

Adaptive social protection in Indonesia: Stress-testing the effect of a natural disaster on poverty and vulnerability

Katrin Gasior  | Gemma Wright | Helen Barnes | Michael Noble

Southern African Social Policy Research
Insights, Hove, UK

Correspondence

Katrin Gasior, Southern African Social Policy
Research Insights, Hove, UK.
Email: katrin.gasior@saspri.org

Funding information

UNICEF, Grant/Award Number:
IDS/PCA2021204

Abstract

Indonesia is among the countries with the highest exposure to natural disasters, and risks are expected to increase due to climate change. Natural disasters and other shocks require well-developed social protection systems that can cushion the economic consequences for those most vulnerable to these events. International stakeholders advocate for 'Adaptive Social Protection' which links social policy with strategies on disaster risk reduction and climate change adaptation. This article uses the tax-benefit microsimulation model INDOMOD to analyse the adaptiveness of the Indonesian social protection system by simulating an income shock caused by a natural disaster and testing reforms to the existing social protection system. We find that the existing system generally performs well in lifting people out of poverty in normal times but does not sufficiently help them to prepare for and cope with shocks. This is especially the case for large households, households with more than two children, people in their 20s and 80s and individuals with a disability. The tested hypothetical reforms reduce the impact of the shock and better target those identified as needing more support but require a substantial increase in social spending.

KEYWORDS

adaptive social protection, Indonesia, tax-benefit systems

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2023 The Authors. *Social Policy & Administration* published by John Wiley & Sons Ltd.

1 | INTRODUCTION

Indonesia is among the countries with the highest exposure to numerous natural disasters (BKF, 2018). Climate change is expected to exacerbate these risks, increasing the need for a well-developed social protection system that is—among others—prepared to cushion the economic consequences for those most vulnerable to these events.

Many international organisations advocate for 'Adaptive Social Protection' (ASP) as a tool to improve the resilience of poor and vulnerable households to shocks (Bowen et al., 2020) as well as to better link strategies on disaster risk reduction and climate change with social policy (Davies et al., 2013). ASP is built on improving households' ability to prepare for, cope with and adapt to shocks to prevent them from falling into or being trapped in poverty (Bowen et al., 2020).

Tax-benefit microsimulation models are useful tools to test the adaptiveness of social protection systems to shocks. Using microdata, such models allow one to assess the financial consequences of shocks and the cushioning effects of the system for the population as well as population sub-groups. More specifically, such static models are well placed to explore the ability to prepare for and immediately cope financially with shocks in the short-term but are less useful for exploring households' ability to adapt to a shock, such as moving to a different area or diversifying a business activity, though in theory such transitions could be accommodated (but are not pursued here).

Around the world, recent empirical applications used microsimulation models to monitor the distributional impact of the COVID-19 pandemic and the role of welfare states in mitigating effects before microdata became available (Avellaneda et al., 2021; Barnes, Espi-Sanchis, et al., 2021; Brewer & Tasseva, 2021; Cantó et al., 2021; Lastunen et al., 2021). Wright et al. (2021) present similar findings for Indonesia. Results highlight the positive cushioning effect of COVID-related policies and the important role of the government in introducing emergency policies, but also accentuate challenges faced by the existing tax-benefit system in responding to changes in the income situation of households.

Building on this analysis, we use the ASP lens to study the role of the Indonesian tax-benefit system in improving households' ability to prepare for and to cope with a shock. We simulate an income shock caused by a hypothetical natural disaster using information from a past El Niño event. We analyse the comprehensiveness and adequacy of existing social protection arrangements and how additional modifications could help to improve their adaptiveness.

The article contributes to the literature by combining tax-benefit microsimulation techniques with the ASP framework. The INDOMOD tax-benefit microsimulation model, which is underpinned by the SUSENAS dataset, enables the distributional effect of existing and hypothetical policies to be assessed and can help inform decision-making about how to ensure a basic level of social protection for all. The underpinning dataset provides detailed information on the income situation of households which is usually not available to researchers outside the data provider. The article thus also provides new insights into the income situation of Indonesian households not available elsewhere.

2 | CASH TRANSFERS AND ASP

ASP aims at improving poor and vulnerable households' resilience to shocks (Costella et al., 2021; Gyori et al., 2021). Disasters increase existing vulnerabilities and create new ones, especially if households are unprepared and have to make difficult decisions regarding their health, education, and livelihoods, often leading to long-term effects (ADB, 2018). The objective of ASP is to provide households with the financial means to adapt to shocks without having to choose coping mechanisms that might jeopardise their socioeconomic situation.

ASP is very closely related to core concepts in the social policy literature. Barr (1992) distinguishes between two core functions of welfare states: the 'Robin Hood function' (reducing poverty and income inequality through redistribution) versus the 'Piggy-bank function' (providing insurance to offset risks over the life-cycle). While the former

can be translated into improving levels of preparedness, the latter is closely related to coping with shocks but extends classic life-cycle risks to include disaster risks.

Cash transfers play an important role in ASP both in terms of providing predictable transfers to build up resilience before a shock happens and by scaling up interventions in response to shocks (Schnitzer, 2019). Even though in-kind benefits are still more common in low- and middle-income countries, the number of countries providing cash benefits is increasing (Midgley, 2019).

Understanding risks and hazards in a country can help to design measures that provide better levels of preparedness. Simultaneously, programmes need to be designed in a way to automatically react to changes in incomes when a natural disaster happens. Exceptional situations often also require the introduction of emergency measures that address new vulnerabilities. Such measures typically make use of existing systems in terms of identifying eligible households, delivery mechanisms and personnel capacity and thus also rely on the functioning of the existing system. ILO (2021) provides many international examples of ways in which governments have acted fast to help people during the COVID-19 pandemic, including income support for specific groups and universal basic income payments. In fact, many existing flagship programmes in low- and middle-income countries stem from such emergency responses to shocks in the past (UNICEF, 2019). In Indonesia, the pandemic provided an opportunity to fast-track reforms (Yuda, 2023).

An important dimension of cash transfers is targeting, not only in addressing persistent poverty and preparedness but coping with shocks. Successful targeting provides support to those who need it, when they need it and where they need it, in appropriate form and quantities (Barrett & Maxwell, 2005). Many low- and middle-income countries do not have information about the households' income situation and use proxy-means tests (PMTs) for targeting. PMTs are based on social information systems that measure medium- or long-term characteristics of households to approximate their income and do not necessarily cover all vulnerable households or those who do not have access to benefits in normal times (Berner & van Hemelryck, 2021; Kidd et al., 2017). Thus, PMTs are not constructed to quickly react to changes in circumstances which makes it difficult to target affected groups beyond the persistent poor and categorically vulnerable in a timely manner.

One step toward quicker identification is a unified database which collects information across different social protection programmes and links various information sources (Schnitzer, 2019). Still, a unified database is a form of PMT which only provides greater potential to react to changes in circumstances if it is regularly updated, includes a large enough share of each local community, and if governments anticipate potentially affected population groups for different types of shocks and start to integrate additional targeting variables into the database (UNICEF, 2019). This includes identifiers of climate and disaster-related risks as well as geographical information (ADB, 2018).

