of the inelastic characteristics of the property tax and the capacity to address the economic factors of disaster insurance willingness to pay as explained by Ciumas & Coca, (2015). Studies involving tax incentives for building disaster resilience capacity are limited. Shindo & Thorburn, (2020) stated that tax incentives can be imposed directly on insurance premiums paid through a specific insurance-related tax or a general consumption tax. Another alternative can be in form of insurance premiums reimbursement through income tax deductions.

Wang (2015) provided four main indicators to monitor the financial condition of public organizations to pay for service provision, namely cash solvency, budgetary solvency, long-run solvency, and service solvency. Budgetary solvency refers to the ability to collect sufficient revenues to pay for expenditures or expenses in the budget period. Budgetary solvency can be measured in two main approaches. First by operating ratio, with an assessment of revenues sufficiency to cover expenditures. Second, the own-source ratio indicates the revenue level from the government's own-sources without intergovernmental financial assistance.

Alam et al. (2019) use three ratios of budget solvency, which comprise the ratio of total revenue without special allocation fund to total expenditure without capital expenditure, employee expenditure and other expenditures. Further explanation by Alam et al. (2019) explains that a ratio value of over 1 show that local government revenue is sufficient to cover its expenditure. Based on the explanations mentioned, budgetary solvency can be calculated with the equation as follow:

Figure 2
Budgetary Solvency Formula

$$Budgetary\ Solvency_{i,t} = \left[\sum_{t=1}^{n} \frac{Local\ Owned\ Revenue\ (including\ Property\ Tax) - Source\ Revenue_{i,t}}{Capital\ Exp_{i,t} + Consumption\ Exp_{i,t} + Social\ Assistance\ Exp_{i,t} + Unexpected\ Exp_{i,t}}\right]$$

The selection of budgetary solvency is also coherent with recent publications to analyse the impact of natural disasters on local government in Indonesia (Wiyanti & Halimatussadiah, 2021). Wang (2015) also stresses the significance of socioeconomic and organizational factors that influence local government financial conditions. The view is also coherent with contextual features that shape the perceived financial vulnerabilities

and capacities introduced by Barbera et al., (2017). Demographic factors such as population can contribute to the increase in tax revenue, hence should be included in analyzing the revenue capacity of the government. Siagian et al. (2014) provided more socioeconomic factors namely status, gender, age, population growth, and family structure.

Gorina et al. (2018) stressed the reliance of local governments on property taxes which is negatively associated with fiscal distress. Furthermore, Gorina et al. (2018) argue that communities that are more reliant on non-property tax revenues could expose the governments to a higher possibility of fiscal distress compared to governments that are more reliant on the property tax. Hence the fiscal intervening instruments related to property taxes need to be further analyzed.

Research Methods

The research is conducted using a research model utilizing the concept of Budget Solvency as a measurement of fiscal balance in times of disaster. Local Tax incentives' role in fiscal balance is examined to find the properties affecting fiscal capacity for financial resilience. The findings from the statistical analysis is expected to provide policy recommendations on how to utilize local land and building tax in urban and rural areas to promote fiscal resilience. The research proposed the use of the positivism paradigm with a quantitative approach. Neuman (2014) argues the dominant paradigm in social science is positivism. Positivism uses a quantitative approach.

This research is conducted to analyze the causal relations of land and building tax on rural and urban areas incentives to the fiscal balance and disaster insurance in Indonesia with a descriptive research purpose in mind. With the characteristics of descriptive research in mind, statistical analysis is used with help of quantitative data. Hence, this research will answer the question of how land and building tax incentives affect fiscal balance. The data on this research is proposed to be collected from secondary data sources, including the Ministry of Finance of Indonesia, the National Agency for Disaster Management, the National Bureau of Statistics, MAIPARK, and Local government publications as identified by Safitra & Hanifah.

