DISSERTATION

THREE ESSAYS ON INDONESIA'S ECONOMIC DEVELOPMENT

Submitted By

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ABSTRACT

THREE ESSAYS ON INDONESIA'S ECONOMIC DEVELOPMENT

Since the 1998 Asian Financial Crisis, Indonesia's Gross Domestic Product has grown 5-6 percent per year. This rapid economic growth increased overall living standards for many Indonesians. Despite accelerating economic growth however, Indonesia still faces multiple economic problems as an emerging economy. Poverty and inequality, including in rights to health care and education, are some of the problems that still affect Indonesian people. These observations, since the Asian Financial Crisis, have led the Indonesian government to start establishing and reforming certain social protections. The Government of Indonesia (GoI) 's 2045 vision sets an ambitious target for Indonesia to achieve high-income country status and near-zero poverty via these reforms as a celebration of its 100 years of independence in 2045 (Holmemo, et al., 2020).

In chapter 1, titled Geographic Poverty Traps in Rural Indonesia: Isolation and Disasters, I investigate the central issue of the poverty trap in rural Indonesia. Indonesia effectively reduced official poverty from 60 percent to just under 10 percent between 1970 and 2018. However, at the subnational level, economic conditions vary depending on regional growth, employment, and other factors. Rural Indonesia faces continuing and significant challenges with limited economic, health, and education infrastructure access. These problems escalate further in mountainous areas where infrastructure investment is lacking. These aspects of isolation and remoteness can be studied in relationship to the economic concept of "poverty traps" that limit the economic

mobility of households. Kraay and McKenzie (2014) define a poverty trap is a set of self-reinforcing dynamics that cause countries to start poor and stay poor, hence present poverty is a direct cause of future poverty. Using Sosial Ekonomi Nasional (Susenas), Potensi Desa (Podes) and the Indonesia Family Life Surveys (IFLS), I find that geographical variables and isolation play a vital role in individual wealth accumulation even after controlling for household spending, health and education facilities, and government intervention. Limited access to banks and the market also are documented to be significant determinants consistent with poverty traps for households. My policy suggestion to tackle these problems is by pushing infrastructure investment in the rural area. Complementary to expensive and slow investments in physical infrastructure, the government can also push the infrastructure digitalization “internet for all" program to speed up the process and facilitate household access to market and necessary infrastructure.

In chapter 2, titled Preventive and Promotive Health Care Utilization in Indonesia: Ex-Post and Ex-Ante Moral Hazard of Insurance Ownership, I investigate the relationship between insurance ownership and people's health-seeking behavior. The Government of Indonesia Law No. 36 of 2009 specified five official categories of health care in Indonesia: 1) promotive health care, 2) preventive health care, 3) curative health care, 4) rehabilitative health care, and 5) traditional health care. However, even after almost 14 years since the enactment, health care in Indonesia is still dominated by curative treatment despite further reforms such as the GoI implementing universal health care (BPJS-Kesehatan) in 2014. BPJS-Kesehatan experienced a slow roll-out and huge annual losses due to increases in curative treatment expenses particularly. Possible policy reforms include market-based policies such as increasing the premium price or reducing the benefits of insurance. However, using IFLS waves 4 and 5, I show that it is possible

to also consider non-market-based policies such as promoting preventive and curative health care to help fix issues in the health care market. I find that insurance ownership affects individual health decisions and behavior in the form of workout intensity, smoking, and consumption behavior. This chapter provides suggestive evidence that reinforcing positive behavior and creating incentives to promote good and healthy habits can help minimize costs while maximizing health in the population. I argue that government policy should strengthen preventive and promotive care within the healthcare system and providers.

Lastly, in chapter 3, titled Spending More on the Girls? Post-Conflict Education Discrimination? Evidence from Timor-Leste, we investigate the role of conflict on education spending in two countries: Timor-Leste and Indonesia. Conflict frequently happens due to unstable and changing political climates over the course of economic development. In this research, we consider open warfare to represent significant conflict. Therefore, we consider Timor-Leste to be affected by conflict under this definition, whereas Indonesia is not. Using the Timor-Leste Living Standard Survey and Indonesia Family Life Survey, we compare education spending trends across these countries. We find a significant difference between boys' and girls' education spending in Timor-Leste. Girls' education spending is much higher than boys in Timor-Leste, while this phenomenon does not appear in Indonesia. We argue that conflict plays a role in this "reverse" discrimination and relate this to hypotheses about why boys have lower spending in Timor-Leste. First, conflict creates a lost generation of boys who went to war and are reluctant to return to school. Second, conflict creates a limited supply of affordable public schools and an increasing demand for more reliable private schools. We also consider the potential role of Catholic schooling as a differential factor between the Timor-Leste and Indonesia cases. We present descriptive evidence drawn from comparing private to public

schools as those are the indicators available in our data. We argue that girls in Timor-Leste tend to go to private Catholic schools rather than public schools, especially when safety is in question.

