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Adaptive Social Protection in Indonesia – Stress-testing the effect of a natural disaster on poverty and vulnerability

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Adaptive Social Protection in Indonesia – Stress-testing the effect of a natural disaster on poverty and vulnerability[1]

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Southern African Social Policy Research Insights

Executive Summary

Indonesia is among the countries with the highest exposure to natural disasters, and risks are expected to increase in the future due to climate change. Natural disasters and also other shocks require well-developed social protection systems that are able to cushion the economic consequences for those most vulnerable to these events. Many international and national organisations advocate for 'Adaptive Social Protection' (ASP) which links social policy with strategies on disaster risk reduction and climate change adaptation. The main emphasis is on improving households' ability to prepare for, cope with, and adapt to shocks.

This paper uses the tax-benefit microsimulation model INDOMOD to analyse the adaptiveness of the Indonesian social protection system both under normal conditions, and after a simulated hypothetical income shock caused by a natural disaster, using El Niño as a showcase. El Niño is a climate phenomenon that has the ability to change the global atmospheric circulation and as such to influence temperature and precipitation around the world. The drought caused in severely hit regions in Indonesia leads to a disruption of established crop patterns and harvest losses. The dry periods furthermore often cause forest fires affecting the livelihood of those employed in the forestry, transportation, tourism, and public health sector.

The analysis focuses first on how the current tax-benefit system prepares individuals and households for a shock (Section 6.1). Secondly, it tests whether the level of preparedness improves after introducing a hypothetical policy reform by augmenting existing benefits and by introducing two new categorical benefits for old-age and disabled individuals ('augmented reform') (Section 6.2).

[1] **Acknowledgments**: This paper was written as part of the Programme Cooperation Agreement between Southern African Social Policy Research Insights and the United Nations Children's Fund (PCA Reference IDS/PCA2021204). UNICEF Indonesia is thanked for their support. The information of this document expresses SASPRI's views and opinions and does not necessarily represent UNICEF's position.
The results presented here use the INDOMOD tax-benefit microsimulation model which is based on the software EUROMOD version 3.4.10. Originally maintained, developed and managed by the Institute for Social and Economic Research (ISER), since 2021 EUROMOD is maintained, developed and managed by the Joint Research Centre (JRC) of the European Commission, in collaboration with EUROSTAT and national teams from the EU countries. We are indebted to the many people who have contributed to the development of EUROMOD. The results and their interpretation are the authors' responsibility.

Next, the analysis stress-tests the welfare system by introducing an income shock caused by a hypothetical El Nino event. Based on information from previous events, we simulate a labour market income shock to individuals living in regions more likely to be significantly hit and working in sectors affected by such an event. The analysis explores the impact of the income shock under the current tax-benefit system, under the augmented hypothetical reform and under an additional hypothetical reform that introduces emergency benefits in addition to the existing policy design ('reactive reform') (Section 6.3).

Main results:

- We find that the current (March 2020) system, prior to the COVID-19 pandemic, performs fairly well. The social protection system moves 50 percent of poor households from below the poverty line to the vulnerable group, and 1 percent to the less vulnerable group. 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 disabled people, 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 current system (using the March 2020 tax-benefit rules) does not protect people adequately. The poverty rate in the affected provinces rose from 11.4 percent to 15.3 percent. In the absence of any policy reforms, those already in poverty would have become poorer (measured using the poverty gap), 17 percent of vulnerable households would have fallen into poverty, and nine percent of less vulnerable households would have become vulnerable. The social protection arrangements therefore do not adequately help people to prepare for and cope with shocks.
- Both hypothetical reform scenarios reduce the impact of the shock in the selected provinces, with the reactive reform being more effective than the augmented reform in reducing poverty. However, the augmented reform scenario is more efficient in reducing poverty and vulnerability risks for those identified as needing more support by the World Bank (2019), i.e. households with children and elderly people.

Main policy conclusions:

- Results reveal the high probability of households containing children being poor or vulnerable, highlighting the importance for further exploration of child-specific support.
- A key criterion of ASP is that the benefit system can respond quickly to an emergency context. This is challenging with the current system of the integrated database. Refinements to the system would allow for faster emergency support for affected households.
- Another key requirement of ASP is for there to be adequate financial planning for disasters by government. This also includes institutional coordination and clear delivery channels and protocols. Recently implemented mechanisms will help ensure that there is a fast and transparent flow of sufficient disaster funds when disasters occur.
- Separately, there is a need to identify ways in which to finance a more comprehensive social security provision in 'normal' times, e.g. to provide better social protection for children as mentioned above.

1 Introduction

Indonesia is among the countries with the highest exposure to natural disasters[2], facing the risk of earthquakes, tsunamis, floods, landslides, volcanic eruptions, fires, extreme weather, extreme wave activity, and drought in most regions of the country (BKF, 2018). Climate change is expected to exacerbate these risks in the future. Recent examples include the 2018 earthquake in Lombok and the 2021 earthquake in Nusa Tenggara Timur. The government's financial strategy to prepare for the manifold consequences of such disasters identifies six priorities (BKF, 2018), including the protection of households and communities affected by disasters with a specific focus on low-income groups.

Natural disasters but also other shocks such as economic crises, pandemics, conflicts and forced displacement require well-developed social protection systems that are – among others – prepared to cushion the economic consequences for those most vulnerable to these events. Many international and national organisations advocate for 'Adaptive Social Protection' (ASP) which is described by the World Bank as 'a response to widespread demand for the use of social protection as a tool to build the resilience of poor and vulnerable households to […] shocks' (Bowen et al., 2020: 1). It links social policy with strategies on disaster risk reduction and climate change adaptation (Davies, 2013).

The main emphasis is on improving households' ability 'to prepare for, cope with, and adapt to shocks in a manner that protects their well-being: ensuring that they do not fall into poverty or become trapped in poverty as a result of the impacts' (Bowen et al., 2020: 3). The first two aspects – the ability to prepare for and cope with shocks – are both key as in many cases they will determine whether adaptation to a shock is even needed in the first place. For example, a comprehensive social security system which includes social assistance and social insurance schemes will help *prepare* people for financial shocks that might occur, as well as to *cope* with them if they arise, and if provided at adequate levels will ensure that people do not fall into or become trapped in poverty.

Tax-benefit microsimulation models are useful tools to 'stress-test' (Atkinson, 2009) the extent to which social protection systems can deal with such shocks based on hypothetical scenarios or information from past events. Using micro data, the model allows one to analyse distributional effects of a social protection system as well as the consequences of a shock for vulnerable groups. More specifically, microsimulation models are particularly well placed to explore the ability to *prepare* for and *cope* with shocks, both with respect to the current tax and benefit arrangements and with respect to hypothetical reform scenarios that might help build resilience. These types of models are less immediately 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).

Empirical applications of Atkinson's stress-testing approach include research on the European unemployment shock at the onset of the 2008 economic crisis (Figari, Salvatori and Sutherland, 2010), the poverty risk of mothers after childbirth and divorce in Europe (Popova and Navicke, 2019) and more recently, the consequences of the COVID-19 pandemic. However, the comprehensiveness of social protection systems and their policy design differ in low and middle-income countries. For example, proxy-means-tests and unified databases which are often used to identify benefit recipients in low- and middle-income countries can be less reactive to income shocks than the income-based means-tests applied in high-income countries. Across the world, the stress-testing approach provided a useful toolkit in timely monitoring of the distributional impact of the pandemic and the role of

[2] Ranked 38th in the World Risk Index and 33rd in 'Exposure'. Source: WorldRiskReport Results 2021 retrieved from weltrisikobericht.de, last accessed 28 September 2021.

welfare states in mitigating the effects before micro data becomes available (see for example Avellaneda et al. (2021) for Andean countries; Barnes et al. (2021a) for South Africa; Brewer and Tasseva (2021) for the United Kingdom; Cantó et al. (2021) for European countries; Jara et al. (2021) for Ecuador; and Lastunen et al. (2021) for five countries in Africa).

Wright et al. (2021) present findings for Indonesia, exploring how the first year of the COVID-19 pandemic affected people's earnings and poverty situation using the tax-benefit microsimulation model INDOMOD (Barnes et al., 2019) together with adjusted datasets to reflect the economic shock throughout 2020. They estimate that in 2020 the additional COVID-related policies meant that poverty rose from 6.8 percent to a maximum of 8.3 percent rather than to 10.7 percent if they had not been introduced. The results highlight the important role of the government in introducing emergency policies to cushion the economic shock and thus, in supporting people to cope with the shock. However, results also show challenges faced by the existing tax-benefit system in responding to changes in the income situation of households.

Building on this analysis, we extend the stress-testing approach using a more focused Adaptive Social Protection lens to study the role of the Indonesian tax-benefit system in improving households' ability to prepare for and to cope with an economic shock caused by a natural disaster. This allows us to analyse the following research questions:

- How comprehensive are Indonesia's social protection arrangements? That is, which groups are currently included in and excluded from the various social assistance schemes, and what are the characteristics of these groups?
- How adequate are the social protection arrangements? That is, to what extent are benefit recipients still vulnerable to shocks?
- What additional policies or modifications could help ensure that people can better prepare for and cope with shocks?

The paper contributes to the existing literature by applying the stress-testing lens to a middle-income country, using economic shocks caused by natural disasters and the ASP framework. The focus of the analysis is on the design of tax-benefit policies and the extent to which they help people prepare for and cope with shocks. The INDOMOD tax-benefit microsimulation model which is underpinned by a nationally representative dataset enables the distributional effect of existing (March 2020) and hypothetical policies to be assessed and can help inform decision-making about how to ensure that there is at least a basic level of social protection for all.

The paper is organised as follows: Section 2 contains a discussion of the role of the tax-benefit system in the provision of Adaptive Social Protection. Section 3 introduces the Indonesian tax-benefit system that was in place in March 2020 and considers the extent to which those arrangements (prior to the COVID-19 pandemic) can be regarded as providing ASP. Section 4 contains a justification for considering El Niño as a hypothetical example of a natural disaster. Section 5 sets out the methodological approach. Section 6 presents the results and Section 7 discusses the main findings and highlights areas for further investigation.