3 | THE INDONESIAN TAX-BENEFIT SYSTEM

Indonesia is the largest economy in Southeast Asia, characterised as a middle-income country by the World Bank.¹ It has achieved significant reductions in extreme poverty in the last ten years (from 11% to 3%) while inequality remained rather stable. GDP per capita is at 4788 current US\$ which is 60% lower than the average in the East Asian and Pacific region. Its labour force is characterised by a low level of unemployment (4% in 2022) but high levels of informality (80% of those in employment) and a relatively high share of workers in agriculture (31% of those in employment).

Indonesia is already in a good position with respect to ASP as it has a well-established tax-benefit system. While social protection focused mainly on formal workers and social investment in the past (Gough, 2004), the focus shifted to targeting poor people following the 1997 Asian financial crisis (Sumarto, 2017). More recently, Indonesia has moved toward a more institutionalised and inclusive social protection system (Sumarto, 2020).

The following social assistance benefits help people to prepare for and cope with shocks: the Family Hope Programme (PKH) is a conditional cash transfer paid to poor and vulnerable families, the Smart Indonesia Programme

(PIP) provides cash assistance to school-aged children from poor, vulnerable and priority families, and the Electronic Food Voucher (BPNT) supports poor and vulnerable families to fulfil basic food needs. Additionally, Indonesia's tax-benefit system is flexible in the sense that direct taxes, national health insurance and social insurance schemes can react quickly to changes in circumstances, by design. Additional regional ASP-oriented initiatives are underway to address local, as opposed to national, disasters.

Eligibility for social assistance benefits is determined using the Integrated Database on Social Welfare (DTKS). This unified database contains social, economic and demographic information for almost 30 million households with the lowest welfare status in Indonesia, covering close to 40% of households. Even though not designed to react to a household's change in circumstances, the benefit system was able to quickly respond to the COVID-19 pandemic where the number of beneficiaries was increased for PKH and BPNT and several new emergency policies were introduced (Wright et al., 2021). At the same time, experiences with the pandemic have shown that the database is not sufficiently large enough to expand programmes in all regions and that it needs regular updates which are not always budgeted for in all local governments (Asmanto et al., 2020).

Even though the Indonesian government emphasizes the importance of a resilient population, limitations in terms of the adequacy of the provision and gaps in coverage have been identified. For example, the World Bank (2019) points out that support for disabled people is inadequate, and that over a third of elderly people in Indonesia are either poor or vulnerable. Importantly, they also observe that 'a final coverage gap relates to social assistance for the poor and vulnerable, adversely affected by natural disasters and climate-related shocks and stresses, as the existing social assistance system does not fully accommodate their needs to "bounce back" after such events' (World Bank, 2019, p. 40). The issue of disaster readiness is particularly salient here. The authors argue that disaster response needs to include expansion of existing schemes as well as the introduction of emergency benefits which need to be rooted in a strong ASP framework that includes early warning systems, predictable financing and scalability of key programmes. They recommend expanding coverage of social assistance benefits, to take the household size in the level of BPNT into account and introducing means-tested benefits for elderly and disabled people. The importance of better support for at-risk children, elderly and people with a disability is also acknowledged in a national strategy paper to improve social protection in Indonesia (Rahayu Kusumastuti et al., 2018).

4 | EL NIÑO AS A SHOWCASE

El Niño is used as an example to simulate a sub-national natural disaster where the income consequences caused by past events have been documented. It is a phenomenon that changes the global atmospheric circulation leading to extended dry periods affecting several provinces of Indonesia. Although extreme events only happen every 20 years, less severe events happen more frequently, and climate change is expected to influence frequency and magnitude of events in the future.²

The consequences of El Niño differ by region and period (Setiawan et al., 2017). In more severely hit regions, the drought leads to a disruption of established crop patterns and harvest losses, leaving farmers without income and the community with food and drinking-water shortages (Tabor et al., 2015). Over recent decades, El Niño events accounted for two-thirds of the variation in rice outputs, a major staple in Indonesia (Naylor et al., 2007). The underproduction of rice furthermore leads to an inflation of rice prices due to shortages and the need to import rice from other countries (Tabor et al., 2015). This most likely affects poorer and vulnerable households more severely as most of their expenses are based on food items. Additionally, past El Niño events have led to forest fires affecting the livelihoods of those employed in the forestry, transportation, tourism, and public health sectors (ADPC, 2000). The focus of the analysis is on the direct income shocks only as analysing other effects would require an additional macro-perspective.

The last severe drought following the 2015 El Niño caused an income drop of at least 30% for one third of the studied population and less significant losses for another 28% of households (WFP, 2016). The impact varied across main income source, with agricultural workers and workers in food crop production being hit the hardest.

Tabor et al. (2015) highlight two areas of intervention in line with ASP. First, easing food trade can help to build up food stocks which improves coping with shortages in agricultural outputs. Second, strengthening social protection can help farmers to prepare and to cope with drought. The presented analysis focuses on the latter by analysing the role of cash transfers in cushioning the income shocks caused by El Niño.

5 | METHODOLOGY

The tax-benefit microsimulation model INDOMOD (Barnes, Noble, & Wright, 2021) is used to stress-test Indonesia's tax-benefit system both under normal conditions, and after the simulated hypothetical income shock caused by El Niño.

INDOMOD is a static tax-benefit microsimulation model that runs on the EUROMOD platform (Sutherland & Figari, 2013). Although EUROMOD has been developed for the European context, it is flexible enough to accommodate the specificities of low- and middle-income countries (Decoster et al., 2019). The analysis includes all national cash benefits, personal income tax on labour income and social insurance contributions (SIC) paid by employees. A detailed description and macro validation of the model is available in the Country Report (Barnes, Noble, & Wright, 2021) and an overview of tax-benefit policies is available in Table A1. The analysis is based on the policy situation in March 2020 which allows one to focus on the situation before the COVID-19 pandemic caused a real-life stress-test to the system.

The model is underpinned by the National Socio-Economic Survey (SUSENAS) for March 2020 (BPS, 2020) which contains detailed information from over 330,000 households on a wide range of socio-demographic characteristics, the labour market situation as well as detailed income and consumption-related information. The large representative sample allows one to assess the distributional impact of the shock and variations in social impact for different population sub-groups (Table A2). SUSENAS data has already been used for similar analysis in the past (Ali & Tiwari, 2020; Jellema et al., 2017). However, INDOMOD is underpinned by a SUSENAS version that includes individual-level information on market incomes which is usually not available to researchers. This allows for more precise simulations of the income shock, personal income tax and SIC. The analytical steps include adjusting the dataset to the income shock caused by El Niño in selected provinces, modelling the hypothetical reform scenarios and simulating consumption levels for each scenario (Table 1).

TABLE 1 Scenarios overview.