The research uses local government as a unit of analysis. The local government in Indonesia consisted of provinces, regencies, and cities which evolving in numbers since the start of decentralization in Indonesia. However, the authority for taxing land and building in urban and rural areas is under the jurisdiction of the regencies and city government. The last changes in the number of local governments in 2014 consisted of 34 provinces, 415 regencies, 1 administrative regency, 93 cities, and 5 administrative cities. The administrative regencies and cities are not autonomous local governments, hence are not included in the analysis. The additional 4 provinces in the fiscal year of 2022 are also excluded from the analysis.

The enactment of local taxes and retributions based on Law no. 28 2009 on Local Taxes and Retributions are further regulated by the Minister of Finance and Minister of Home Affairs of Indonesia’s joint regulation no. 213/PMK.07/2010 on Preparatory Stage

of Authority Transfer of Land and Building Taxes of Rural and Urban Areas as Local Taxes. The Authority is regulated to be transferred in the 2014 fiscal year at the latest.

The research uses the purposive sample approach in the selection of the sample from the population of local governments in Indonesia. To avoid bias of the local taxes' authority variation, this research is proposed to use data from the fiscal year 2014 to 2022. The incentives on land and building tax on rural and urban areas as local taxes are founded at 21 district-level governments (Safitra & Hanifah, 2022) therefore, this research is proposed to use the sample of the district-level government. Data analysis technique for secondary data analysis is conducted using statistical analysis to answer the causal relationship of the variable of interest. As mentioned in the population and sampling section, the data which will be collected is data on different regencies and cities in Indonesia for the year 2014 to 2022 in form of panel data. According to Gujarati & Porter (2009) panel data analysis is conducted with Pooled Ordinary Least Squares or Pooled OLS, Fixed Effect Model or FEM, and Random Effect Model or REM. However, the decision on data analysis technique or estimation model depends on several data tests. Data test need will be conducted with Hausman Test and Breusch-Pagan Test. These preliminary tests will be conducted to determine the inferential statistics model in data analysis.

The research model is developed based on answering the research questions. The research uses a multivariate regression model to address the questions on how the land and building tax on rural and urban areas' incentives affect the fiscal balance during the disaster. The model developed a budget solvency model similar to Wiyanti & Halimatussadiah (2021) with the adjustment of the inclusion of the land and building tax on rural and urban areas tax incentives dummy variable. The empirical model is as follows:

Figure 3
Model Specification

$$SOLV_{i,t}^{l,k} = \alpha_0 + \sum_{j=0} \beta_j BDM_{k,i,t} + \sum_{g=1} \gamma_g POP_{g,i,t} + \sum_{g=1} \gamma_g GRDPK_{g,i,t} \sum_{j=0} \delta_j STM_{m,i,t} + \sum_{j=0} \delta_j PAFF_{,i,t} + \theta_{i,t} + \varepsilon_{i,t}$$

legends:

1. SOLV is the dependent variable in region I and period t comprising the budgetary solvency ratio. The variables is calculated from the annual budget realization data of subnational governments. Data obtained from the Directorate General Fiscal Balance, Ministry of Finance.
2. BDM is an independent variable consisting of damaged infrastructure caused by disasters in each region during the observation period. The variable indicates the

severity of disasters. Data were obtained from Data Informasi Bencana Indonesia (DIBI), National Agency for Disaster Management Indonesia.