Three essays complement each other where the main goal is policy improvement on Indonesia's economic development. Chapter one discusses poverty and how access and isolation problems should and could be solved with the investment in infrastructure, both through physical and digitalization. Chapter two discusses how the government can reshape the universal health care policy with increasing health costs. Behavior nudges through prevention and promotion of a healthy lifestyle are one way to reduce the pressure of increasing costs. Chapter three discusses how conflict relates to education spending. Political and economic stability is needed to avoid further conflict, which leads to missing generations in the future. All three together fit nicely as policy recommendations to solve and/or prevent more development problems and hamper the nation's progress in the future.

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Chapter 1 - Geographic Poverty Traps in Rural Indonesia: Isolation and Disasters

1. Introduction

Amartya Sen defines absolute poverty as deprivation in terms of necessities goods such as food, safe drinking water, sanitation facilities, health, shelter, education, and information (Sen, 1983). The United Nations Educational, Scientific, and Cultural Organization (UNESCO) defines absolute poverty by going even deeper and incorporating limitations to a quality life, such as fundamental social and cultural needs[1]. Persistent absolute poverty is called as chronic poverty. Chronic poverty is defined by a lack of variance in income across multiple years rather than a single year's (Hulme, Moore, & Shepherd, 2001). Hulme and Sheperd (2003) argue that a distinguishing feature of chronic poverty in the temporal aspect is its extended duration and passing on to the subsequent generation, which usually lasts five years or more. The scale of the problem is so significant that estimates indicate that around 320-443 million people[2] live trapped in chronic poverty (Bird, 2019)[3].

Kraay and McKenzie (2014) define a poverty trap is a set of self-reinforcing dynamics that cause countries to start poor and stay poor, hence present poverty is a direct cause of future poverty[4]. Besides the temporal and time aspect, the spatial aspects may influence absolute and chronic poverty. Bird (2019) defines spatial poverty traps occur when low geographic capital (e.g., physical, natural, social, political, and human capital within the area) creates disadvantage and leads to prevalent poverty. Furthermore, a geographic poverty trap is defined by a

[1] http://www.unesco.org/new/en/social-and-human-sciences/themes/international-migration/glossary/poverty/
[2] Chronic Poverty Advisory Network (CPAN) data from 2014.
[3] Like Sen, Bird (2019) defined chronic poverty by multiple deprivations, including hunger, undernutrition, illiteracy, lack of access to safe drinking water and essential health services, social discrimination, physical insecurity, and political exclusion.
[4] In smaller modalities, countries can be replaced with communities or households.

characteristic of a household's area of residence that entails that household consumption cannot rise over time (Jalan & Ravallion, 2002). Many developing countries are known to have a geographic concentration of poverty. This includes, for example, areas in the eastern islands of Indonesia, northeastern India, northwestern Bangladesh, Northern Nigeria, Southeast Mexico, and Northeast Brazil (Jalan & Ravallion, 2002).

In addition to this location aspect of poverty, Barbier and Hochard (2019) introduce "Poverty-Environment Traps" where poverty traps happen because marginal environmental conditions resulting low yields and soil deterioration. In addition to the low production due the environmental condition, lack of access to markets and infrastructure also often hinders poor peoples' capacity to enhance their agricultural methods and livelihoods, and also hinder off-farm work opportunities (Barbier & Hochard, 2019) (Santos & Barrett, 2018)[5][6]. Like these research, Barret, Carter, and Chavas (2018) introduce biophysical feedback loops as a first mechanism that can trap people in spatial poverty. This mechanism links environmental shocks to reductions of the natural resource systems productive capacity that eventually can trap individuals in poverty. This suggests that geography affects household consumption and welfare (Jalan & Ravallion, 2002). Since geographic externalities can arise from local public goods or local endowments of private goods, well-endowed living areas are hypothesized to give poor households a higher chance of escaping poverty.

The seminal work by Jalan and Ravallion introduces variables related to "classical" geographic poverty traps such as characteristics of terrain[7] (for example, living in the mountains,

[5] It is estimated that one-third of the rural population in developing countries are located on less favored agricultural land and areas constrained by biophysical conditions or market access (Barbier & Hochard, 2018).
[6] Santos and Barret (2018) argue that imperfections in market access can press poor and non-poor families' productive assets, abilities, and capacities below the critical levels needed to move towards a non-poor equilibrium.

a rural area, or a coastal area) and includes several infrastructure variables to control the access and remoteness (i.e., kilometers of roads per capita, population density, and fertilizer used per cultivated area). However, these variables are incomplete for characterizing the extent of remoteness and isolation in a developing country with characteristics such as those in Indonesia.