Region	Scenario	Dimension	Shock	Tax-benefit system
Nationwide	A	Preparedness	No	Existing (national baseline)
	B	Preparedness	No	Augmented reforms (Benefit for elderly and individuals with disability, extension of BPNT and PKH, higher PKH for families with more children)
Selected provinces	A	Preparedness	No	Existing (selected provinces baseline)
	B	Coping	Yes	Existing
	C	Coping	Yes	Augmented reforms
	D	Coping	Yes	Reactive reforms (Pre-employment Card, village fund cash transfer, BPNT amounts to reflect household size)

Preparedness is assessed using the standard dataset while coping is analysed using a dataset with shocked incomes.

While the level of preparedness is mostly assessed nationwide, the analysis on the consequences of the income shock focuses on provinces more likely to be affected by severely/exceptionally dry conditions during strong El Niño events: Bali, Jawa Timur, Kalimantan Selatan and Timur, Maluku Utara, Nusa Tenggara Barat and Timur, Papua and Papua Barat, Sulawesi Selatan, Tenggara and Utara and Sumatera Selatan (Setiawan et al., 2017). In these provinces, incomes are reduced based on the occupation of individuals following WFP (2016) who analyse people's reported income shocks by occupation and income type following a drought in eight districts. Within each group set out in Table A3 in the Supplemental Material, the specified share of individuals is randomly selected into one of the four shock groups (severe, moderate, slight, none) and their incomes reduced accordingly, resulting in the dataset with shocked incomes. It is recognised that a natural disaster would have additional impacts on the affected population (e.g. displacement or food price increases). However, these are held constant in the analysis.

A distinction is furthermore made between existing benefits and two types of hypothetical policy reforms: augmented benefits to improve preparedness, and reactive benefits to improve coping. The policy reforms draw from the government's response to COVID-related income shocks, recommendations made by the World Bank (2019) and UNICEF et al. (2021), discussions with key stakeholders and findings from our own research (Wright et al., 2021).

The augmented reform comprises of a new categorical benefit for elderly and individuals with a disability who live in the poorest 70% of households, and an extension of BPNT and PKH to the poorest 40% of households. The assistance for elderly and disabled people is removed from PKH which results in higher benefit amounts for families with more children, as payments are now made for the children in the family rather than elderly or disabled family members.

The reactive reform is an example reform that could be introduced in response to a natural disaster and is applied to the provinces that are affected by the shock only. The aim of the scenario is to reduce poverty to at least the level that it was prior to the shock. First a Pre-employment Card is simulated; this was first introduced in response to the COVID-19 pandemic for unemployed people aged 18+ who live in households that are not in receipt of existing benefits. Second, a benefit is simulated for households that are not in receipt of PKH or BPNT but are among the poorest 40% in Indonesia, similar to the Village Fund Cash Transfer introduced in response to the COVID-19 pandemic. Third, the BPNT payment is adjusted to reflect household size.

The analysis focuses on four different mutually exclusive consumption groups: (1) the poor (PO) with consumption levels below the poverty line, (2) the vulnerable (VU) with levels between the poverty line and below 1.5 times the poverty line, (3) the less vulnerable (LV) with levels between 1.5 and below 3.5 times the poverty line and (4) the wealthiest (WE) with levels of at least 3.5 times the poverty line. The poverty line is based on the 2020 national poverty lines which are province and urban/rural-specific (BPS, 2020) and account for variations in the cost of living across the country. In most provinces, the poverty line is closest to the international lower-middle-income poverty line of US\$3.65 per day (Table A4).

All results are based on equivalised household consumption using the per-capita equivalent scale. Consumption is the typically applied concept for inequality and poverty statistics in Indonesia. Consumption levels in the baseline scenario rely on information from SUSENAS. Changes in consumption are assessed by assuming that simulated changes in incomes lead to the same changes in consumption. Changes in incomes can be driven by the simulated income shock, which also leads to changes in direct taxes and social insurance contributions, and changes in benefit entitlements. All results present first-order effects and do not take behavioural changes into account.

The analysis is based on various outcome measures. The first measure is the share of the population in each consumption group with the share of the poor representing the poverty headcount ratio. A transition matrix furthermore shows how the share changes due to the shock or reform.

The second indicator is the coverage rate, which measures the proportion within each group receiving support. It shows which groups are currently included in and excluded from the various social assistance schemes and how reforms affect their coverage.

Third, the replacement rate measures the average post-event consumption as a proportion of the pre-event consumption. Applied to the different scenarios and compared with the baseline scenario, it presents the extent to which consumption potentials in each group change due to the shock or reform.

Finally, predicted probabilities show the probability of adults being poor or vulnerable for selected characteristics while holding other characteristics constant at their mean. They are based on logit models that control for gender, age, education, marital status, disability, economic status, rural/urban, female-headed households, household size, number of children, income source and province fixed-effects (Table A5).

6 | ANALYSIS

6.1 | Preparedness of the existing system

The first part of the analysis focuses on the preparedness dimension of ASP. It shows the extent to which existing support measures are sufficient to lift people out of poverty or vulnerability and as such, manage to help a large share of the population to be prepared for a shock.

The left-hand side graph in Figure 1 compares the distribution of the four consumption groups (Actual consumption) with a hypothetical distribution based on consumption levels that do not take benefits as well as taxes and SIC into account (Pre-benefit/tax/SIC consumption). The difference between the two distributions shows how well the existing tax-benefit system increases consumption levels. The share of the poor group is reduced significantly by 10 percentage points (pp) due to the receipt of benefits. This in turn leads to an increase of the vulnerable group by 8 pp. The share of the less vulnerable increases by 3 pp and the share of the wealthiest decreases by 2 pp.

The right-hand side in Figure 1 provides more insights into the specific transitions of each group from a situation with no taxes and benefits to one in which the existing taxes and benefits are in place. It shows the four consumption groups based on the pre-tax-benefit scenario and the share that transitions to another group in the post-tax-benefit scenario. The highest impact is achieved in the poorest group. Although a large share of the poor remains poor, 50% move to the vulnerable group and 1% to the less vulnerable group after receiving benefits. Upward