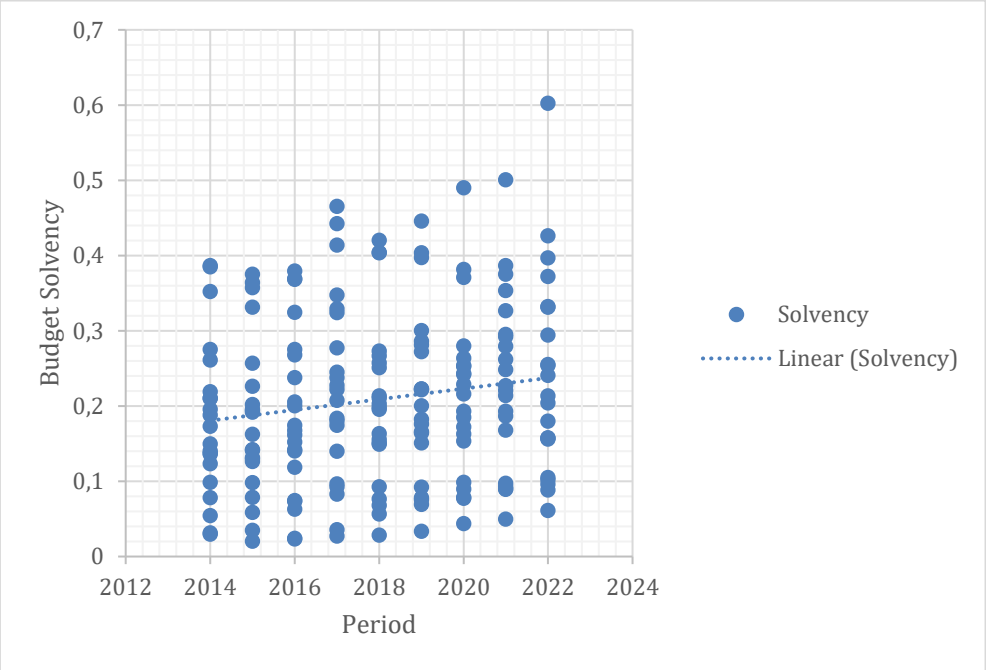
3. PAFF is an independent variable consisting of people affected by disasters in each region during the observation period. The variable indicates the severity of disasters. Data was obtained from Data Informasi Bencana Indonesia (DIBI), National Agency for Disaster Management Indonesia.
4. STM is an independent variable that indicates property tax stimulus. Data is treated as dummy variable which comprises the existence of legal decree of stimulus on land and building tax in urban and rural area provided by each municipality. Since there is no consolidated database on such data, the collection of the data is conducted manually through online search and tabulations of the decree.
5. POP is the control variable for population in each region. Data is sourced from National Bureau for Statistics (BPS).
6. GRDPK is the control variable for Gross Regional Domestic Product per capita. Data is sourced from National Bureau for Statistics (BPS).

The decentralization of property tax brings the liberty to local government to induce variants of rates and incentives on property tax. The degree of transparency and publication of incentives are varied between local governments. Therefore, the analysis of this research is limited to publicly available incentives regulations in 21 subnational governments (Safitra & Hanifah, 2022)

Results and Analysis

Descriptive Analysis

Figure 4
Scatter Plot Subnational Budget Solvency



During the observable periods, the average budgetary solvency of the subnational governments is increased. However, it still depicts the capacity of its government to fulfil its expenses from locally owned sources. Only a considerably 0,2 ratio of the expenses can be provided from local-source revenue. Subnational governments in Indonesia heavily rely on intergovernmental transfers to finance their programs.

Table 1
Subnational Budget Solvency Ratio in ascending order

Reg Code	Regency	Year	Solvency
1812	TULANGBAWANG BARAT	2015	0,020433502
1808	TULANGBAWANG	2016	0,023335175
1812	TULANGBAWANG BARAT	2016	0,024083259
1812	TULANGBAWANG BARAT	2017	0,027381828
1812	TULANGBAWANG BARAT	2018	0,028557053
1812	TULANGBAWANG BARAT	2014	0,029934357
1808	TULANGBAWANG	2014	0,031496037
1812	TULANGBAWANG BARAT	2019	0,033810314
1808	TULANGBAWANG	2015	0,034830883
1808	TULANGBAWANG	2017	0,035625311
1812	TULANGBAWANG BARAT	2020	0,043736724
1812	TULANGBAWANG BARAT	2021	0,049714349
1310	SOLOK SELATAN	2014	0,054307346
1808	TULANGBAWANG	2018	0,056773652
1310	SOLOK SELATAN	2015	0,058583498
…..	……	……	……
…..	……	……	……
…..	……	……	……
3471	KOTA YOGYAKARTA	2022	0,397186337
3471	KOTA YOGYAKARTA	2019	0,397239924
3273	KOTA BANDUNG	2019	0,403707151
3471	KOTA YOGYAKARTA	2018	0,403873559
3374	KOTA SEMARANG	2018	0,404152099
3374	KOTA SEMARANG	2017	0,413931651
3273	KOTA BANDUNG	2018	0,420576204