2 ASP and the role of the tax-benefit system

Adaptive Social Protection is based on the idea that poor and vulnerable households should be supported so that they can be resilient to shocks like climate change (e.g. Bharadwaj et al., 2021; Costella et al., 2021; Gyori et al., 2021), natural disasters, economic crises, pandemics, conflicts and

forced displacement. The different types of shocks can affect households in various ways – such as with respect to people's assets, food security, labour market status and earnings - and these require different types of support. Disasters increase existing vulnerabilities and create new ones, especially if households are unprepared and revert to poor coping strategies such as selling their productive assets, reducing consumption levels or making difficult decisions regarding their health, education, and livelihoods, often leading to long-term effects (ADB, 2018). For example, research on the consequences of prolonged droughts from El Niño in Indonesia has highlighted that about 27 percent of the population had incomes slightly above the poverty line and could become poor if food prices increase and agricultural income suddenly decreases (Tabor et al., 2015). The aim of ASP is to provide households with the financial means - e.g. through emergency benefits in affected regions - to cope with a shock without having to choose coping mechanisms that might risk their socioeconomic situation and livelihood (ADB 2018).

Even though the notion of resilience and the three actions attached to it (prepare, cope, and adapt) emphasize the role of individual agency, ASP requires governments to actively improve the resilience of households through social protection programmes. ASP aims at reducing poverty and building up resilience before a shock happens, among others through predictable transfers, and by scaling up interventions in response to shocks (Schnitzer, 2019). A stable income situation pre-crisis enables households to prepare for a potential shock by for example acquiring assets, savings, or having the means to build earthquake-secure homes. This in turn is crucial for coping with a shock in the short-term, and both preparing and coping are good prerequisites for the potential to adapt to a new situation in the long-term.

The role of the tax-benefit system differs in each of the stages. The general purpose of the welfare state is to provide a decent living standard through income redistribution to reduce poverty and income inequality as well as by providing insurance to offset risks over the life cycle, particularly childbirth, retirement and unemployment which are known to bear a higher poverty risk (Bar, 1992). Many social programmes in low and middle-income countries focus on the persistent poor, as opposed to a stronger focus in high income countries on the transient poor to avoid situations of persistent poverty. In the context of South-East Asian countries, support generally includes means-tested social assistance programmes, social insurance programmes linked to formal employment and contributory healthcare programmes with means-tested support for the poor (Cook and Pincus, 2014).

If the design of the tax-benefit system is set up in the right way, the system in place is able to cushion income shocks in times of crisis and the additional risks during disasters. In the welfare literature, this is often defined as the automatic stabilising function of the tax-benefit system, i.e. the 'in-built flexibility to absorb shocks' (Pechman, 1973). In addition, exceptional situations might also require discretionary measures, i.e. the introduction of ad-hoc emergency measures if the existing system is not prepared or the situation requires additional support. 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 current social policy system.

Emergency measures can be based on a vertical expansion leading to a longer benefit duration, higher benefit amounts, or additional components for already existing beneficiaries. Horizontal expansion, on the other hand, leads to the inclusion of new beneficiaries from affected communities.

Furthermore, understanding risks and hazards of a country can help to design social protection measures that take multiple dimensions of resilience into account. Examples include supporting farmers during lean seasons as an integral part of the tax-benefit system, providing cash transfers to ensure children can attend school and continuing to pay the benefit when schools are closed due to

disaster, or including index mechanisms to increase support levels when the macro situation changes (ADB, 2018).

ILO (2021) provides many international examples of ways in which governments have acted fast to help people during the COVID-19 pandemic, including with respect to health care, income support for children, people of working age, and older persons, as well as exceptional one-off payments and universal basic income payments. They highlight that more than 100 countries have provided support for children in poverty. For example, in South Africa, the Child Support Grant (CSG) was increased in value by R300 for the month of May 2020, and thereafter caregivers of children in receipt of the CSG were given a special payment (referred to as the Caregiver Social Relief of Distress benefit) of R500 per month for the months of June-October 2020 inclusive. Many flagship programmes in low- and middle-income countries – including Indonesia - stem from such emergency responses to shocks in the past (UNICEF, 2019). Given the significant and positive impact of many of the COVID specific responses, it will be interesting to see whether these short-term reliefs will be converted into more permanent forms of provision.

An important dimension of ASP is targeting, not only in addressing persistent poverty and the preparedness for shocks but also in 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 and Maxwell, 2005). As mentioned above, the ideal design of benefits does not only manage to target those currently in need of support but is also responsive to shock-induced vulnerabilities.

However, many low- and middle-income countries do not have information about the incomes of the majority of the population and thus use proxy-means tests as a targeting strategy. Proxy-means tests are based on social information systems that measure medium- or long-term characteristics of households to approximate household income and do not necessarily cover all vulnerable households nor those in the population who do not have access to social entitlements in normal times (Berner and Van Hemelryck, 2021; Kidd et al., 2017). Thus, proxy-means tests 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 towards easier and quicker identification is the development of a unified database which collects information across different social protection programmes and links various information sources (Schnitzer, 2019). Nevertheless, a unified database is still a form of proxy-means test which has its challenges. It only provides greater potential to react to changes in circumstances if it is regularly updated, includes a large enough share of each local community to allow for horizontal expansion of programmes, and if governments anticipate potentially affected population groups for different types of shocks and start to integrate additional targeting variables into the unified database (UNICEF, 2019). This also includes climate and disaster related risks and information on spatial and temporal components (duration, frequency and timing) that can be integrated into the means-test in times of crisis (ADB, 2018). Examples of such disaster and climate aware targeting approaches are the inclusion of geographical variables and indicators of agro-climatic zones in Pakistan, and the inclusion of housing characteristics and the proximity to a hazardous natural element in the Dominican Republic (UNICEF, 2019).

The tax-benefit system is therefore a pivotal mechanism for providing support for people in normal times, as well as in emergency situations. The following section introduces the tax and benefit arrangements in Indonesia, highlighting the main strengths and challenges that have been identified.

3 The Indonesian tax-benefit system and its potential for ASP

Indonesia is already in a good position with respect to ASP as it has a sophisticated tax-benefit system which is well established. Social protection consists of both a social assistance and a social insurance scheme.

Taking the policies in turn that are modelled in INDOMOD, the following permanent schemes help people to *prepare* for and *cope* with shocks:

- National Health Insurance - *Jaminan Kesehatan Nasional*
- Social Insurance schemes - *BPJS Ketenagakerjaan, PT Asabri, PT Taspen*
- Family Hope Programme - *Program Keluarga Harapan (PKH)*
- Smart Indonesia Programme - *Program Indonesia Pintar (PIP)*
- Electronic Food Voucher / Basic Food Program - *Bantuan Pangan Non Tunai (BPNT) / Program Sembako*

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. Eligibility for social assistance benefits is determined using the Integrated Database on Social Welfare (Data Terpadu Kesejahteraan Sosial, 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 percent of households with the lowest welfare rank (with variations across districts). The DTKS employs a proxy-means test method to rank households. Even though such proxy-means tests are not designed to react to a household's change in circumstances, the benefit system was able to accommodate being adjusted quickly in response to a crisis situation, as evidenced by the rapid changes that were implemented because of the COVID-19 pandemic where the number of beneficiaries was increased for PKH and BPNT and several new emergency policies were introduced. Preliminary results undertaken using INDOMOD show that these measures went a long way to mitigate the impact of the pandemic in 2020 (Wright et al., 2021).

A number of other ASP-oriented regional initiatives are underway to address local, as opposed to national, level disasters. Such initiatives include the design of a Cash for Drought programme in Nusa Tenggara Timur; promoting shock responsive social protection in Nusa Tenggara Barat by building on a local intervention called Jaring Pengaman Sosial (JPS) Gemilang; and strengthening capacity for ASP in Yogyakarta for provincial, district and village governments. Indonesia is therefore on a strong footing in terms of prioritising a resilient population, both at the national level and regionally. This multi-level approach is crucial for ASP to work optimally.

Nevertheless, limitations in terms of the adequacy of the provision and gaps in coverage have been identified.[3] For example, the World Bank identified that support for disabled people is inadequate, and that over a third (36 percent) 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 current social assistance system does not fully accommodate their needs to 'bounce back' after such events.' (World Bank, 2019: 40). The issue of disaster readiness is particularly salient here. The authors argue that 'For social assistance to be adaptive and scalable in response to disaster, the system should be able to increase benefits to existing recipients, extend benefits to new recipients, and introduce new benefits under the existing programs. These should be implemented under a strong adaptive

[3] The issues of coverage and adequacy are examined further in Section 6 below.

social protection framework that includes early warning systems, predictable financing, and scalability of key programs to respond to disaster in a timely and predictable manner' (World Bank, 2019: 49).

In response to these observations, World Bank (2019) recommend that social assistance should be expanded up to the 70th percentile, decreasing to the 40th percentile by 2045 as poverty decreases. More specifically, they suggest *inter alia* increasing coverage of PKH and BPNT to the poorest 40 percent, adjusting the value of BPNT by household size, and introducing means-tested benefits for elderly and disabled people. Regarding the adequacy of the coverage, the World Bank argues that 'The guaranteed minimum level of protection should be set so that it provides adequate consumption support and protection against household shocks' and brings households above the poverty line (World Bank, 2019: 45). The importance of better support for at-risk children, elderly and people with disability is also acknowledged in a national strategy paper to improve social protection in Indonesia (Rahayu Kusumastuti et al., 2018).

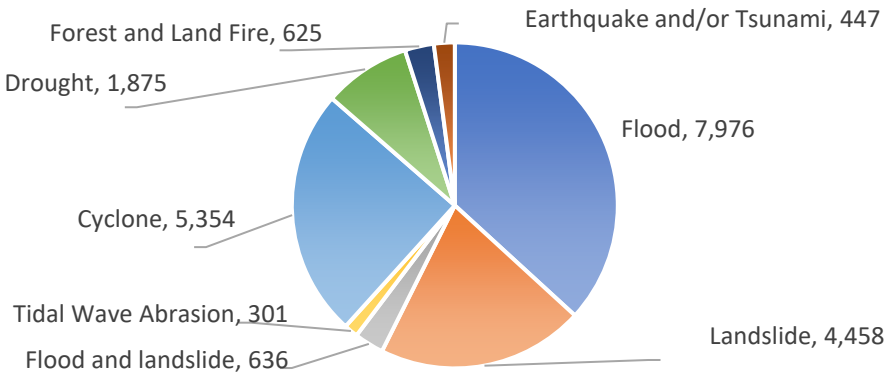
With reference to the COVID-19 pandemic, a recent study made a number of policy recommendations for ensuring that families are best protected during the pandemic, including a recommendation to consider a universal and unconditional child benefit, take household size into account in the BPNT formula, ensure that food can be obtained at an affordable price, and enhance working conditions such as extending sick-leave and parental leave entitlements (UNICEF, UNDP, Prospera and SMERU, 2021). More broadly they recommend 'efforts to continuously reform the overall social protection system and measures through fiscal assessments, streamlining of programs, and expanding social protection coverage for all.' (UNICEF, UNDP, Prospera and SMERU, 2021: 46).