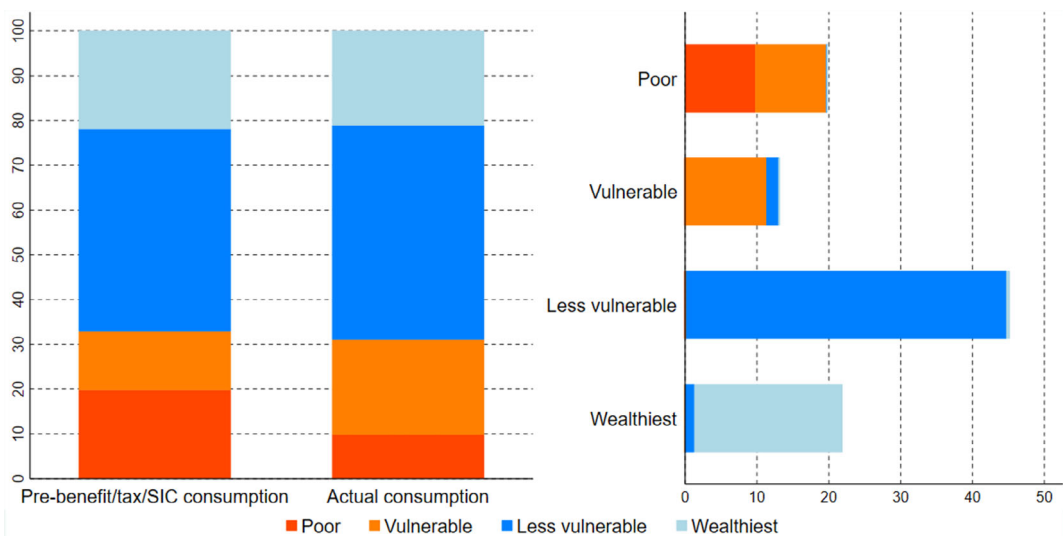


FIGURE 1 Distribution of consumption groups (left) and transitions after taking the tax-benefit system into account (right). Source: Own calculations using INDOMOD. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1111/spol.12983)]

transitions are at the same time less likely for the vulnerable group as 86% of those who are vulnerable pre-tax-benefit are still vulnerable post-tax-benefit. Downward transitions in the less vulnerable and wealthiest groups due to contributions are very rare, with 99% remaining less vulnerable and 94% still belonging to the wealthiest group respectively.

This leaves 31% of the Indonesian population as poor or vulnerable under the existing tax-benefit system and as such, in a constant state of crisis rather than being able to prepare for a potential natural disaster.

The coverage rate in Panel A of Table 2 provides an indication whether this is due to households not receiving support or due to the received support not being sufficient to lift them out of poverty and vulnerability. The latter is the case in Indonesia where the poor and vulnerable are very well covered. This perfect targeting is to some extent an artefact of the modelling in INDOMOD which uses the original consumption variable available in SUESNAS as a proxy for the identification of beneficiaries in the DTKS. Nevertheless, results provide a good assessment of the policy design and efficiency of the system in a scenario where the identification of the poorest households is reliable.

Moving to population sub-group specific results, Figure 2 (orange dots) shows whether the risk of being poor or vulnerable is the same across population sub-groups and who is less likely to be able to prepare for a shock. While being a woman is not a strong predictor of higher risks, living in a female-headed household increases the probability. The risk of being poor/vulnerable is furthermore u-shaped by age. In line with higher risks at older age, individuals with a disability are also more likely to be poor/vulnerable. An important predictor of being poor or vulnerable is education as adults with no or primary education face a significantly higher probability than adults with better education.

Also important are the available income sources and the composition of the household. Adults living in a household with self-employment income from trade, hotels or restaurants are the least likely to be poor or vulnerable. The least protective income sources are employment incomes in the agricultural sector and incomes from agriculture. These are also the sources that are likely to be more adversely affected by El Niño, highlighting important gaps in

TABLE 2 Baseline versus augmented reform indicators, nationwide.

		(A) Baseline				(B) Augmented reform			
		PO	VU	LV	WE	PO	VU	LV	WE
Share ^a		9.8	21.3	47.8	21.2	8.8	14.3	55.7	21.3
Transition of ^b	Poor	—	—	—	—	90.1	9.2	0.7	0.0
	Vulnerable	—	—	—	—	0.0	62.8	37.2	0.0
	Less vuln.	—	—	—	—	0.0	0.0	99.8	0.2
	Wealthiest	—	—	—	—	0.0	0.0	0.0	100.0
Coverage rate ^c	Total	100.0	100.0	3.9	0.8	100.0	100.0	41.0	0.8
	PKH	89.1	45.8	0.0	0.0	89.1	87.3	25.7	0.0
	PIP	72.9	71.1	3.0	0.8	72.9	71.1	21.3	0.8
	BPNT	100.0	100.0	2.7	0.0	100.0	100.0	30.7	0.0
	Disabled	—	—	—	—	1.4	1.0	0.7	0.0
	Elderly	—	—	—	—	26.5	21.4	15.4	0.0
Replacement rate ^d		—	—	—	—	104.9	109.4	107.1	100.0

Note: PO refers to poor, VU refers to vulnerable, LV refers to less vulnerable and WE refers to wealthiest.

^aShare of the poor = poverty headcount ratio.

^bShare of group transitioning to other group after reform.

^cShare of group receiving the benefit.

^dPost-event consumption as a proportion of pre-event consumption.

Source: Own calculations using INDOMOD.

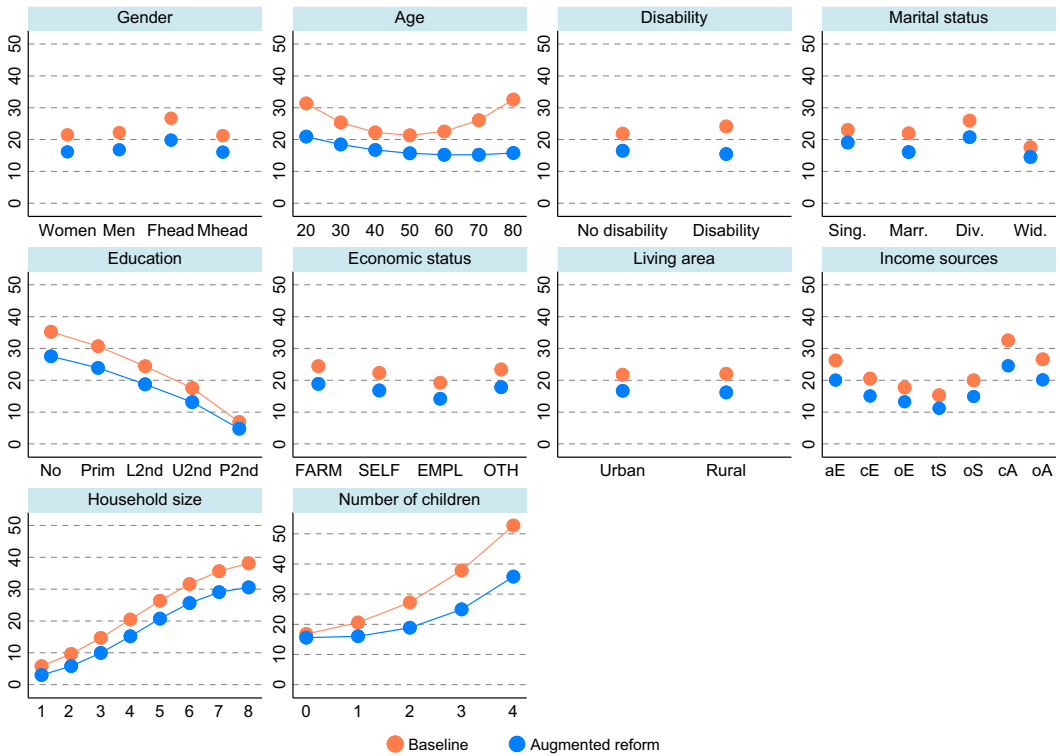


FIGURE 2 Average probability to be poor or vulnerable—baseline versus augmented reform. *Source:* Own calculations using INDOMOD. Individuals aged 18+ only. Predicted probability of being poor or vulnerable with control variables at their mean values. Labels for marital status refer to single, married, divorced and widowed. Labels for education refer to no education, primary, lower secondary, upper secondary and post-secondary/tertiary education. Labels for economic status refer to farmers, self-employed, employees and other. Labels for income sources refer to agricultural employment income (aE), employment income from construction or processing industry (cE), other employment incomes (oE), self-employment income from trade, hotel and restaurants (tS), other self-employment income (oS), agricultural income from rice crops and palawija (cA) and to other agricultural income (oA). [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]