This article focuses on identifying biophysical feedback loops in environmental factors in Indonesia by isolating how geographical factors, market access, remoteness/isolation, and disaster shocks affect individual wealth and poverty in that country setting. Indonesia is distinctive geographically in that it has several islands and areas that vary from coastal to mountainous. This makes Indonesia a compelling case study to see how diverse geographical aspects affect individual wealth accumulation and economic wellbeing. Furthermore, Indonesia is compelling as a setting for understanding questions pertaining to geography and poverty because it experiences numerous natural disasters that differentially affect economic outcomes in certain areas of the country[8]. We argue that the use of classical variables, such as indicators for mountainous or coastal areas as proxies for remoteness and isolation are incomplete and could led to statistical bias in empirical work in some study contexts. We then contribute to the literature by introducing how additional geographic characteristics related to poverty traps can be used to improve econometric modeling in the context of Indonesia. In sum, we will test

[8] In 2020 for example, Statista recorded that Indonesia experienced 29 natural disasters, the highest number of any country (https://www.statista.com/statistics/269652/countries-with-the-most-natural-disasters/. Accessed September 23, 2021).

geographical poverty trap causes by several channels in addition to “classical” (mountainous area) as figure 1 shows below.

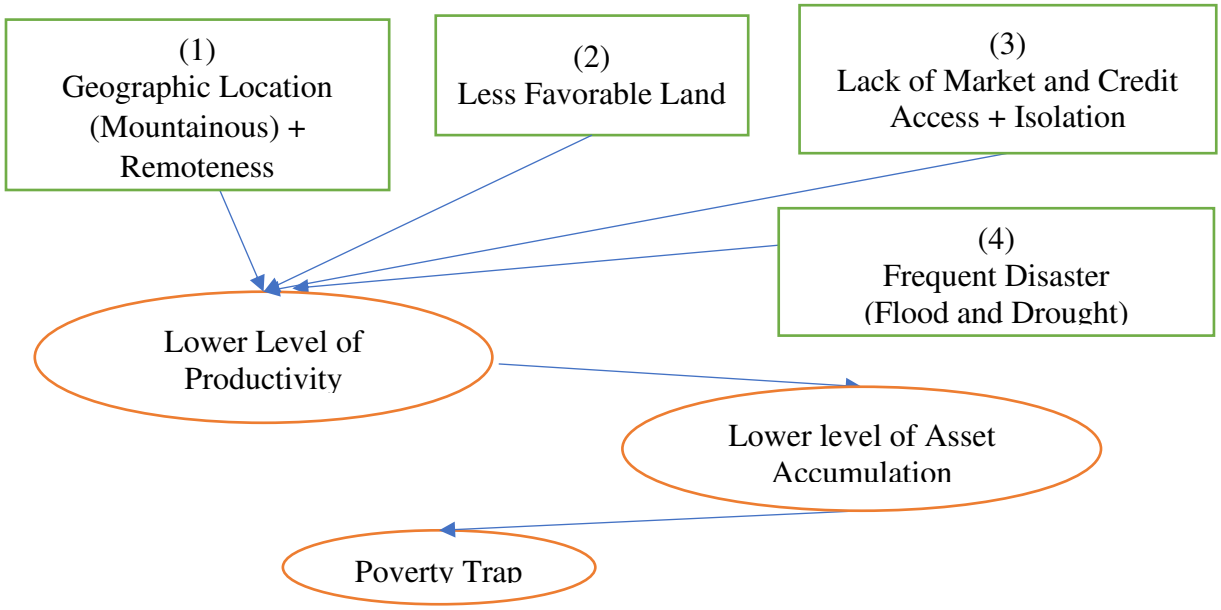

Figure 1. Mechanism of Rural Geographic Poverty Trap
source: Author

The poverty trap mechanism can be divided into several channels: geographical location, land quality, market access, remoteness/isolation, and disaster. The first channel is through geographical location such as mountainous areas. Jalan and Ravallion (2002) discuss how living in a less-endowed area will put an individual or household at a disadvantage compared to a well-endowed area. However, geographical locations such as mountainous areas themselves have variations which could be resulting different endowments which leads to the introduction of the second channel.

We introduce less favorable land as this second channel. This mechanism aligns with Kraay and McKenzie's (2014) findings, which argue that the existence of a remote and isolated area will result in a gap of income production. Furthermore, Barbier and Hochard (2019) discuss that many areas face biophysical constraints that restrict land productivity and instigate

environmental degradation in developing countries. Constraints such as rugged terrain, low soil quality, and limited rainfall hinder agricultural production and earnings[9].