A further challenge that is widely recognised is the need to ensure that the government's integrated database is kept up-to-date and covers a sufficiently large proportion of the population (Asmanto et al., 2020). This is discussed in the final section.

4 El Niño as a showcase for a natural disaster

Indonesia faces regular natural disasters including floods, landslides, tidal waves, cyclones, drought, fires, earthquakes and tsunamis. Figure 1 below summarises the number of natural disasters that were recorded between 1996-2017. It has further been estimated that in Indonesia 55 million people have been displaced between 2007 and 2018, with annual economic losses of US$2.2 to US$3 billion per year (World Bank, 2020a: 9).

Figure 1: Number of disasters by type, 1996-2017

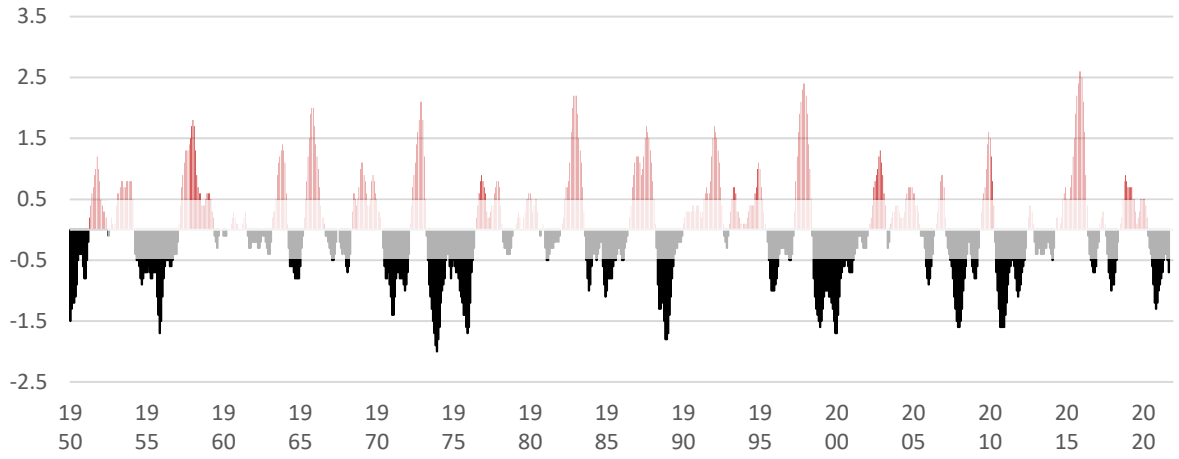


Source: World Bank (2019) page 36.

El Niño was selected as an example of a hypothetical natural disaster in this paper for several reasons. First, previous El Niño events have been well documented, particularly in terms of their environmental impact. Second, unlike some disasters, such events can be forecasted well, meaning for example that agricultural agency officials are able to provide advice on when to plant crops. Third, the risks and hazards are well known. And fourth, the event usually affects several – but not all - islands of Indonesia allowing us to analyse the effects for a sub-national area .

El Niño is one out of three stages of the El Niño–Southern Oscillation (ENSO)[4], a climate phenomenon that has the ability to change the global atmospheric circulation and as such to influence temperature and precipitation around the world. El Niño refers to a warming of the ocean surface which increases rainfalls over the tropical Pacific Ocean and tends to decrease rainfall in Indonesia and the Western Pacific. The other two stages are La Niña (cooling stage leading to rainfall increases in Indonesia and decreases in the tropical Pacific Ocean) and the neutral stage with close-to-average temperatures. Figure 1 shows the changes in seasonal sea surface temperatures in the last 20 years pointing to around six El Niño episodes. However, extreme events like the one in 2015-16 usually only occur once every 20 years. On the other hand, research on the consequences of climate change suggests that aggressive greenhouse gas emissions will most likely have an impact on the frequency of extreme events as well as the magnitude of extreme events[5].

Figure 2: Oceanic Niño Index (ONI), 2000-2021



Source: Own representation based on NOAA/ National Weather Service data
Note: Seasonal (3-month) sea surface temperatures in the central tropical Pacific Ocean compared to the 1981-2010 average. Warming or cooling of at least 0.5˚Celsius above or below average near the International Dateline is one of the criteria used to monitor the El Niño-La Niña climate pattern.

Indonesia typically has two seasons (dry from April to September and wet from October to March) with some variations in different regions. The warming of the ocean affects the trade wind which leads to extended dry periods affecting several provinces of Indonesia. Setiawan, Lee and Rhee (2017) provide regional patterns of previous El Niño events (1950-2010) showing that the effects differ by provinces, time of the year and intensity of the event.

In more severely hit regions, the drought caused by El Niño leads to a disruption of established crop patterns and harvest losses, leaving farmers without income and the community with food and

[4] Description of ENSO and the three stages based on NOAA Climate.gov (https://www.climate.gov), last accessed on 16/11/2021.
[5] https://research.noaa.gov/article/ArtMID/587/ArticleID/2685/New-research-volume-explores-future-of-ENSO-under-influence-of-climate-change, last accessed on 16/11/2021.

drinking-water shortages (Tabor, Ginting and Aji, 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 production of rice is particularly sensitive to temperature changes which suggests that effects could be worsened in the future due to climate change, leading to an increase in the probability of delays to the wet season (World Bank and ADB, 2021). The World Bank and Asian Development Bank estimates a reduction of national production by 10 to 25 percent if temperature changes by 1°C.

Underproduction of the main staple furthermore leads to an inflation of rice prices due to shortages and the need to import rice from other countries (Tabor, Ginting and Aji, 2015). This most likely affects poorer and vulnerable households more severely as most of their expenses are based on food items. The World Bank estimated a fall in rice production by 2.1 million Tonnes after the 2015 El Niño, leading to an increase in rice prices of 10.2 percent[6].

Past El Niño events have also led to forest fires affecting the livelihood of those employed in the forestry, transportation, tourism, and public health sector (ADPC, 2000) on top of the ecological damages. Additionally, areas faced losses of infrastructure and houses, health-related risks, school closures and disruption of air, land and sea travel.

A World Food Programme study (2016) focuses on the consequences of the drought following the 2015 El Niño on households in eight districts in the provinces Jawa Timur, Nusa Tenggara Barat, Nusa Tenggara Timur and Papua. Results show that 31 percent of the households faced a more than 30 percent loss in their primary income source, a further 18 percent report a decrease between 10 and 30 percent, 10 percent report a lower than 10 percent reduction and 41 percent report no change in their primary income source. The impact varies across districts but more importantly across main income source with agricultural workers and workers in food crop production being hit the hardest (46 to 49 percent report a severe decrease in income and only 15 to 18 percent are not affected). Focusing on agricultural households shows that 44 percent grew rice in 2015. Among them, 40 percent lost at least 50 percent of their rice harvest due to the drought.

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 helps to cope with shortages in agricultural outputs. Second, strengthening social protection can help farmers to prepare and to cope with drought. Specifically, they suggest lowering the prize of subsidized rice distributed under the Raskin programme, increasing cash transfers for affected rural households, and improving food security given that the loss in agricultural outputs has a direct effect on farmers' own food security.

5 Methodology: stress-testing with INDOMOD

The Indonesian tax-benefit microsimulation model INDOMOD (Barnes et al., 2021b) is used to stress-test the tax-benefit system both under normal conditions, and after a simulated hypothetical income shock caused by El Niño. INDOMOD is a static tax-benefit microsimulation model for Indonesia which has been developed by SASPRI for use by Government in collaboration with UNICEF Indonesia (Barnes et al., 2021) and runs on the EUROMOD platform (Sutherland and Figari, 2013).

The 2020 policy system is used for this analysis which refers to all policies in place in March 2020. This allows us to focus on the social situation *before* the COVID-19 pandemic caused a real-life stress-test to the tax-benefit system.

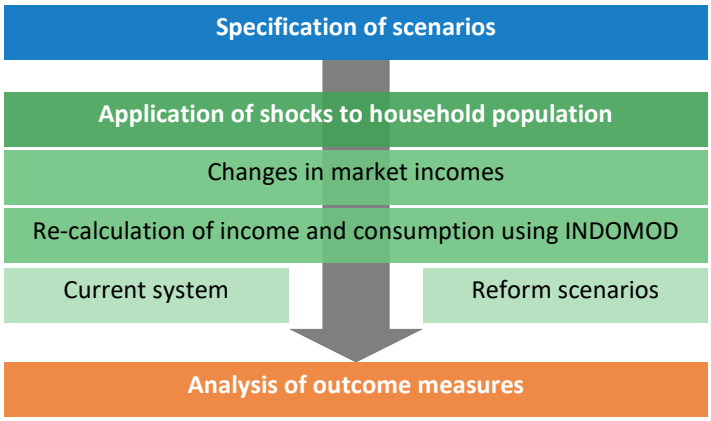
[6] https://www.reuters.com/article/indonesia-elnino-idUSL3N12R1SW20151028 .

The principal idea of stress-testing is to apply plausible macro-economic shocks to micro data to test the resilience of the welfare state and to identify vulnerabilities of the system. As such, stress-testing is not a forecasting exercise but a method to simulate a worst-case scenario to test 'the performance of the welfare state in mitigating the effects' (Popova and Navicke, 2019: 60).