being able to prepare for a natural disaster. The probability of being poor/vulnerable furthermore increases with household size. The risk for one-person households is 6%, the risk for five-person-households (the average household size in Indonesia) is 26%, and the risk for eight-person-households is 38%. Even more important is the number of children in the household. Most households in Indonesia have at least two children. Disregarding other characteristics, the probability of being poor or vulnerable is 27% for households with two children, 38% for households with three children and 53% for households with four children.

6.2 | Augmented reform to improve preparedness

The second part of the analysis still focuses on the preparedness dimension and explores whether the augmented reform scenario improves preparedness for a shock. Panel B of Table 3 provides the results of the augmented reform scenario in comparison to the baseline results shown in Panel A.

Results for the poor are disappointing at first glance. Even though social assistance benefits are increased to a wider target group and additional support is provided to individuals with a disability and elderly individuals, the

TABLE 3 Baseline versus income shock and reform indicators, selected provinces.

	(A) Baseline				(B) Income shock				(C) Shock + augmented reform				(D) Shock + reactive reform			
	PO	VU	LV	WE	PO	VU	LV	WE	PO	VU	LV	WE	PO	VU	LV	WE
Share	11.4	21.2	46.6	20.7	15.3	21.5	44.2	19.0	13.6	14.6	52.7	19.1	9.9	20.0	51.0	19.0
Transition of																
Poor	–	–	–	–	100.0	0.0	0.0	0.0	92.8	6.7	0.5	0.0	73.9	26.1	0.0	0.0
Vulnerable	–	–	–	–	16.9	83.0	0.0	0.0	13.4	58.9	27.8	0.0	6.5	74.5	19.0	0.0
Less vulnerable	–	–	–	–	0.6	8.2	91.2	0.0	0.2	2.9	96.7	0.2	0.2	2.6	97.1	0.0
Wealthiest	–	–	–	–	0.1	0.0	8.1	91.8	0.1	0.0	8.1	91.7	0.1	0.0	8.0	91.9
Coverage rate																
Total	100.0	100.0	4.1	1.0	100.0	100.0	4.3	1.0	100.0	100.0	41.5	1.0	100.0	100.0	52.3	2.6
PKH	87.6	45.9	0.0	0.0	87.6	46.2	0.0	0.0	87.6	86.1	24.7	0.0	87.6	45.9	0.0	0.0
PIP	70.0	69.2	3.1	1.0	70.0	69.2	3.2	1.0	70.0	69.2	20.4	1.0	70.0	69.2	3.1	1.0
BPNT	100.0	100.0	2.7	0.0	100.0	100.0	2.9	0.0	100.0	100.0	30.0	0.0	100.0	100.0	2.7	0.0
Disabled	–	–	–	–	–	–	–	–	1.4	1.0	0.8	0.0	–	–	–	–
Elderly	–	–	–	–	–	–	–	–	27.7	24.0	17.1	0.0	–	–	–	–
Village fund	–	–	–	–	–	–	–	–	–	–	–	–	0.0	0.0	48.1	0.0
Pre-empl. card	–	–	–	–	–	–	–	–	–	–	–	–	0.0	0.0	2.1	1.7
Replacement rate	–	–	–	–	91.1	92.7	94.6	96.4	96.0	102.0	101.7	96.4	107.6	104.1	102.0	96.4

Note: See Table 2.

Source: Own calculations using INDOMOD.

reform decreases poverty levels by 1 pp only. This is mostly explained by the high coverage rate of benefits in the baseline. All poor households already receive support and extending the number of beneficiaries does not impact on them. Still, the replacement rate shows that consumption levels of the poor increase by 5 pp due to new benefits and higher top-up amounts for households with more children.

The most important impact of the reform is in the group of the vulnerable which decreases from 21% to 14%. Extending the number of beneficiaries increases the share of PKH recipients from 46% to 87%. In addition, 21% of the vulnerable receive the newly introduced old-age benefit. This leads to an increase in consumption levels of 9 pp (see replacement rate) which moves 37% of the vulnerable to the group of the less vulnerable and improves their ability to prepare for shocks.

The less vulnerable group benefits from the reform in terms of coverage which increases from 4 to 41%, and higher welfare resilience, but not significantly enough to move them to the group of the wealthiest. The wealthiest group is not affected by the reform. This shows that if targeting through the DTKS works as envisaged, the augmented reform can improve ASP in Indonesia without allocating government resources to the wealthiest of the country.

Furthermore, the hypothetical changes lead to decreases in the probability to be poor or vulnerable for those characteristics which make a household most likely to be poor or vulnerable in the baseline (blue dots in Figure 2): younger and older age-groups, lower educated adults, adults living in larger households and households with more children. Households are also differently affected by their income sources. Individuals living in households with incomes from crops or palawija—who are the most exposed to being poor or vulnerable in the baseline—benefit the most, followed by households with other agricultural incomes and agricultural workers.

6.3 | El Niño and policy reforms to improve coping

The final analysis section focuses on the coping dimension. It analyses how the existing tax-benefit system cushions an income shock caused by El Niño compared with the two hypothetical reform scenarios. All presented results are based on the selected provinces with higher probability of being affected by strong El Niño events.

Comparing Panel A and Panel B in Table 3 shows how El Niño affects households and whether the existing tax-benefit system is flexible enough to cushion the income shocks. Focusing on the transitions within each group first shows that they are differently affected by the shock. The poor are not affected in the sense that they were already poor in the baseline, while 17% of the vulnerable and 1% of the less vulnerable fall below the poverty line. Another 8% of the less vulnerable become vulnerable and 8% of the wealthiest join the group of the less vulnerable. Overall, these transitions lead to an increase in the share of poor individuals by 3 pp, resulting in more than one third being poor or vulnerable as the existing benefit system does not automatically react to the changes in incomes.