The effect of less favorable agricultural area is heightened if the area has limited access to markets. Therefore, the third channel is through limited market access. As mentioned earlier, Santos and Barret (2018) argue that imperfections in market access can force families' productive assets, abilities, and capacities under the critical levels needed to move towards a non-poor equilibrium. Physical isolation and remoteness factors are interconnected to the previous channels specifically first channel (mountainous location) and third channel (market access). This is reflected in the household's physical distance to the government office (district or kecamatan capital) and to economic infrastructure such as banks. The addition of these factors: remoteness/isolation, less favorable land, and limited market access (especially credit) can lead to a lower level of land productivity.

The fourth and last channel that might affect the level of production of rural household in Indonesia that is explored in this paper is through frequent disasters. Gignoux and Menendez (2016) discuss those individuals facing short-term economic losses from earthquakes. Earthquakes negatively affect capital stocks and, therefore, productive assets. In the presence of earthquakes and the absence of insurance, individuals or households may need to sell remaining assets to smooth their consumption during the recovery process. However, Gignoux and Menendez (2016) argue that this adverse effect is only temporary. With the recovery aid, the infrastructure and productive assets can be improved and updated with more modern technology, resulting in higher productivity than with the previous technology. In the other hand, the result can be different if the disaster happens frequently and is smaller in size (locally and temporally),

[9] Barbier and Hochard (2019) define these areas as Less-Favored Agricultural Areas (LFAAs)

and/or happens in a remote poor rural area. In this case, government attention and aid may be limited or unlikely.

Coping strategies after disaster shocks tend to be costly in the short and long term for the poorest households in these remote rural areas (Carter, Little, and Negatu, 2007). Furthermore, Barbier and Hochard (2018) (2019) argue that poor households in these remote less-favorable agricultural areas often rely on natural resources extraction, such as conduct deforestation, to smooth their consumption after disaster shocks. This leads to additional capital or stock depletion through land degradation, leading to more individuals and households trapped in poverty.

This article relates the stagnancy and decline of poor households' asset ownership to the poverty trap concept. Without policy intervention, poverty traps can transmit intergenerationally, creating persistent poverty across generations. This paper is divided into two main sections. The first section discusses how isolation and disaster affect poverty using cross-sectional data from Indonesia's national survey (Susenas)[10] and Indonesia's village potential data (Podes)[11] to document associations between isolation and disaster and the poverty status of individuals. For this first section, geographic poverty is defined by absolute poverty causes by geographic and environmental aspect. We introduce remoteness and isolation as additional factors (beyond expenditure or asset measurements) for geographic poverty. We are using the term "remote less-favored agricultural land"[12] to measure how remoteness and isolation and biophysical factor affect household wealth. Lastly, we introduce a disaster variable, which affects individuals living within the geographic location.

[10] Indonesia National Socio-Economic Survey by *Badan Pusat Statistic, Government of Indonesia*
[11] Village Potential Survey by *Badan Pusat Statistic, Government of Indonesia*
[12] Barbier and Hochard (2018)

The second section of the paper focuses on how isolation and disaster can influence the formation of a "poverty trap," which we define by household that poor stay poor (Kraay & McKenzie, 2014)[13]. For this, we utilize the Indonesia Family Life Surveys longitudinal data[14]. In contrast to the static poverty analysis, the geographic poverty trap in this second section is defined by characteristics of a household's area of residence that limit the extent to which household consumption cannot rise over time (Jalan & Ravallion, 2002). We add to this definition by introducing isolation/remoteness factors associated with those geographical locations. Remoteness measured by the distance of household to the government office (kecamatan/district) and economic infrastructure (bank). As in the first section, besides isolation/remoteness, we also introduce poverty-environment trap[15] which we measure by a less-favorable-land biophysical factor, where a less-favorable-land market exists. Furthermore, we also introduce limited market access where economic infrastructure such as bank is absent. Lastly, we also introduce disasters (flood and drought) as one potential factor affecting household wealth accumulation which related to poverty. We also primarily focus on rural areas with limited market access where the impact of isolation is heightened.

In summary, we test several hypotheses corresponding to the four mechanisms which we have identified. First, we examine whether living in the mountains affect individual asset accumulation as proxy of poverty and poverty trap. Second, we look at whether biophysical land affect poverty status or creation of poverty trap for the household. Third, we see whether limited market access significantly affect household poverty status and whether it is creating poverty trap for the household. Fourth, like the third, we test whether isolation and remoteness

[13] Kraay and McKenzie (2014) use country level as explanation. In this article we use household.
[14] IFLS is published and maintained by RAND.
[15] (Barbier & Hochard, 2019)

significantly affects household poverty status and whether it creates a poverty trap for the household. Lastly, we test whether the existence of frequent disasters such as droughts and floods affect household wealth accumulation in ways related to household poverty status and poverty traps.