INDOMOD Version 3.1 (the version used here) is underpinned by the National Socio-Economic Survey/ *Survei Sosial Ekonomi Nasional* (SUSENAS) for March 2020 (BPS, 2020). The survey contains detailed information from over 330,000 households and more than 1.3 million individuals including variables on demographics, education, labour force participation, functional impediments, health insurance, social protection, household expenditure (food and non-food), income from wage/salary, business income, property income, non-consumption income and expenditure, and financial transactions. Using a representative sample of the Indonesian population allows us to evaluate the distributional impact of the shock and variations in social impact for different population sub-groups.

Figure 3 summarises the analytical steps. As will be elaborated further in this section, these comprise specifying the scenarios to model, applying the economic shocks to the baseline SUSENAS dataset within INDOMOD to reduce people's market incomes accordingly (described below), as well as household expenditure, and then analysing the impact of the current tax-benefit system and selected reform scenarios.

Figure 3: Overview of analytical steps



5.1 Specification of the scenarios

Table 1 provides an overview of the scenarios applied in this analysis. The scenarios differ by region (nationwide vs. selected provinces), income shock (no shock vs. income losses) and policy system (current vs. reforms).

A distinction is made between benefits in place in March 2020 (note that this is prior to the COVID-19 pandemic) and two types of hypothetical policy reforms: augmented benefits to improve preparedness, and reactive benefits introduced to help cope with the shock. These policy reforms do not relate to the current vision for ASP in Indonesia which is not yet in the public domain, but instead draw from the government's response to COVID-related income shocks, as well as recommendations made by the World Bank (2019) and UNICEF et al. (2021). The hypothetical reforms are also informed

by discussions with key stakeholders, as well as findings from our own analysis using INDOMOD about coverage and adequacy of the existing benefits.

Table 1: Overview of scenarios

Scenario	Applied shock	Region	Applied policy reforms	
National baseline	No shock	Nationwide	None	
Regional baseline	No shock	Selected provinces	None	
Regional baseline	Income losses	Selected provinces	None	
National baseline plus augmented benefits	No shock	Nationwide	Augmented benefits	• Benefit for poorest 70% of elderly and disabled • Higher benefit amount (PKH) for families with more children • Extension of BPNT and PKH to poorest 40%
Regional shock plus augmented benefits	Income losses	Selected provinces	Augmented benefits	
Regional shock plus reactive benefits	Income losses	Selected provinces	Reactive benefits	• Pre-employment Card for unemployed • Cash transfer • BPNT amounts reflect household size

While the level of preparedness is assessed nationwide, the analysis on the consequences of the income shock focuses on provinces more likely to be affected by severely to exceptionally dry conditions during strong El Niño events[7]: 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.

In these selected provinces, incomes are reduced based on the occupation of individuals following the results of a World Food Programme survey (2016) which measured people's reported income shocks by occupation and income source type following a drought in four provinces (see Table 2). Within each group set out in Table 2, individuals are randomly selected into the four shock groups (severe, moderate, slight, none) in INDOMOD until the specified share is reached. The affected income source is reduced accordingly, resulting in the shocked dataset.

It is recognised that a natural disaster would have additional impacts on the affected population. For example, some people might need to move to a different area, food prices might increase[8], and people's expenditure patterns might alter. However, these are held constant in the analysis presented here.

Table 2: Share affected by income shocks

	Severity of income shock			
By income source and sector	**Severe >30%**	**Moderate 10-30%**	**Slight <10%**	**No change**
Self-employment income from trade, hotel & restaurants	6	9	7	78
Other self-employment income	8	21	9	62

[7] Based on Figure 13c in Setiawan, Lee and Rhee (2017). All provinces with a probability of severely to exceptionally dry conditions higher than 33 percent are selected.

[8] For example, the World Bank estimated that the 2015-16 El Niño event caused rice prices to increase by 10.2 percent (https://www.reuters.com/article/indonesia-elnino-idUSL3N12R1SW20151028).

Employment income from construction & processing industry	10	11	9	70
Agricultural employment income	46	27	10	18
Other employment income	1	6	2	91
Agricultural income from rice crop & palawija	49	21	15	15
Other agricultural income	33	29	6	32

Source: Adapted from WFP (2016) Figure 3
Note: The analysis applies an income shock of 35 percent for severe losses, 20 percent for moderate losses, 5 percent for slight loss.

The augmented benefits comprise four hypothetical changes: new categorical benefits for older people and disabled people who live in the poorest 70 percent of households[9] in Indonesia, and an extension of BPNT and PKH to the poorest 40 percent of households in Indonesia. These were drawn from recommendations made by the World Bank (2019) of ways in which social protection could be generally enhanced to protect people in 'normal' times. In addition, the assistance for elderly and disabled 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 (up to a maximum of four eligible individuals and a maximum amount of IDR 10 million per year).

The reactive benefits refer to an example policy reform that could be introduced in response to the hypothetical natural disaster. We simulate three adjustments to the benefit system exclusively in the affected areas. The aim of the reform scenario is to reduce poverty to at least the level that it was prior to the shock. The scenario prioritises support for unemployed people, and for households in the affected provinces that - even prior to the shock - were in the poorest 40 percent of households in Indonesia. Two policies that were introduced in response to COVID-19 are used as hypothetical reforms for the El Niño shock, as well as an adjustment to an existing benefit - BPNT. The reforms are only applied to the provinces that are affected by the shock. First a Pre-employment Card is simulated; this was first introduced in response to the COVID-19 pandemic (though had been planned prior to this) and is paid at IDR 600,000 per month to unemployed people aged 18 and over who live in households that are not in receipt of the normal benefits. This benefit is payable to a maximum of two unemployed people per household and for a period of four months. Second, a Cash Transfer was simulated for the households that are not in receipt of PKH or BPNT but are among the poorest 40 percent of households in Indonesia; this is similar to the Village Fund Cash Transfer which was first introduced in response to the COVID-19 pandemic, but the area type criterion is dropped. Third, the BPNT payment was adjusted to reflect household size. The values of the Cash Transfer and BPNT payment were set at the same rate per month as follows: IDR 200,000 for single person households, IDR 300,000 for two-person households, IDR 400,000 for three-person households, and IDR 500,000 for households of four people or more. Unlike the Pre-employment Card, the Cash Transfer and BPNT payments are made continuously (until the household circumstances improve but this is not simulated so it is assumed that payments are made throughout the year following the shock).

Finally, household incomes and consumption levels as well as single tax-benefit elements are recalculated in INDOMOD. The re-calculation is carried out based on the current (March 2020) tax-benefit system as well as for the augmented and reactive reform scenarios using both the baseline and the shocked dataset.

[9] Although social assistance benefits are usually targeted at families in Indonesia, because the relationship information in SUSENAS 2020 is not sufficiently detailed to enable families to be identified, the benefit is applied at the household level in INDOMOD.

5.2 Analysis of outcome measures

The analysis focuses on four different consumption groups[10]: the first group comprises people living in poor households with consumption levels below the poverty line, the second group is referred to as the vulnerable with consumption levels below 1.5 times the poverty line, the third group is labelled as less vulnerable with consumption levels below 3.5 times the poverty line and the fourth group is defined as the wealthiest with consumption levels of 3.5 times the poverty line or more.

All definitions are based on equivalised household consumption levels using the per-capita equivalent scale and the 2020 national poverty line[11]. The national poverty line in Indonesia varies by province and is specific to urban and rural areas. Thus, cut-off points for each group are regional-specific. In most provinces, the national poverty line is in between the international middle-income (US$1.90 per day per capita) and upper-middle-income poverty line (US$3.20 per day per capita).

The analysis is based on five outcome measures

- The first measure is the **poverty head-count rate**, i.e. the share of the population being poor, vulnerable, less vulnerable or belonging to the wealthiest group. The larger the share of the latter two groups, the more individuals are prepared for a shock.
- The second indicator is the **benefit coverage rate**, which measures the proportion within each group receiving support in total and by type of benefit. It shows which groups are currently included in and excluded from the various social assistance schemes and how reforms affect their coverage.
- The third measure is the **poverty gap**, which presents the extent to which individuals fall below the poverty line as a proportion of the poverty line. It is an indication of the additional minimum cost needed to eliminate poverty in Indonesia if transfers were perfectly targeted. In addition, the vulnerability gap presents the additional minimum cost needed to eliminate vulnerability as a proportion of the vulnerability line (1.5 times the poverty line).
- Fourth, the **Relative Welfare Resilience Indicator** (RWRI) (Figari, Salvatori and Sutherland, 2010) shows the average post-event consumption as a proportion of the pre-event consumption for each group. 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 income shock or the reform scenarios.
- Finally, the fifth outcome measure shows **predicted probabilities of being poor or vulnerable** by socio-demographic characteristics to assess which groups are more likely to be poor or vulnerable.

All results present so-called first-order effects of income and policy changes and do not take medium- or long-term related behavioural changes into account.

6 Analysis

The analysis focuses first on how the current tax-benefit system prepares individuals and households for a shock (Section 6.1), and then on how an augmented tax-benefit system prepares individuals and households for a shock (Section 6.2). The analysis then explores the impact of an income shock under

[10] The definitions are borrowed from a World Bank report (WB 2019) but consolidated into four groups and slightly renamed.