3273	KOTA BANDUNG	2022	0,426249869
3471	KOTA YOGYAKARTA	2017	0,442481122
3374	KOTA SEMARANG	2019	0,4459134
3273	KOTA BANDUNG	2017	0,465281231
3374	KOTA SEMARANG	2020	0,490331967
3374	KOTA SEMARANG	2021	0,500823205
3374	KOTA SEMARANG	2022	0,602274983

All the municipalities with the highest budgetary solvency are located on Java Island. Only Kota Semarang can sustain more than half of its expenses through locally owned sources of revenue. Kota Yogyakarta and Kota Bandung have relatively higher than the other municipalities although not as high as Kota Semarang. Kabupaten Tulang Bawang barat, Kabupaten Tulang Bawang, and Kabupaten Solok Selatan are the three lowest subnational governments in budgetary solvency. The issue of budgetary capacity discrepancies between subnational governments is still an enormous problem for Indonesia.

Table 2
Number of Property Tax Stimulus Period (Annual)

Subnational Governments	Number of Property Tax Stimulus Period (Annual)
ACEH BESAR	1
BANTUL	2
BANYUWANGI	9
BONE BOLANGO	1
BOYOLALI	4
KARIMUN	4
KOTA BANDAR LAMPUNG	9
KOTA BANDUNG	3
KOTA GORONTALO	5
KOTA PALEMBANG	1
KOTA PEKALONGAN	3
KOTA PEKANBARU	4
KOTA SAMARINDA	1
KOTA SEMARANG	4
KOTA YOGYAKARTA	2
PASURUAN KAB	5
SOLOK SELATAN	6
SRAGEN	1
TEMANGGUNG	4
TULANGBAWANG	3

TULANGBAWANG BARAT	8
Grand Total	**80**

During the 2014-2022 periods of observations, two municipalities namely Kabupaten Banyuwangi and Kota Bandar Lampung regularly provide property tax stimulus for their respective residents. Kabupaten Aceh Besar, Kabupaten Bone Bolango, Kabupaten Sragen, Kota Palembang, and Kota Samarinda was the least stimulus provider. However, none of the stimuli is provided to deal with a natural disaster. Disaster-related stimulus is only provided during the COVID-19 Pandemic. Observed municipalities averaged in providing 3 periods of property tax stimuli. The challenge in analyzing subnational governments' policies resides in the availability of public information dissemination as legal decrees are not easily available online.

Model Building

The inferential statistics analysis is conducted using Panel Data Random Effect Model based on the preliminary test as follows

Table 3
Panel Data Model Selection Preliminary Test Results

Model Test	Null Hypothesis	Hasil Uji	
Redundant Fixed Effects Tests (Chow Test)	There is no misspesifications if *Panel Least Square* (PLS) model is used	Cross Section F Statistic	51.896
		Probability	0.0000
		Cross Section Chi-Square	355.719
		Probability	0.0000
Correlated Random Effects (Hausman Test)	There is random correlation on *cross-section data. Use Random Effect Model* (REM)	Chi Square Statistic	4.352
		Probability	0.4999

There is no evidence of a multicollinearity problem on the dataset based on pair wise correlation results. However, there is a heteroscedasticity problem based on glejser test. Therefore, the model is modified using first difference modification of population variable of control (POP) into population growth (d1POP). The model also employ period weight to maintain homoscedasticity.

Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.090338	0.028955	3.119937	0.0021
GRDPK	2.18E-09	4.21E-10	5.176446	0.0000
STM	-0.001602	0.007812	-0.205075	0.8378

BDM	-7.34E-07	1.12E-05	-0.065575	0.9478
PAFF	8.12E-08	3.35E-08	2.423790	0.0165
D1POP	2.53E-07	9.67E-08	2.616056	0.0097

Effects Specification		
	S.D.	Rho
Cross-section random	0.082259	0.8783
Idiosyncratic random	0.030625	0.1217

Weighted Statistics			
R-squared	0.323403	Mean dependent var	0.027704
Adjusted R-squared	0.302520	S.D. dependent var	0.036596
S.E. of regression	0.030563	Sum squared resid	0.151327
F-statistic	15.48668	Durbin-Watson stat	1.500791
Prob(F-statistic)	0.000000		

Based on the Panel EGLS Random Effects analysis, 32% of the change in budgetary solvency can be described by the statistically significant joint change in Gross Regional Domestic Products per capita (GRDPK), Number of People Affected by the Disaster (PAFF), Population growth (D1POP), the building damages (BDM) and property tax stimulus (STM).

The budgetary solvency of the subnational government is affected significantly by the Gross Regional Domestic Products per capita (GRDPK), Number of People Affected by the Disaster (PAFF), and Population growth (D1POP) in a 95% level of confidence. All the significant independent variables affect budgetary solvency in a positive manner. The increase in Gross Regional Domestic Products per capita (GRDPK) and population growth (D1POP) would increase the subnational government's economic capacity by increasing the local-owned revenue source. The number of People Affected by the disaster could also increase budgetary solvency. This result might be caused by the flow of economic resources from outside the municipalities through disaster aid provided by the central governments or humanitarian acts.

On the other hand, the building damages (BDM) and property tax stimulus (STM) are not statistically significant affecting subnational budgetary solvency. Infrastructure damage would increase the capital expenditure of the local government, hence the negative correlation to budgetary solvency. This finding echo (Wiyanti & Halimatussadiah, 2021) conclusions that show damage to public buildings has no significant effects on fiscal balance at the municipal level. Furthermore, property tax stimulus (STM) is also negatively correlated to budgetary solvency since its characteristics reduce the tax income of the subnational governments.

Conclusions

The subnational governments' budget capacity in Indonesia is still a far cry from the independent condition to deal with natural disasters. The budget conditions have heavily relied on intergovernmental transfers from central governments. Further measures should be implemented by local governments to boost their fiscal health. Policy alternatives should focus on maintaining Gross Regional Domestic Products growth and population growth. Basic government services in infrastructure, health, social assistance, and education could play a role to promote economic and social growth.

Based on the model analysis, we can safely conclude that a property tax stimulus is a safe option for policy incentives in promoting disaster insurance. Property tax stimulus could be given to the residents willing to participate in the disaster insurance program. This initiative would not affect the subnational fiscal balance significantly. Indonesia's local government could benchmark the Japanese initiatives to provide individuals' local residence tax deductions with limited allowances (Watanabe, 2015). However, the initiatives should also be further analyzed in relation to each municipality's characteristics. Although not significantly affect fiscal balance, subnational governments could also take into account the negative correlation of building damage during a disaster to its fiscal balance. The implementation of building codes can also be a field of policy mixture with the implementation of property tax stimulus as implemented in Spain, the United States, and Canada (Safitra, 2022).

Further research could be expanded to a wider range of subnational governments and specific budget allocations. Another point to consider is the coordination mechanism between central and subnational governments in implementing the policy alternatives. The data on disaster severity is also limited to property damages and life casualties. The National Agency for Disaster Management or Badan Nasional Penanggulangan Bencana (BNPB) has not published monetary data on disaster impacts. Hence further research could be sharpened with the monetary impact of the disasters on the subnational economy. Furthermore, the limited data availability also restricts the use of more time frequencies for the data analysis. The analysis of the annual data conducted can be more precise if arranged in a more specific period of time. Budget allocation and disaster timing could play different roles in the subnational economy as it needs different administration processes.

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