The paper proceeds as follows. The second section reviews literature related to poverty and poverty traps in developing countries, specifically Indonesia. The third sections discuss the data and econometrics methodology. Section four present results. Lastly, section five provides the final discussion and conclusions.

2. Literature Review

2.1. Poverty in Developing Countries

Based on World Bank data, poverty has been declining over the past two decades. However, data also show significant heterogeneity in outcomes across countries. Around 45.5 percent of people in low-income countries and 16.9 percent of people in low-middle income countries are estimated to be living on under $1.90 a day[16]. In Southeast Asia, poverty incidence has been reduced in the past three decades due to the high aggregate rate of growth, primarily the growth of the agriculture and the services sector (Warr, 2006). Economic growth for the Southeast Asian countries from 1980 to 2005 averaged five percent per year, and the poverty headcount ratio dropped more than 50 percent since the 1990s (Balisacan, Edillon, & Piza, 2005). Some authors also make connection that the incidence of poverty headcount reduction to the expansion of social protection programs after the Asian Financial Crisis in the 1990s (Cook & Pincus, 2014).

[16] https://povertydata.worldbank.org/poverty/category/LIC and https://povertydata.worldbank.org/poverty/category/LMC. Accessed February 5th, 2021.

However, a large inequality gap between countries and between the poor and the rich within countries is still evident. This fact is consistent with predictions in the early literature such as in Ahluwalia, Carter, and Chenery (1978), which links rapid growth of developing countries to uneven distributions and persistent poverty. In contrast, in the more recent empirical literature, Ravallion and Chen (1997) used 67 countries' household surveys and found slight decreases in absolute poverty with little correlation between inequality and changes in average living standards. This work suggests then that only a subset of people enjoy developing countries' rapid economic growth. Furthermore, Klasen and Waibel (2015) found that many countries success reducing poverty through high growth rates (like in some populous Asian economies such as China, India, Indonesia, and Vietnam). Klasen and Waibel (2015) additionally notes that substantial rates of per capita increase and associated poverty reduction has been experienced in the majority of countries from all regions, which includes Sub-Saharan Africa. This finding supported by World Bank (2013) report that mentions Millennium Development Goals (MDGs) on reducing absolute poverty into half already reach four years ahead of the schedule (year 2011)[17]. However, despite all the good trends, developing countries specifically Southeast Asian countries, still facing challenges to maintain the low level of poverty and inequality in the shape of the economic risk of financial globalization, unequal division of labor, rapid urbanization, and prominent levels of informal employment (Cook & Pincus, 2014).

2.2. Poverty Traps in Developing Countries: Measurement and Existence

Jalan and Ravallion (2002) utilize consumption expenditure to measure the household's wealth status. Their research defines a poverty trap as stagnant or decreasing consumption expenditure over time. A problem with utilizing consumption expenditure is that measurement

[17] MDGs stated that reducing half of absolute poverty is targeted in the year 2015.

relies on preferences which may change over time. Recent work addresses this issue by introducing asset accumulation indices as the unit of measurement. Alternative approaches to poverty measurement start with static and income-based ("first generation"), followed by dynamic and income-based ("second generation"), and followed again with static and asset-based ("third-generation"), and finally dynamic and asset-based ("fourth generation") are summarized in Figure 2 below (Carter & Barrett, 2006):