The non-flexibility of the system is also reflected in the coverage rate which is not affected by the income shock. While INDOMOD takes the automatic reduction in taxes and SIC due to lower incomes into account when simulating the shocked consumption levels, benefit receipt is held constant as it is assumed that the DTKS is not adjusted to the new situation immediately. Thus, while incomes decrease, they are not compensated by higher support from the government leading to an overall reduction in consumption levels across groups. The replacement rate highlights the highest relative losses in the poor and the vulnerable group. On average, poor individuals can only consume 91% of what they were able to consume before El Niño. Vulnerable individuals are only able to consume 93% of what they were consuming in the baseline.

The final two panels in Table 3 show the results of the reform scenarios. Panel C shows the results for the selected provinces after the shock but having additionally applied the augmented reforms that were presented for the whole of Indonesia in the previous section. Here, we see that the augmented reforms cushion the shock of the natural disaster to a certain extent: poverty in these provinces rises from 11% to 14% (rather than 15% in the absence of the augmented reform) and the share of vulnerable decreases to 15% (compared with 21% in the

baseline). While the additional support means that 7% of the poor move to the vulnerable group despite the income shock, 28% of the vulnerable move to the less vulnerable group. On the other hand, 13% of the vulnerable move below the poverty line due to the income shock not being cushioned sufficiently by the augmented reform.

The replacement rate improves most markedly for those in the vulnerable and less vulnerable groups, compared with the shock with no augmented reforms. However, poor people are not supported to the extent that their circumstances revert to the pre-shock situation.

Panel D presents the results for the reactive reform, where in addition to the shock, a dedicated set of policy changes are made in the affected provinces. The poverty rate decreases from 11% (prior to the shock) to 10% (after the shock with the reactive reform). Just over a quarter of those in poverty move into the vulnerable group, and almost a fifth of those in the vulnerable group move into the less vulnerable group. Although the replacement rate for the wealthiest group is much the same with or without the reforms shown in Panels C and D, it increases for all other groups to a situation better than prior to the shock. The reactive reform therefore provides an example of a dedicated response to a natural disaster that provides direct support to those who were already in poverty to the extent that they move above the poverty line, and it also more than halves the number of vulnerable households that would have fallen into poverty without the additional support. Overall, this leads to a poverty and vulnerability gap that is below the pre-shock situation.

Nevertheless, the cost of the reforms is significant, each at least doubling usual expenditure on benefits in these provinces (Table A6).

Figure 3 shows how the probability of being poor or vulnerable changes by characteristics. The orange circles show the baseline probability in the selected provinces, the red circles show the effect of the income shock. For

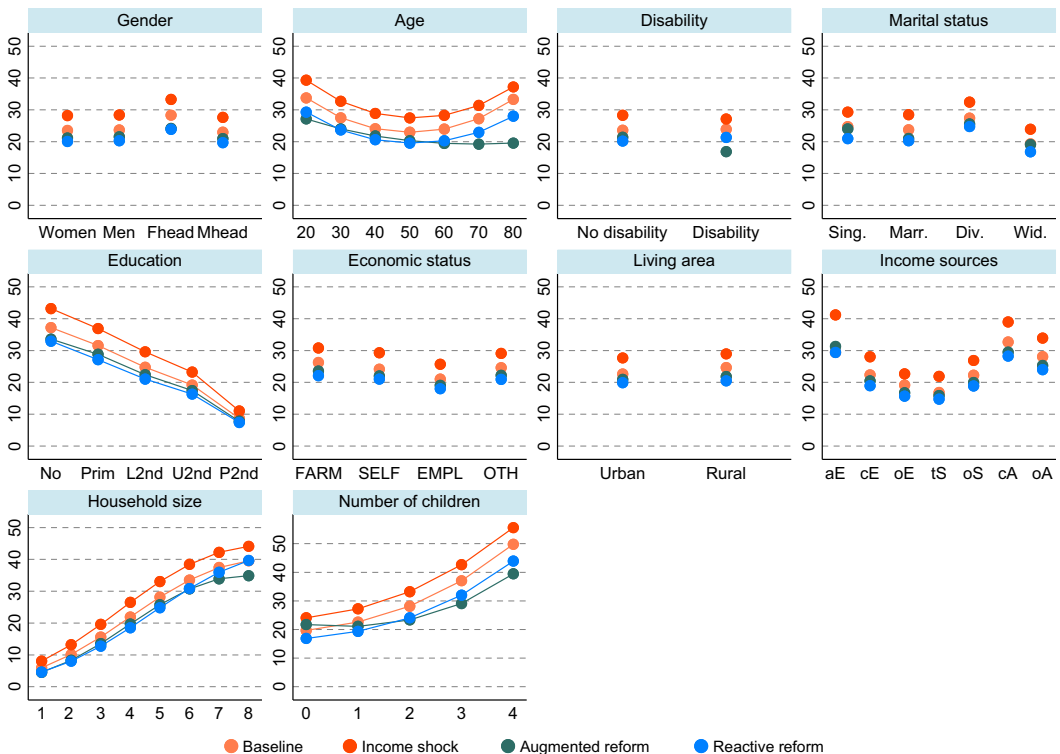


FIGURE 3 Average probability of being poor or vulnerable for selected provinces: baseline vs. income shock and reform scenarios. Source: Own calculations using INDOMOD. Individuals aged 18+ living in selected provinces (see Figure 2). [Colour figure can be viewed at wileyonlinelibrary.com]

most characteristics, the probability of being poor or vulnerable increases by 5 pp. Least affected are adults with higher education. Most affected are individuals living in households with agricultural employment income who already have a very high likelihood of being poor or vulnerable in the baseline. The impact of the shock further varies by household size and number of children in the household with larger households being hit more severely.

The two reforms (the augmented benefits shown in dark green, and the reactive reforms shown in blue) decrease the probability of being poor or vulnerable to levels below the baseline, with two exceptions: individuals living in households with agricultural labour income in both scenarios and households with eight household members in the reactive reform scenario. Notably, the impacts of the two reforms are very similar for most sub-groups and so the dots are overlaid in most figures. The greatest exceptions are that the augmented reform provides additional support for elderly and individuals with a disability, as well as for people living in larger households or with four or more children in the household, when compared with the reactive reform.

7 | CONCLUSION

In this article, the Indonesian tax-benefit system has been examined to explore the extent to which it helps people to prepare for and cope with income shocks.

We find that the existing system, before the COVID-19 pandemic, performs fairly well. Nevertheless, the benefits are not sufficiently adequate to lift everyone out of poverty in normal times. The risk of poverty is greatest for people in their 20s and 80s, for individuals with a disability, for people in large households, and in households with more than two children.

On simulating a natural disaster in selected provinces, we find that the existing system does not adequately help people to prepare for and cope with shocks as it does not take changes in circumstances into account. What stands out most prominently is the role of both household size and number of children when estimating the risk of a household being in poverty. This reflects the fact that most benefits in Indonesia do not sufficiently account for the composition of the household and highlights the importance of improving child-sensitive social protection in Indonesia.

The simulated hypothetical policy reforms improve the adaptiveness of the tax-benefit system as both reduce the impact of the shock. While the reactive reform is most effective in reducing poverty, the augmented reform is partly more efficient in reducing poverty and vulnerability risks for those identified as needing more support such as households with children and elderly people (World Bank, 2019).