[11] https://www.bps.go.id/indicator/23/195/2/poverty-line-rupiah-kapita-month-by-province-and-area.html.

the current tax-benefit system, and under the augmented and reactive tax-benefit systems (Section 6.3)

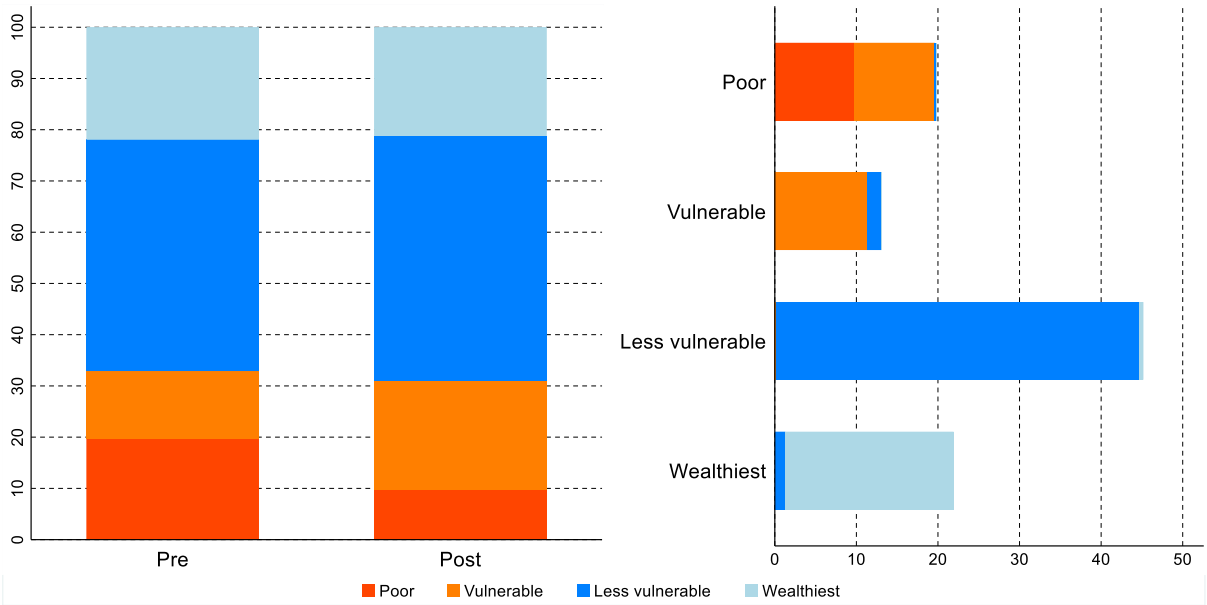
6.1 Preparedness of the current tax-benefit system in Indonesia

The first part of the analysis focuses on the preparedness dimension of adaptive social protection in Indonesia. It shows the extent to which current 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 4 compares the distribution of the four consumption groups (post benefit and taxes, labelled 'Post') with a hypothetical distribution where benefits are no longer paid to the households and households no longer need to pay direct taxes and social insurance contributions (pre benefit and taxes, shown in the first column and labelled 'Pre'). The difference between the two distributions shows how well the current tax-benefit system increases consumption levels to lift individuals out of poverty or vulnerability.

As can be seen, the share of the poor group (shown in red) is reduced significantly by 10 percentage points due to the receipt of benefits. This in turn leads to an increase of the vulnerable group (shown in orange) by 8 percentage points. At the top of the distribution, the share of the less vulnerable (shown in bright blue) increases by 3 percentage points and the share of the wealthiest (shown in light blue) decreases by 2 percentage points.

Figure 4: Distribution of groups (left) and transitions (right) after taking the tax-benefit system into account



Source: own calculations using INDOMOD v3.1.
Note: Total population.

The graph on the right hand side in Figure 4 provides more insights into the specific transitions of each group from a situation with no taxes and benefits to one in which the current taxes and benefits are in place. It shows the four consumption groups based on the pre-tax-benefit definition and the share that transitions to another group after considering the tax-benefit system. While upward transitions into a less poor group are driven by benefit receipt, downward transitions are driven by direct taxes and social insurance contributions.

The highest impact is achieved in the poorest group of the population (the top bar on the right hand side). Although a large share of the poor remains poor (49 percent), 50 percent move to the vulnerable group and 1 percent to the less vulnerable group. Upward transitions are at the same time less likely for the vulnerable group as 86 percent 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 percent remaining less vulnerable and 94 percent still belonging to the wealthiest group respectively.

This leaves 31 percent of the Indonesian population as poor or vulnerable under the current tax-benefit system (see Panel A of Table 3) and as such, in a constant state of crisis rather than being able to prepare for a potential natural disaster. Focusing on the selected provinces with higher probabilities to be hit by a strong El Niño shows that the share of poor and vulnerable varies considerably in different provinces (see Table 6 in the Appendix), ranging from 49 percent being poor or vulnerable in Nusa Tenggara Timur to 17 percent in Bali. All selected provinces together comprise 33 percent of poor and vulnerable individuals. The large share of poor or vulnerable Indonesians – overall and in the selected provinces - suggests that households are either not receiving support or that the support received is not sufficient to lift them out of poverty and vulnerability.

Table 3: Overview of indicators: baseline versus augmented reform scenario by group

		(A) Baseline				(B) Augmented reform			
		PO	**VU**	**LV**	**WE**	**PO**	**VU**	**LV**	**WE**
Share of group*		9.8	21.3	47.8	21.2	8.8	14.3	55.7	21.3
Transition of**	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**	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
Poverty gap		1.6				1.4			
Vulnerability gap		7.7				6.6			
RWRI**		-	-	-	-	104.9	109.4	107.1	100.0

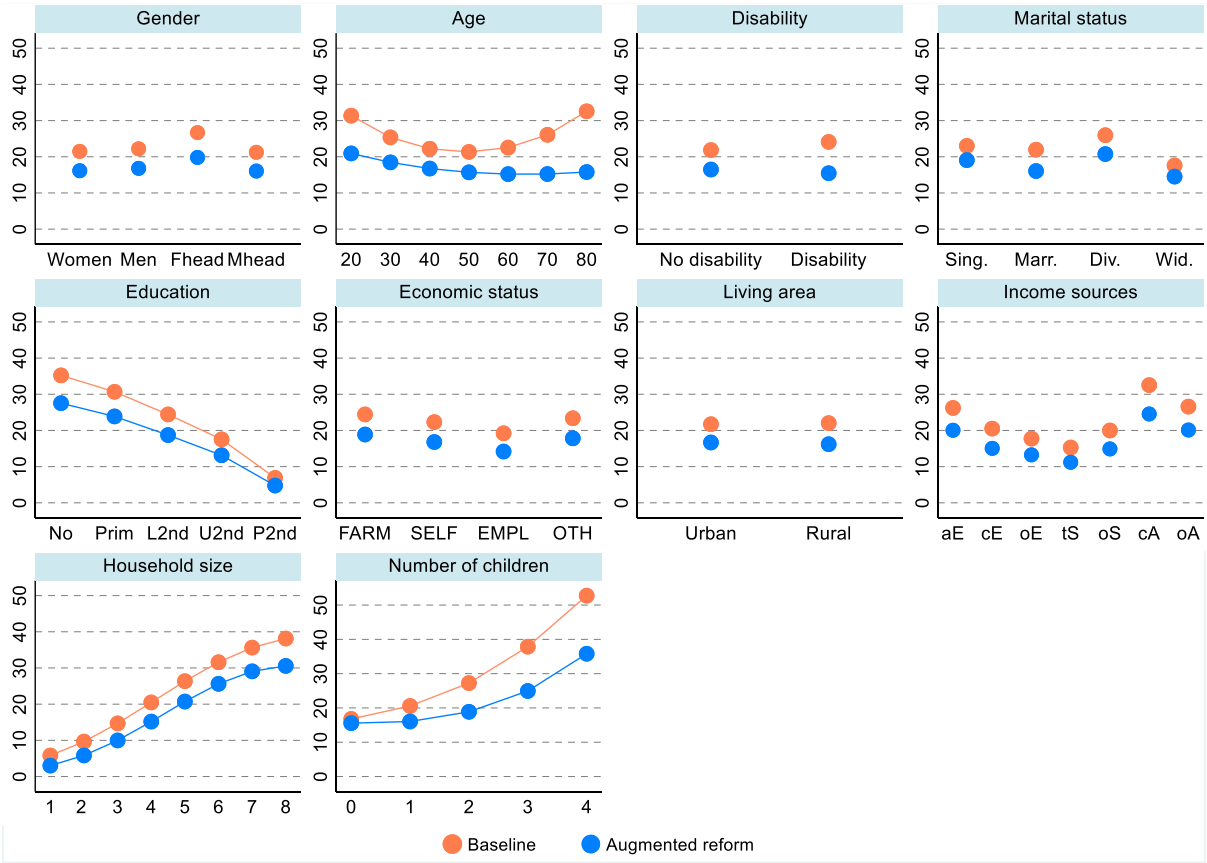
Source: own calculations using INDOMOD v3.1.
Note: Total population. "PO" refers to poor, "VU" to vulnerable, "LV" to less vulnerable and "WE" to wealthiest. Vulnerability gap is similar to the poverty gap but applies the vulnerability line. Both measures refer to the total population. * Share of poor refers to the poverty rate/poverty head-count. ** Based on baseline group definitions.

Panel A of Table 3 shows the coverage rate, i.e. the share in each group receiving support, under the current tax-benefit system (Panel B is discussed in section 6.2). The poor and vulnerable are very well covered by the current benefit system: all poor and vulnerable households receive at least one benefit. The share of less vulnerable and the wealthiest receiving support is very small (4 and 1 percent). 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.

The most important benefit in terms of coverage is BPNT (received by 100 percent of the poor and vulnerable groups), followed by PKH for poor households and PIP for the vulnerable. This overall high coverage shows that the government targets a large share of the population and that many households receive more than one benefit. However, a large share of those receiving support is still poor or vulnerable which suggests that the received level of support is too low to lift them out of poverty or vulnerability. The poverty and vulnerability gap measures presented in the table provide some indication of the additional minimum cost needed to eliminate poverty and vulnerability in Indonesia if transfers were perfectly targeted. While the poverty gap is comparably small, it would require overall 8 percent of the vulnerability gap (1.5 times the poverty gap) to be transferred to the poor and vulnerable.

Who are the population sub-groups more likely to be poor or vulnerable? The light orange circles in Figure 5 show the probability of adults being poor or vulnerable for selected characteristics while holding other characteristics constant at their mean values (the blue dots are discussed in section 6.2).

Figure 5: Average probability of adults to be poor or vulnerable in the baseline and the augmented reform scenario by selected characteristics



Note: Individuals aged 18 and older. Predicted probability of being poor or vulnerable with control variables at their mean values (see Table 7 in the Appendix for logit results). 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).

Focusing only on the baseline (orange dots), the figure highlights that being a woman is not a strong predictor of higher poverty and vulnerability risks but that living in a household that is headed by a woman increases the risk by 5 percentage points. The probability of being poor/vulnerable decreases

with age but increases again in older age. In line with higher risks at older age, individuals with disability are also more likely to be poor or vulnerable. An important predictor of being poor or vulnerable is educational attainment. Adults with higher education face significant lower risks (7 percent) than individuals with no (35 percent) or only primary education (31 percent). Further important characteristics are the composition of the household in terms of income sources and size. 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, with at least every fifth adult being poor or vulnerable. The probability of being poor or vulnerable increases with household size. The risk for one-person households (although not very common in Indonesia) is 6 percent, the risk for five-person-households (the average household size in Indonesia) is 26 percent, and the risk for large eight-person-households is 38 percent. 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 percent for households with two children, 38 percent for households with three children and 53 percent for households with four children. The risk for individuals living in households without children is 17 percent. Other factors with less pronounced differences are the economic status of the adult (with lower risks of employees), the marital status (with lower risks of widows) and the living area of the household (with non-significant differences between rural and urban households).