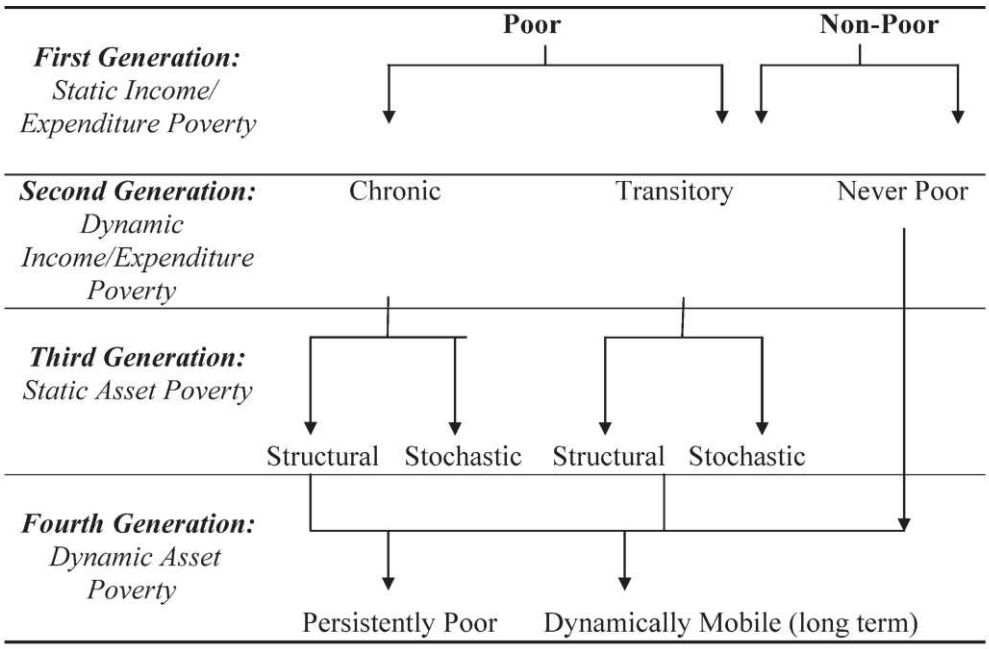

Figure 2. Alternative Approach to Poverty Measurement
Source: Carter and Barrett (2006)

While much of the literature identifies "fourth generation" poverty traps through welfare dynamics using asset measures (Adato, Carter & May, 2006; Antman & McKenzie, 2007; Barrett et al., 2006a; Carter, Little, Mogues, & Negatu, 2007; Jalan & Ravallion, 2005; Lokshin & Ravallion, 2004; Lybbert, Barrett, Desta, & Coppock, 2004; McKenzie & Woodruff, 2006; Van Campenhout & Dercon, 2009) in Barret and Carter (2013), limitations in available data from Indonesia lead us to focus on "third-generation" static poverty measurement.

Chronically poor households tend to have lower levels of assets than others (McKay & Perge, 2013). Barbier (2010) discusses how a lack of assets and access to the market may limit the ability of poor households to adopt technologies to improve farming and livelihood. Lack of assets could lead to a poverty trap for households or individuals living in remote rural areas and isolated areas facing frequent disaster shocks. Hallegatte et al. (2020) summarize how poor people are disproportionally affected by disasters and other natural hazards because they often lose a higher percentage of their wealth than the non-poor if affected by a disaster. Poor individuals also tend to have lower socioeconomic resilience, which is reflected in a lower ability to cope and recover from a disaster. Hallegatte et al. (2020) summarize how disasters and natural hazards can create even deeper poverty holes for poor people, as seen below.

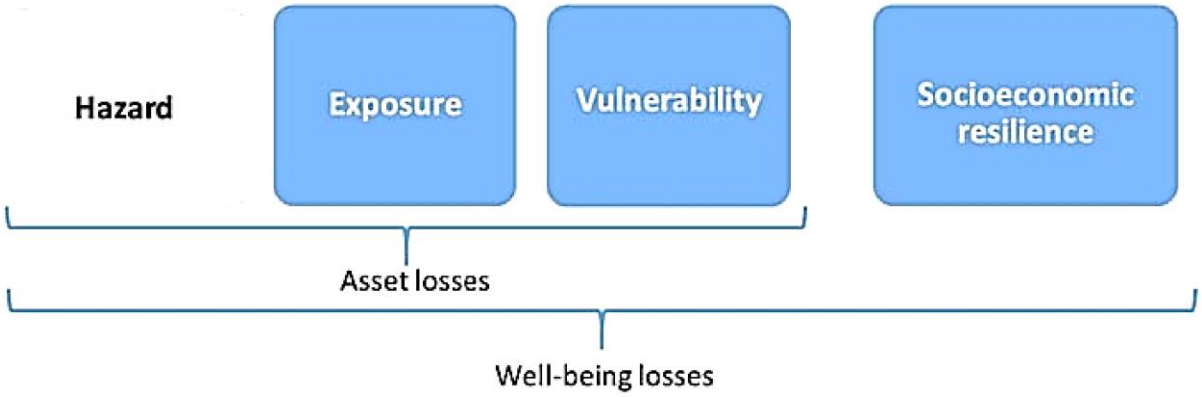

Figure 3. A Comprehensive Framework to Understand the Impact of Natural Hazards on Well-Being
Source: (Hallegatte, Vogt-Schilb, Rozenberg, Bangalore, & Beaudet, 2020)

Disaster and natural hazard impacts could also be long-term. Caruso (2017) studied 100 years of disasters in Latin America and found that young children exposed to disaster suffer long-lasting adverse effects, such as lesser human capital accumulation, inferior health conditions, and limited asset ownership as an adult. Furthermore, isolation also plays a role in remote rural areas by reducing the number of available production technologies to cope with disaster shocks. Even without the shock, this leads to considerable differences in production that

can be modeled as a separating equilibrium (Kraay & McKenzie, 2014). The illustration of a gap in production can be seen in figure 4:

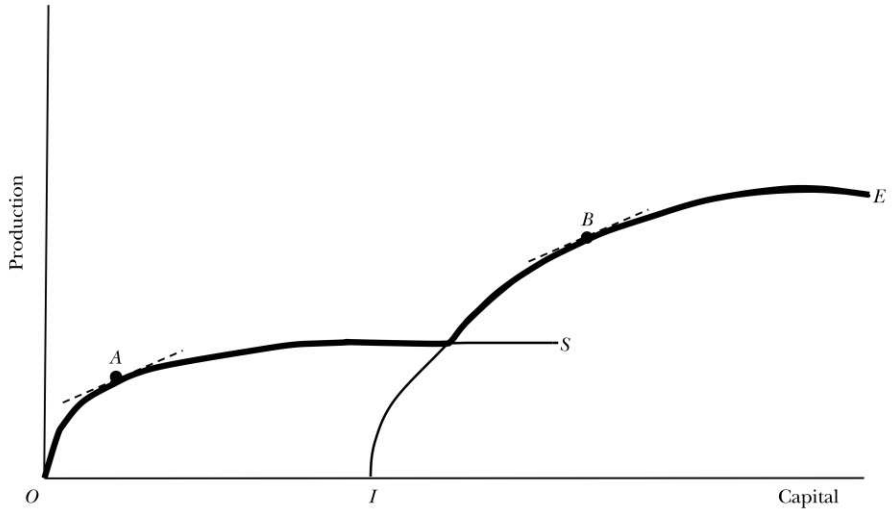

Figure 4. Production Non-convexity Arising from Choice between Two Technologies
Source: Kraay & McKenzie (2014)

Kraay and McKenzie (2014) argue that the existence of remote, rural, isolated areas will result in a discrete step between point A (low-income production) and point B (high-income production) due to the availability of production technologies. With the significant difference in the production level, there will be a substantial difference in individual or household income generation or asset accumulation between two locations defined by their differences in the extent of remoteness and isolation.

2.3. Geographic Aspects of Poverty

Before Jalan and Ravallion published their breakthrough article on the poverty trap, other research acknowledged geography-related poverty. In Bangladesh, a significant and sizeable geographic characteristic affecting living standards is found even after controlling the non-geographic characteristics (Ravallion & Wodon, 1999). Recent research shows that despite high returns to internal migration and even in cases without restrictions on labor mobility, many

people remain poor in rural areas throughout the world (Kraay & McKenzie, 2014). Furthermore, the spatial distribution of rural populations in developing countries impacts overall poverty indirectly by lowering the poverty-reducing impact of income growth (Barbier & Hochard, 2018).

Another factor that relates to the geographic aspect of poverty is frequent disasters. There are several arguments why disaster shocks specifically can affect the poverty status of an individual or a household. In Mexico, research finds there is a significant and adverse effect of natural disasters on both human development and individual poverty status (Rodriguez-Oreggia, De La Fuente, De La Torre, & Moreno, 2013). In rural Vietnam, the research found that three types of disasters (storms, floods, and droughts) negatively affect household income and expenditure (Arouri, Nguyen, & Ben Youssef, 2015). In Bangladesh, research found that there are significant adverse effects of floods on the spatial incidence of poverty both in the short term and in the long term (Dasgupta, 2007). Furthermore, although the pattern is different across countries, adopting coping strategies can be costly both in the short term and in the long term for the poorest households facing shocks (Carter, Little, & Negatu, 2007).

2.4. Indonesia, Poverty, Poverty Trap, Isolation, and Disaster

Using *Susenas* data from 1970 to 2018, Hill (2021) found that Indonesia effectively reduced poverty from 60 percent to just under 10 percent (from 70 million people to 25.92 million)[18]. However, at the sub-national level, the author finds that the rate of decline is uneven depending on the regional economic growth, employment, and other factors. Hill (2021) further describes the lack of education of the household head as the primary determinant of poverty and the obstacle to economic mobility in Indonesia, followed by household size, assets (wealth),

[18] See appendix for the full table.

employment status, health status, and the location of the household (urban/rural). In addition to these internal factors, poverty in Indonesia is also affected by external factors such as world food prices (Warr & Yusuf, 2013). Between 2007 and 2008, the fluctuation of world food prices raised poverty incidence in Indonesia in both rural and urban areas (Warr & Yusuf, 2013).

Other work suggests that poverty traps can transmit intergenerationally in Indonesia (Daimon, 2001). Dartanto and Nurkholis (2013), utilizing *Susenas* panel data from 2005 and 2007, found that 28 percent of poor households are classified as chronically poor. Their definition of chronically poor is that a household remains poor across two time periods. The authors find that rural households are more vulnerable than urban households to falling into poverty (11 percent of rural households fall into poverty compared to one percent of urban households) (Dartanto & Nurkholis, 2013). Regionally, Dartanto and Nurkholis (2013) found that areas outside Java-Bali Island contributed to more transient poverty and were more vulnerable to negative shocks.