The presented reforms are mostly based on policy recommendations suggested by international organisations. INDOMOD provides a unique tool to test these recommendations in terms of their social and fiscal impact as well their impact for different population subgroups. Such analysis is the prerequisite for improving social policy, especially in a context with limited fiscal space. The results furthermore provide new insights about the existing tax-benefit system. Such evidence-based policy making is a fairly new practice in many low- and middle-income countries due to the lack of tools similar to INDOMOD. Thus, more generally the analysis provides a framework for other low- and middle-income countries for testing their tax-benefit systems using an ASP lens.

A key criterion for ASP is the reliable identification of poor and vulnerable households in both 'normal' times and an emergency context. The existing integrated database is out-of-date, covers too small a percentage of the population, and different ministries operate with different databases leading to confusions in the implementation of existing programmes (Asmanto et al., 2020; Sumadi, 2023). These issues are not accounted for in INDOMOD, which is a limitation of the analysis. Nevertheless, results provide a good assessment of the policy design and efficiency of the system in a scenario where the identification of the poorest households is reliable.

Another key requirement of ASP is for there to be adequate financial planning for disasters by government. These issues are not addressed in this article but include ensuring not only that financial support can be obtained quickly but also that there is institutional coordination and clear delivery channels and protocols to ensure that the

financial assistance is channelled quickly to where it is needed (World Bank, 2020). The Indonesian government already allocates funding for potential natural disasters, categorised as 'other spending' rather than social assistance.

Separately, there is a need to identify ways in which to finance more comprehensive social protection as better preparedness also improves coping with a crisis. One option involves consideration of adjustments to the direct taxation schedules. Alternatively, a recent study explored options and recommended the use of social impact bonds, green financing, and a sovereign wealth fund (IESR, 2021). Additionally, the World Bank (2019) advised that consideration should be given to reducing fuel subsidies, as more than half of the subsidy goes to the middle/upper classes (World Bank, 2019: 44). They also recommend exploring options to remove VAT exemptions and instead use the additional revenue to finance social protection reforms (World Bank, 2019). This is in-line with a growing recognition that VAT exemptions are a blunt way in which to provide support for low-income households (Gcabo et al., 2019; Harris et al., 2018; Keen, 2013). These financing suggestions can also serve to fund disaster-related emergency support.

The synthetic application of the El Niño shock provides just one area-specific example of a natural disaster among a range of different natural disasters that Indonesia is vulnerable to and that are on the rise globally. Analysis such as this serves to highlight the utility of tax-benefit microsimulation modelling for assessing a country's social protection system, to quantify the extent to which it helps people to prepare for and cope with shocks and to identify ways of providing more effective support both in normal times and in emergencies.

ACKNOWLEDGMENTS

This article was written as part of the Programme Cooperation Agreement between Southern African Social Policy Research Insights (SASPRI) and the United Nations Children's Fund (PCA Reference IDS/PCA2021204). UNICEF Indonesia is thanked for their support. The results use INDOMOD version 3.1 which is based on the EUROMOD software. Originally maintained, developed and managed by ISER, since 2021 EUROMOD is maintained, developed and managed by the JRC of the European Commission, in collaboration with EUROSTAT and national teams from EU countries. We are indebted to the many people who have contributed to the development of EUROMOD. The information of this document expresses SASPRI's views and opinions and does not necessarily represent UNICEF's position.

DATA AVAILABILITY STATEMENT

Please contact the authors for information on data and code availability. [Corrections added on 13 December 2023 after first online publication: Data Availability Statement has been updated in this version.]

ORCID

Katrin Gasior  <https://orcid.org/0000-0003-4342-1174>

ENDNOTES

¹ Information in this paragraph is based on World Development Indicators (World Bank) and ILOSTAT indicators (ILO) [last accessed 28 August 2023].

² <https://research.noaa.gov/article/ArtMID/587/ArticleID/2685/New-research-volume-explores-future-of-ENSO-under-influence-of-climate-change> [last accessed 16 November 2022].

REFERENCES

- ADB. (2018). *Strengthening resilience through social protection programs: Guidance note*. Asian Development Bank.
- ADPC (2000). Indonesia Country Study. UNEP/NCAR/WMO/UNU/ISDR.
- Ali, R., & Tiwari, S. (2020). *Ex-ante poverty and distributional impacts of COVID-19 in Indonesia*. Indonesia COVID-19 observatory brief 1. World Bank.