In summary, the analysis undertaken using the baseline scenario highlights the fact that although in principle the benefits are targeted well at those in poverty, many households still live in poverty or vulnerable circumstances. In line with the World Bank's (2019) observations, elderly and disabled people are particularly disadvantaged, but so are younger adults. What stands out most prominently is the role of both household size and (relatedly) the number of children in the household when estimating the risk of a household being in poverty. This reflects the fact that most benefits in Indonesia do not sufficiently take the composition of the household into account.

6.2 Augmented reform to improve preparedness in Indonesia

The second part of the analysis section focuses on a hypothetical reform to improve the level of preparedness of the poor and vulnerable in Indonesia. The basic idea is to increase support to the poorest households across Indonesia. The augmented reform adjusts the BPNT rules, introduces categorical support for disabled and elderly individuals in the poorest 70 percent of the population and tailors the payment of PKH to consider family size.

Table 3 provides a comparison of the baseline versus the augmented reform scenario and presents the indicators discussed in section 6.1 plus the relative welfare resilience indicator and the poverty gap to show the extent to which the reform increases consumption levels in each group.

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 disabled and elderly individuals, the reform decreases poverty levels by 1 percentage point only, from 9.8 percent to 8.8 percent. This is mostly explained by the high coverage rate of benefits in the baseline. All poor households already receive support and thus, extending the number of beneficiaries does not impact on the poorest households in Indonesia. Still, the Relative Welfare Resilience Indicator (RWRI) shows that the consumption levels of the poor increase by 5 percentage points after the reform due to the 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 percent to 14 percent. Extending the number of beneficiaries increases the share of PKH recipients from 46 to 87 percent. In addition, 21 percent of the vulnerable receive the newly introduced old-age benefit. This leads to an increase in consumption levels of 9 percentage points (see RWRI indicator) which moves 37 percent of the vulnerable to the group of the less vulnerable and improves their ability to prepare for shocks.

The group of the less vulnerable benefits from the reform in terms of both coverage which increases from 4 percent to 41 percent, and higher welfare resilience, but not significantly enough to move to the group of the wealthiest. The group of the wealthiest 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. The augmented reform moves poor and vulnerable Indonesians closer to the vulnerability threshold with a reduction in the vulnerability gap of 1 percentage point.

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 (see the blue circles in Figure 5). This is for example the case for female-headed households, where the probability decreases by 7 percentage points compared to 5 percentage points for male-headed households. The newly introduced benefits for elderly and disabled decrease the probability by 11 percentage points for elderly aged 70 and 9 percentage points for disabled. Due to the reform, differences by age are less pronounced as the probability of younger adults to be poor or vulnerable is reduced more significantly than the probability for middle-aged adults, resulting in an overall flatter age-curve. Although educational attainment is still a strong predictor, lower education groups benefit more than higher education groups. Like education, the household size and the number of children living in the household are still very strong predictors of being poor or vulnerable but less significant than in the baseline. This is especially the case for individuals living in households with four children where there is a reduction in probability of 17 percentage points. Households are also differently affected by their income sources. Individuals living in households with incomes from crops or palawija - who are the ones most exposed to being poor or vulnerable in the baseline - benefit the most. Their risk is reduced by 8 percentage points, followed by households with other agricultural incomes and agricultural workers, with reductions of 7 and 6 percentage points. Characteristics more equally affected are urban versus rural living areas, marital status and economic status.

In summary, a reform that comprises augmented cover in ‘normal’ times has a positive impact on poverty reduction. By simply increasing the BPNT coverage, introducing two categorical benefits for older people and people with disabilities (and removing older and disabled people from the household count in the PKH policy, thereby augmenting support for households with children), poverty would fall from 9.8 percent to 8.8 percent and vulnerability from 21.3 percent to 14.3 percent. Subgroups particularly at risk of poverty or vulnerability are preferentially supported. Better coverage in normal times helps a larger share of the population to make ends meet and even to prepare for crises, both of which are vital elements of ASP. Such, or similar, reforms would of course require additional financial resources: Table 10 in the Appendix shows that national expenditure on benefits would double.

6.3 The simulated effects of El Niño and policy reforms to improve coping in selected provinces

Results of this section focus on the consequences of the simulated income shock caused by El Niño. It furthermore analyses whether the two hypothetical reform scenarios lead to improved coping with the income shock. The first scenario focuses on the situation of households after the income shock but having additionally applied the augmented reforms that were presented in the previous section 6.2. The second scenario is also based on shocked incomes but instead introduces a new set of policy changes, referred to as 'reactive reforms'. All presented results are based on selected provinces only as the shock has only been applied to those provinces with a higher probability of being affected by a strong El Niño.

Results initially compare the baseline situation (current consumption levels, see Panel A in Table 4) with a shocked situation where consumption levels of some households are reduced due to losses in earnings, self-employment incomes and agricultural incomes (see Panel B in Table 4). These results relate only to the impact of the shock in the current tax-benefit system.

Focusing on the transitions within each group in Panel B shows that they are differently affected by the income shock. The poor are not affected in the sense that they were already poor in the baseline. However, the increase in poverty gap suggests that they are in an even more severe situation after the income shock. In addition, 17 percent of the vulnerable and 1 percent of the less vulnerable fall below the poverty line. Another 8 percent of the less vulnerable become vulnerable and 8 percent 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 percentage points, resulting in more than one third of the selected population (people in 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) being poor or vulnerable as the current benefit system does not automatically react to the changes in incomes. There is no clear relationship between the level of poor and vulnerable in the provinces before the shock and the size of the impact. The provinces affected the most are Sumatera Selatan, Sulawesi Utara, and Kalimantan Selatan (see Table 6 in the Appendix).

The coverage rate of benefits is not affected by the income shock. While INDOMOD takes the reduction in taxes and social insurance contributions 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 relative welfare resilience indicator measures the proportion of the post-event consumption compared to the pre-event consumption in each group. The highest relative losses are in the poor and the vulnerable group. On average, poor individuals can only consume 91 percent of what they were able to consume before El Niño. Vulnerable individuals are only able to consume 93 percent of what they were consuming in the baseline.

The final two panels in Table 5 in the Appendix show the results for the two 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 Section 6.1 (new benefit for elderly and disabled in poorest 70 percent of households, higher PKH benefit amount for families with more children, extension of BPNT and PKH to poorest 40 percent). Here, we see that the augmented

reforms cushion the shock of the natural disaster to a certain extent: poverty in these provinces rises from 11.4 percent to 13.6 percent (rather than 15.3 percent in the absence of the augmented reform) and the share of vulnerable decreases to 14.6 percent (compared to 21.2 in the baseline). While the additional support means that 7 percent of the poor move to the vulnerable group despite the income shock, 28 percent of the vulnerable move to the less vulnerable group. On the other hand, 13 percent of the vulnerable move below the poverty line due to the income shock not being cushioned sufficiently by the augmented reform (compared to 17 percent in the shocked scenario without reforms). The less vulnerable are also better protected by the augmented reforms with only 3 percent moving to the vulnerable group compared to 8 percent in the shocked scenario without reforms. The RWRI improves most markedly for those in the vulnerable and less vulnerable groups, compared to the shock with no augmented reforms (Panel B). However, in spite of the augmented reform more than doubling the cost of benefits across Indonesia, poor people are not supported to the extent that their circumstances revert to the pre-shock situation (Panel A). Increases in the poverty gap due to the income shock are not compensated by the augmented reform while the vulnerability gap, considering the income shock and the augmented reform, is close to the baseline gap.

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 (described in Section 5.1: Pre-employment Card for unemployed, cash transfer, BPNT amounts reflect household size). For the selected provinces, the poverty rate decreases from 11.4 percent (prior to the shock) to 9.9 percent (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 RWRI score for the wealthiest group is much the same with or without the reforms shown in Panels C and D (in all cases their score falls to around 96 percent as a result of the shock), it increases for all other groups (Panel D) 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 shown in Panels C and D is significant, each at least doubling usual expenditure on benefits in these selected provinces. As shown in Table 8 in the Appendix, the augmented benefits would result in a 97 percent increase in benefit expenditure, and the reactive reforms would result in a 118 percent increase. The issue of financing is revisited in the final section.

Table 4: Overview of indicators for selected provinces by groups: baseline versus income shock and reform scenarios

		(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 of group*		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 vuln.	-	-	-	-	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	-	-	-	-
	Rural	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	48.1	0.0
	Unempl.	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	2.1	1.7
Poverty gap		2.0				3.5				3.1				1.8			
Vulnerability gap		8.6				11.0				9.2				7.8			
RWRI**		-	-	-	-	91.1	92.7	94.6	96.4	96.0	102.0	101.7	96.4	107.6	104.1	102.0	96.4