- Asmanto, P., Hidayat, T., Suryanto, G. I., & Dewi, S. N. F. (2020). COVID-19 pandemic and the momentum to strengthen the national targeting system. Policy Brief, TNP2K.
- Avellaneda, A., Chang, R., Collado, D., Jara, H. X., Mideros, A., Montesdeoca, L., Rodriguez, D., Torres, J., & Vanegas, O. (2021). Assessing the cushioning effect of tax-benefit policies in the Andean region during the COVID-19 pandemic. CeMPA working paper series 8/21.
- Badan Kebijakan Fiskal (BKF) (2018). Strategi Pembiayaan dan Asuransi Risiko Bencana. Revised Edition. Badan Kebijakan Fiskal Kementerian Keuangan.
- Barnes, H., Espi-Sanchis, G., Leibbrandt, M., Leolo, M., McLennan, D., Noble, M., Pirttilä, J., Steyn, W., van Vrede, B., & Wright, G. (2021). Analysis of the distributional effects of Covid-19 and state-led remedial measures in South Africa. SA-TIED working paper 170.
- Barnes, H., Noble, M., & Wright, G. (2021). indomod country report: Indonesia—INDOMOD V2.0. Report for UNICEF Indonesia.
- Barr, N. (1992). Economic theory and the welfare state: A survey and interpretation. *Journal of Economic Literature*, 30(2), 741–803.
- Barrett, C., & Maxwell, D. (2005). *Food aid after fifty years: Recasting its role*. Routledge.
- Berner, H., & van Hemelryck, T. (2021). Social information systems and registries of recipients of non-contributory social protection in Latin America in response to COVID-19. Project Documents (LC/TS.2021/56), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).
- Bowen, T., Del Ninno, C., Andrews, C., Coll-Black, S., Gentilini, U., Johnson, K., Kawasoe, Y., Kryeziu, A., Maher, B., & Williams, A. (2020). *Adaptive social protection. Building resilience to shocks. International development in focus*. The World Bank.
- BPS. (2020). <https://www.bps.go.id>
- Brewer, M., & Tasseva, I. V. (2021). Did the UK policy response to Covid-19 protect household incomes? *The Journal of Economic Inequality*, 19, 433–458.
- Cantó, O., Figari, F., Fiorio, C. V., Kuypers, S., Marchal, S., Romaguera-de-la-Cruz, M., Tasseva, I. V., & Verbist, G. (2021). Welfare resilience at the onset of the COVID-19 pandemic in a selection of European countries: Impact on public finance and household incomes. *Review of Income and Wealth*, 68, 293–322.
- Costella, C., McCord, A., van Aalst, M., Holmes, R., Ammoun, J., & Barca, V. (2021). Social protection and climate change: scaling up ambition. In N. Anna & J. Ammoun (Eds.), *Social Protection Approaches to COVID-19 Expert Advice Service (SPACE)*. DAI Global UK Ltd.
- Davies, M., Béné, C., Arnall, A., Tanner, T., Newsham, A., & Coirolo, C. (2013). Promoting resilient livelihoods through adaptive social protection: Lessons from 124 programmes in South Asia. *Development Policy Review*, 31(1), 27–58.
- Decoster, A., Pirttilä, J., Sutherland, H., & Wright, G. (2019). SOUTHMOD: Modelling tax-benefit systems in developing countries. *International Journal of Microsimulation*, 12(1), 1–12.
- Gcabo, R., Moche, B., Steyn, W., Moahlodi, B., Pirttilä, J., Noble, M., Wright, G., Barnes, H., & Masekesa, F. (2019). Modelling value-added tax (VAT) in South Africa: Assessing the distributional impact of the recent increase in the VAT rate and options for redress through the benefits system. WIDER working paper no. 2019/13. UNU-WIDER: Helsinki, Finland.
- Gough, I. (2004). East Asia: The limits of productivist regimes. In I. Gough, G. Wood, A. Barrientos, P. Bevan, P. Davis, & G. Room (Eds.), *Insecurity and welfare regimes in Asia, Africa and Latin America: Social policy in development contexts* (pp. 169–201). Cambridge University Press.
- Gyori, M., Diekmann, K., & Kuhne, E. (2021). *The importance of social protection for climate change mitigation in LMICS: Success stories and opportunities for the future*. GIZ.
- Harris, T., Phillips, D., Warwick, R., Goldman, M., Jellema, J., Goraus, K., & Inchauste, G. (2018). *Redistribution via VAT and cash transfers: An assessment in four low and middle income countries*. IFS working paper W18/11. The Institute for Fiscal Studies (IFS).
- IESR. (2021). *Innovative finance for social protection in response to COVID-19: Final report*. Institute for Economic and Social Research, Faculty of Economics and Business, Universitas Indonesia.
- ILO. (2021). *Toward solid social protection floors? The role of non-contributory provision during the COVID-19 crisis and beyond*. ILO Brief.
- Jellema, J., Wai-Pai, M., & Afkar, R. (2017). The distributional impact of fiscal policy in Indonesia. CEQ working paper 40.
- Keen, M. (2013). *Targeting, cascading, and indirect tax design*. IMF working paper WP13/57. International Monetary Fund (IMF).
- Kidd, S., Gelders, B., & Bailey-Athias, D. (2017). *Exclusion by design: an assessment of the effectiveness of the proxy means test poverty targeting mechanism (ESS working paper No.56)*. International Labour Office.
- Lastunen, J., Rattenhuber, P., Adu-Ababio, K., Gasior, K., Jara, H. X., Joste, M., McLennan, D., Nichelatti, E., Oliveira, R. C., Pirttilä, J., Richiardi, M., & Wright, G. (2021). *The mitigating role of tax and benefit rescue packages for poverty and inequality in Africa amid the COVID-19 pandemic*. WIDER working paper, 2021/148. Helsinki.
- Midgley, J. (2019). Social assistance, poverty and development. In J. Midgley, R. Surender, & L. Alferts (Eds.), *Handbook of Social Policy and Development* (pp. 352–372). Edward Elgar Publishing.

- Naylor, R., Battisti, D., Vimont, D., Falcon, W., & Burke, M. (2007). Assessing risks of climate variability and climate change for Indonesian rice agriculture. *Proceedings of the National Academy of Sciences of the United States of America.*, 104, 7752–7757.
- Rahayu Kusumastuti, S., Larasati, D., Siyaranamual, M., Huda, K., Kidd, S., & Gelders, B. (2018). *The future of the social protection system in Indonesia: Social protection for all. TNP2K Publication-2018.* TNP2K.
- Schnitzer, P. (2019). How to Target Households in Adaptive Social Protection Systems? Evidence from Humanitarian and Development Approaches in Niger. *Journal of Development Studies*, 55(sup1), 75–90.
- Setiawan, A. M., Lee, W.-S., & Rhee, J. (2017). Spatio-temporal characteristics of Indonesian drought related to El Niño events and its predictability using the multi-model ensemble. *International Journal of Climatology*, 37, 4700–4719.
- Sumadi, P. (2023). Social protection in Indonesia: Reforming opportunities during Covid-19 pandemic. *Asean Social Work Journal*, 11(1), 49–62.
- Sumarto, M. (2017). Welfare regime change in developing countries: Evidence from Indonesia. *Social Policy & Administration*, 51(6), 940–959.
- Sumarto, M. (2020). Insecurity and historical legacies in welfare regime change in southeast Asia-Insights from Indonesia, Malaysia, and Thailand. *Social Policy and Society*, 19(4), 629–643.
- Sutherland, H., & Figari, F. (2013). EUROMOD: The European union tax-benefit microsimulation model. *International Journal of Microsimulation*, 6(1), 4–26.
- Tabor, S., Ginting, E., & Aji, P. (2015). *Preparing for El Niño: Policy options. ADB papers on Indonesia 01/2015.* Asian Development Bank.
- UNICEF. (2019). *Programme guidance: Strengthening shock responsive social protection systems. PD/GUIDANCE/2019/005.* UNICEF.
- UNICEF, UNDP, Prospera, & SMERU. (2021). *Analysis of the social and economic impacts of COVID-19 on households and strategic policy recommendations for Indonesia.* UNICEF.
- WFP. (2016). *The impact of drought on households in four provinces in Eastern Indonesia.* World Food Programme.
- World Bank. (2019). *Indonesia economic quarterly, December 2019: Investing in people.* The World Bank.
- World Bank. (2020). *International bank for reconstruction and development project appraisal document on a proposed loan in the amount of US\$ 500 million to the Republic of Indonesia for the Indonesia disaster risk finance and insurance. Report No. PAD4070.* World Bank East Asia and Pacific Region.
- Wright, G., Noble, M., Barnes, H., Moechtar, A., McLennan, D., Yusuf, A. A., Gasior, K., & Muyanto, R. (2021). Estimating the distributional impacts of the COVID-19 pandemic and the remedial tax and benefit policies on poverty in Indonesia. *International Journal of Microsimulation*, 14(2), 50–80.
- Yuda, T. K. (2023). Beyond path dependency: Analysing Indonesia's social policy responses to two crises. *Social Policy & Administration*, 57, 1–17.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Gasior, K., Wright, G., Barnes, H., & Noble, M. (2023). Adaptive social protection in Indonesia: Stress-testing the effect of a natural disaster on poverty and vulnerability. *Social Policy & Administration*, 1–16. <https://doi.org/10.1111/spol.12983>