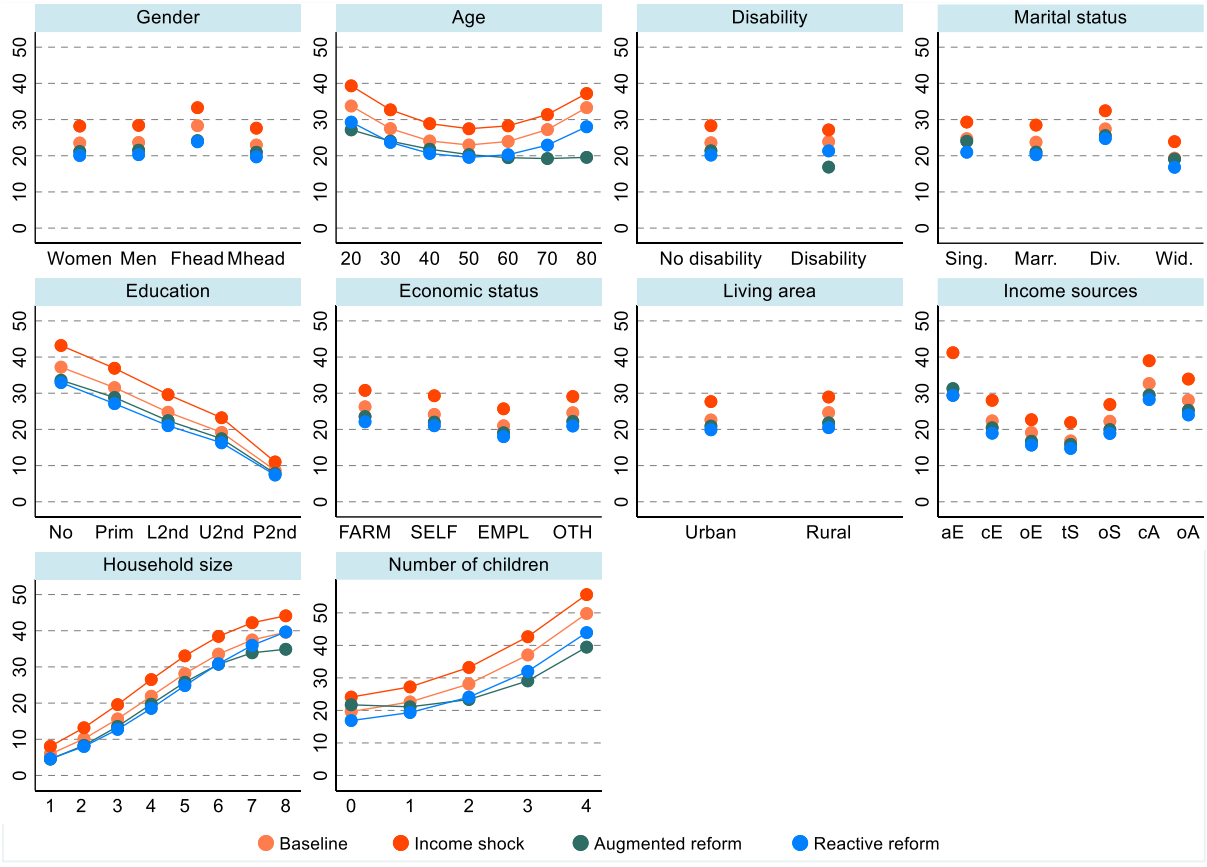
Source: own calculations using INDOMOD v3.1.

Note: Population in selected provinces: 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. "PO" refers to poor, "VU" to vulnerable, "LV" to less vulnerable and "WE" to wealthiest. Vulnerability gap is similar to the poverty gap but applies the vulnerability line. Both measures refer to the total population * Share of poor refers to the poverty rate/poverty head-count. ** Based on baseline group definitions.

Figure 6 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 most characteristics, the probability of being poor or vulnerable increases by 5 percentage points. 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 and this high probability increases by an additional 12 percentage points. The impact of the shock furthermore 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 the very elderly and people with disability, as well as for people living in larger households or with four or more children in the household, when compared to the reactive reform.

Figure 6: Average probability of adults to be poor or vulnerable for selected provinces: baseline vs. income shock and reform scenarios



Note: Individuals aged 18 and older living in the selected provinces: 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. Predicted probability of being poor or vulnerable with control variables at their mean values (see Table 7 in the Appendix for logit results). 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, employment income from construction or processing industry, other employment incomes, self-

employment income from trade, hotel and restaurants, other self-employment income, agricultural income from rice crops and palawija and to other agricultural income.

7 Discussion

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

We found that the current (March 2020) system, prior to the COVID-19 pandemic, performs fairly well. The social protection system moves 50 percent of poor households from below the poverty line to the vulnerable group, and 1 percent to the less vulnerable group. Nevertheless, even having simulated the precise targeting of the benefits (by using household consumption as a proxy for being listed in the DTKS) 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 disabled people, for people in large households, and in households with more than two children. On simulating a natural disaster in selected provinces, we found that the current system (using the March 2020 tax-benefit rules) does not protect people adequately. The poverty rate in the affected provinces rose from 11.4 percent to 15.3 percent. In the absence of any policy reforms, those already in poverty would have become poorer (measured using the poverty gap), 17 percent of vulnerable households would have fallen into poverty, and nine percent of less vulnerable households would have become vulnerable. The social protection arrangements therefore do not adequately help people to prepare for and cope with shocks.

We simulated two hypothetical policy reforms: one which comprised augmented benefits (modelled across the whole of Indonesia in Section 6.2), and one which comprised reactive benefits introduced only in the provinces affected by a hypothetical natural disaster (Section 6.3). Both examples reduced the impact of the shock, with the latter being most effective in reducing poverty (though slightly more costly). However, the augmented reform scenario is partly more efficient in reducing poverty and vulnerability risks for those identified as needing more support by the World Bank (2019), i.e. households with children and elderly people.

The policy reforms presented are not prescriptive but serve as examples of ways in which the social protection arrangements could be adjusted to provide better support to households both in normal times and when there are natural disasters. The focus has not been on the policy reforms introduced in response to COVID-19 and the impact they had (see Wright et al., 2021 for analysis of this kind). However, both the analysis of hypothetical policy reforms presented in the paper and the real-life experience of the pandemic can be drawn upon to develop an ASP framework that includes modifications to the existing social protection programs to improve households' preparedness for shocks and the capacity of the programs to respond to shocks, as well as mitigation of shocks when they happen.

In practice, an infinite number of reforms could be tested using INDOMOD. It is recommended that when Bappenas' ASP Roadmap is published, the reforms recommended are simulated where possible in order to estimate the cost and distributional impact of the changes. The finding that there is a high probability of households with children being poor or vulnerable highlights the importance for further exploration of child-specific support by, for example, including more families with children in the existing social protection system.

A key criterion for ASP is that the benefit system can respond quickly in an emergency context. One of the challenges identified here and elsewhere is that the integrated database of low-income people

quickly becomes out of date, and covers too small a percentage of the population. The World Bank has made several recommendations for improvements, arguing that 'There would be significant benefits in (i) expanding coverage of the DTKS up to 80 percent of the population to help reach the uninsured informal sector and the 'uncovered middle'; (ii) facilitate dynamic data updating; (iii) move to an absolute poverty ranking; (iv) make the UDB[12] interoperable with other databases […]; and (v) integrate with geographic information systems to enable rapid response to shocks and crises.' (World Bank, 2019: 53). The World Bank also recommends more regular use of ID numbers, on the basis that 95 percent of the population have been issued with a unique identification number (*Nomor Induk Kependudukan, NIK*) by the Ministry of Home Affairs. These refinements would mean that in the case of a natural disaster such as was simulated in this paper, the affected population would already be 'in the system' and so it would be much more straightforward to reach them with emergency support. More recently, it has been reported that there is an intention to increase the coverage of the DTKS to nearly 100 percent by 2023 (World Bank, 2020a: 97),

Another key requirement of ASP is for there to be adequate financial planning for disasters by government. These issues are not addressed in this paper 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, 2020a). The government already allocates funding for potential natural disasters, categorised as 'other spending' rather than social assistance. The intention is that the budget can be used to immediately respond to assist people in areas of natural disaster, support the region back to normal activities, and provide support post-disaster through additional social assistance. As part of these objectives, a fiscal mechanism called the Pooling Fund for Disasters (*Pooling Fund untuk Bencana, PFB)* has been set up as part of the 2018 National Disaster Risk Finance and Insurance Strategy to help ensure that there is a fast and transparent flow of sufficient disaster funds when disasters occur. Risk-based fiscal forecasting is an important policy direction for ASP.

Separately, there is a need to identify ways in which to finance more comprehensive social security provision in 'normal' times. 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 (such as the recent BRI Sustainability Bond, or SDG Bonds which are under consideration), green financing, and a sovereign wealth fund (Institute for Economic and Social Research, 2021). Additionally, the World Bank (2019) advised that consideration should be given to reducing fuel subsidies, as more than half (56 percent) of the subsidy goes to the middle and upper classes (World Bank, 2019: 44). They also recommend exploring options to reform excise duty on tobacco. Another important option that is highlighted in their report is to remove VAT exemptions (which amount to IDR 90.6 Trillion per year) and instead use the additional revenue to finance social protection reforms (World Bank, 2019: 55; Gcabo et al., 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 (e.g. Keen, 2013; Harris et al., 2018).

The synthetic application of an El Niño shock to the underpinning dataset in the INDOMOD model provides just one area-specific example of a natural disaster. As highlighted in Section 2, Indonesia is vulnerable to a range of different natural disasters and they are also on the increase globally. Examples of other types of disaster include financial crises, pandemics and social unrest. Analysis such as this serves to highlight the utility of tax-benefit microsimulation modelling for assessing a country's social

[12] Unified Database, the previous name for the DTKS.

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.

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9 Appendix

Table 5: Descriptive overview of sample by consumption group

		PO	VU	LV	WE	Total
Individual characteristics*	Average age	42.7	41.7	41.2	41.2	41.4
	Women	52.0	51.0	49.8	49.5	50.2
	Education: None	20.9	17.1	13.0	7.1	13.1
	Primary	36.1	33.5	27.7	15.5	26.7
	Lower secondary	20.6	20.8	19.5	13.7	18.5
	Upper secondary	20.2	25.3	31.8	36.5	30.6
	Post-secondary, tertiary	2.2	3.3	8.0	27.3	11.1
	With disability	1.7	1.1	0.9	0.7	1.0
	Elderly aged 65 plus	13.1	10.3	8.3	7.5	8.9
	Marital status: Single	16.4	16.6	18.4	22.5	18.8
	Married	71.7	72.9	71.5	66.8	70.7
	Divorced	2.9	2.4	2.3	2.9	2.5
	Widowed	8.9	8.0	7.8	7.8	7.9
	Economic status: Student	1.8	2.2	2.9	5.7	3.3
	Farmer	13.8	12.1	9.4	4.5	9.2
	Employee	17.7	22.6	29.2	38.8	29.1
	Self-employed	17.8	19.5	20.1	18.8	19.5
	Other	43.4	39.0	34.8	30.1	35.3
Household characteristics**	Average household size	4.7	4.3	3.7	3.0	3.7
	No. of children: none	19.2	20.8	31.1	52.9	33.9
	1 child	22.4	28.8	34.4	27.2	30.6
	2 children	30.9	32.3	25.4	15.3	24.5
	3 children	16.8	13.0	7.3	3.8	8.2
	4 children	6.9	3.7	1.4	0.6	2.1
	5 plus children	3.7	1.4	0.3	0.1	0.7
	No. of adults aged 18-64: None	5.8	4.6	4.5	5.1	4.8
	1 adult	9.8	8.4	10.1	20.3	12.4
	2 adults	45.4	49.5	50.8	45.6	48.8
	3 adults	20.4	20.9	20.6	18.1	20.0
	4 adults	12.2	11.4	9.7	7.9	9.7
	5 plus adults	6.5	5.3	4.3	3.0	4.3
	No. of elderly (65 plus): None	70.7	77.0	82.0	85.3	81.0
	1 elderly	21.6	17.9	14.8	12.1	15.2
	2 plus elderly	7.7	5.0	3.3	2.6	3.8
	HH income from: Employment	61.9	66.2	67.6	67.1	66.8
	Agricultural employment	24.4	21.9	15.0	5.0	14.4
	Self-employment	64.7	64.1	61.7	50.7	59.5
	Agriculture	55.5	50.2	40.1	21.2	38.3
	Crops & palawija	20.0	15.9	10.6	4.1	10.6
	Other market incomes	23.5	24.0	22.5	20.4	22.3
	No market incomes	2.4	1.8	2.4	6.1	3.3
	Female head	15.9	14.3	15.2	17.9	15.8
	Rural area	58.6	54.3	47.4	26.0	44.0

Source: own calculations using INDOMOD v3.1.
Note: "PO" refers to poor, "VU" to vulnerable, "LV" to less vulnerable and "WE" to wealthiest. * includes individuals aged 18 and older only, ** based on household level.

Table 6: Share in each consumption group by province and scenario

	Baseline				Augmented reforms				Income shock				Shock + reactive reform				Shock + augmented reform			
	PO	VU	LV	WE	PO	VU	LV	WE	PO	VU	LV	WE	PO	VU	LV	WE	PO	VU	LV	WE
Sumatera Selatan	12.7	24.8	46.9	15.6	11.8	15.9	56.6	15.7	17.0	25.4	43.4	14.2	15.3	16.7	53.7	14.3	10.9	22.8	52.0	14.2
Jawa Timur	11.1	22.7	47.0	19.3	9.5	16.1	55.0	19.4	15.6	22.5	44.3	17.6	13.3	16.3	52.8	17.7	9.7	21.3	51.4	17.6
Bali	3.8	13.5	45.3	37.4	3.2	9.0	50.3	37.5	6.4	15.0	43.4	35.2	5.1	9.7	49.9	35.3	3.6	13.0	48.1	35.2
Nusa Tenggara Barat	14.0	19.4	42.4	24.3	13.0	11.7	51.0	24.4	16.8	19.8	40.9	22.5	15.6	11.4	50.5	22.6	11.0	18.4	48.1	22.6
Nusa Tenggara Timur	20.9	28.1	42.2	8.8	19.7	19.6	51.7	9.0	25.4	26.8	39.8	8.0	23.6	18.1	50.1	8.1	17.3	28.3	46.3	8.0
Kalimantan Selatan	4.4	20.8	55.2	19.7	4.1	12.2	63.9	19.8	7.2	22.5	52.5	17.8	6.4	13.9	61.9	17.9	4.3	18.0	59.9	17.8
Kalimantan Timur	6.1	17.8	57.2	18.9	6.0	11.6	63.5	18.9	8.7	19.5	54.9	17.0	8.1	13.6	61.3	17.0	6.6	16.5	59.9	17.0
Sulawesi Utara	7.6	16.4	45.8	30.2	6.8	10.9	51.8	30.5	12.2	16.5	43.1	28.2	10.5	10.7	50.4	28.4	7.0	15.9	48.8	28.3
Sulawesi Selatan	8.7	18.7	44.5	28.1	7.8	11.6	52.4	28.2	11.8	19.2	42.9	26.1	10.4	11.7	51.7	26.2	7.0	17.0	49.8	26.1
Sulawesi Tenggara	11.0	19.0	42.9	27.1	10.3	11.4	51.1	27.2	14.3	18.9	41.5	25.2	13.1	10.9	50.7	25.3	9.2	17.7	47.8	25.4
Maluku Utara	6.8	23.2	56.2	13.8	6.2	13.7	66.2	13.8	8.7	25.2	53.2	12.9	8.3	14.8	64.1	12.9	5.8	21.2	60.1	12.9
Papua Barat	21.4	19.0	42.9	16.7	21.1	13.7	48.4	16.7	24.9	18.9	40.9	15.3	23.9	14.7	46.2	15.3	21.6	18.3	44.9	15.3
Papua	26.6	13.8	41.8	17.8	26.4	10.5	45.2	17.8	29.6	14.2	40.0	16.1	29.0	10.9	43.9	16.1	24.5	16.1	43.3	16.1
Total	11.4	21.2	46.6	20.7	10.3	14.3	54.5	20.8	15.3	21.5	44.2	19.0	13.6	14.6	52.7	19.1	9.9	20.0	51.0	19.0
Indonesia	9.8	21.3	47.8	21.2	8.8	14.3	55.7	21.3	-	-	-	-	-	-	-	-	-	-	-	-

Source: own calculations using INDOMOD v3.1.

Note: Total refers to total population in the selected provinces. “PO” refers to poor, “VU” to vulnerable, “LV” to less vulnerable and “WE” to wealthiest.

Table 7: Logit results

	INDONESIA		Selected provinces			
	Baseline	**Augmented reforms**	**Baseline**	**Income shock**	**Shock + reactive reform**	**Shock + augmented reform**
Women	-0.0412***	-0.0473***	-0.00801	-0.00994	-0.0220	-0.0139
Age	-0.0601***	-0.0256***	-0.0587***	-0.0562***	-0.0257***	-0.0568***
Age^2	0.0006***	0.0002***	0.0006***	0.0005***	0.0002***	0.0006***
Education (Ref.=Post-secondary/tertiary)						
None	1.993***	2.025***	1.829***	1.815***	1.789***	1.816***
Primary	1.788***	1.833***	1.578***	1.552***	1.565***	1.539***
Lower 2nd	1.474***	1.525***	1.240***	1.223***	1.228***	1.204***
Upper 2nd	1.055***	1.104***	0.913***	0.894***	0.914***	0.891***
Marital status (Ref.=Single)						
Married	-0.0603***	-0.208***	-0.0526*	-0.0407	-0.173***	-0.0425
Divorced	0.160***	0.105**	0.140**	0.146**	0.0833	0.215***
Widowed	-0.337***	-0.327***	-0.315***	-0.277***	-0.293***	-0.272***
Disability	0.128	-0.0763	0.0166	-0.0579	-0.292*	0.0710
Economic status (Ref.=Employee)						
Farmer	0.307***	0.342***	0.292***	0.252***	0.268***	0.257***
Self-employed	0.188***	0.200***	0.180***	0.181***	0.181***	0.192***
Other	0.248***	0.272***	0.205***	0.171***	0.192***	0.188***
Rural	0.0175	-0.0349**	0.114***	0.0621***	0.0535**	0.0370*
Female-headed hh.	0.300***	0.257***	0.281***	0.268***	0.183***	0.245***
Household size	0.588***	0.855***	0.693***	0.678***	0.944***	0.514***
Household size^2	-0.0290***	-0.0540***	-0.0415***	-0.0413***	-0.0678***	-0.0227***
Number of children	-0.105*	-0.157**	-0.0608	-0.0219	0.0391	-0.529***
HH. size # No. children	0.112***	0.0256	0.0486	0.0308	-0.0993***	0.212***
HH. size^2 # No. children	-0.00985***	0.000276	-0.00143	-0.000224	0.0145***	-0.0147***
No. children^2	0.189***	0.188***	0.172***	0.168***	0.150***	0.223***
HH. size # No. children^2	-0.0425***	-0.0325***	-0.0339***	-0.0320***	-0.0142**	-0.0526***
HH. size^2 # No. children^2	0.00280***	0.00169***	0.00166***	0.00152***	-0.000347	0.00320***
Agricultural empl. inc.	0.283***	0.283***	0.356***	0.681***	0.613***	0.592***
Constr./process. empl. inc.	-0.110***	-0.146***	-0.0910***	-0.0168	-0.0713***	-0.103***
Other employment income	-0.481***	-0.473***	-0.484***	-0.541***	-0.549***	-0.563***
Self-empl. Inc. trade etc.	-0.538***	-0.547***	-0.521***	-0.421***	-0.449***	-0.468***
Other self-empl. income	-0.220***	-0.231***	-0.167***	-0.156***	-0.187***	-0.183***
Inc. from crop and palawija	0.606***	0.557***	0.524***	0.557***	0.500***	0.513***
Other agricultural income	0.357***	0.338***	0.348***	0.391***	0.328***	0.332***
Constant	-3.038***	-4.414***	-3.075***	-2.855***	-4.082***	-2.813***
Observations	712,287	712,287	289,096	289,096	289,096	289,096

Source: own calculations using INDOMOD v3.1.
Note: Individuals aged 18 and older. Incl. province-fixed effects.

Table 8: Fiscal impact of reforms

	INDONESIA		Selected provinces			
	Baseline	**Augmented reform**	**Baseline**	**Income shock**	**Shock + augmented reform**	**Shock + reactive reform**
PKH	59,240	118,362	21,120	21,120	39,305	21,120
PIP	12,254	16,923	4,188	4,188	5,660	4,188
BPNT	48,000	69,881	17,218	17,218	24,352	38,841
Disabled	-	1,338	-	-	466	-
Elderly	-	38,286	-	-	14,166	-
Rural	-	-	-	-	-	27,704
Unemployed	-	-	-	-	-	731
Total expenditure	**119,494**	**244,790**	**42,526**	**42,526**	**83,949**	**92,584**
Absolute increase	-	+125,296	-	-	+41,423	+50,057
Relative increase	-	105%	-	-	97%	118%

Source: own calculations using INDOMOD v3.1.
Note: Total expenditure in Billion IDR.