Moreover, as a lower-middle-income country, Indonesia faces a demographic boom between 2020 and 2030 (Hayes & Setyonaluri, 2014). This demographic "bonus" is the economic growth acceleration by the impact of change population structure which marked by a decline in the dependency ratio between old non-productive labor to young productive workers (Kementerian Perencanaan Pembangunan Nasional/Badan Perencanaan Pembangunan Nasional (BAPPENAS), 2015). With most of the population unskilled[19] and 45 percent living in rural

[19] The average expected education in Indonesia is 13 years (http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/IDN.pdf)

areas[20], with the addition of problem such gaps in infrastructure availability and quality[21], the demographic bonus could lead to problematic rather than benefit for Indonesia.

In regards to the disaster issues, pver the last decade, Indonesia has been in the top five countries globally that are most frequently hit by natural disasters, along with China, the United States, the Philippines, and India. On average, 289 natural disasters per year happened in Indonesia in the last thirty years, with an estimated 8,000 annual death toll[22]. With the high frequency of disasters, the Government of Indonesia (GoI) has spent post-disaster recovery money around $300-$500 million annually[23]. While the GoI has tried to subside the impact of major and catastrophic disasters, smaller and more frequent events such as droughts and floods have received less attention. East Java and West Java, the coastal regions of Sumatra, parts of Western and Northern Sulawesi, and Southeastern Papua islands are areas considered to have high vulnerability to multiple climate hazards, including drought, floods, landslides, and sea-level rise (The World Bank, 2011). In relation to the disaster frequency, these areas also are known to be pockets of poverty within Indonesia[24].

A recent publication from the Climate Centre Organization estimated that around 50 million people were affected by the last prolonged drought in Indonesia, which ended in August 2019[25]. As droughts and floods increase in frequency, it is plausible that disaster shocks create poverty traps, especially for individuals and households that live in remote and isolated areas where their jobs are heavily dependent on weather (e.g., farming and fisheries activities).

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[20] https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=ID

[21] In 2018, it is estimated that Indonesia needed $357 billion infrastructure investment. The GoI pledged to fund $150 billion, while continue to look for an investor to fill the gap ($157 billion) (https://www.bloomberg.com/news/articles/2018-01-25/indonesia-seeks-to-plug-157-billion-gap-in-nation-building-plan).

[22] https://www.gfdrr.org/en/indonesia

[23] https://www.gfdrr.org/en/indonesia

[24] https://towardsdatascience.com/indonesias-poverty-profile-6f53b14def0f

[25] https://www.climatecentre.org/news/1211/indonesia-emerges-from-devastating-drought

Without government intervention, the effect of disaster shocks can potentially be both long-term and short-term.

3. Data and Methodology

As previously mentioned, we test several hypotheses:

a) Whether household living in the mountainous area accumulate less wealth (higher poverty) and whether it is created poverty trap (declining asset accumulation) compared to the household living in the non-mountainous area.
b) Whether household living in the less favorable land accumulate less wealth (higher poverty) and whether it is created poverty trap (declining asset accumulation) compared to the household living in the more favorable land.
c) Whether household living with limited market access accumulate less wealth (higher poverty) and whether it is created poverty trap (declining asset accumulation) compared to the household living in with market access.
d) Whether household living in the remote or physical isolation from government office and market accumulate less wealth (higher poverty) and whether it is created poverty trap (declining asset accumulation) compared to the household living closer to market and government offices.
e) Whether household living with more frequent disasters (flood and drought) accumulate less wealth (higher poverty) and whether it is created poverty trap (declining asset accumulation) compared to the household living with less disasters.

To test all these hypotheses, we utilize two different data sources and three main econometric models with two additional models as robustness checks. Cross-section data from Indonesia Central Statistical Bureau (BPS) are utilized to test poverty (wealth accumulation)

hypotheses. Meanwhile, panel data from Rand organization (Indonesia Family Life Surveys – IFLS) are used to test the poverty trap hypotheses.

3.1. Data

To test the hypothesis for the first section of how geographic aspects affect individual wealth accumulation, we use Indonesia's national socio-economic survey data (Susenas-Survei Sosial Ekonomi Nasional) and the Indonesia village potential data (Podes-Potensi Desa) published by Indonesia Central Statistical Bureau (BPS). *Susenas* provides household and individual-level data, while *Podes* provides rich data on the community or village level. The primary independent variables are geographic variables derived from *Podes* corresponding to geographic locations, infrastructure availability, and disaster records. We utilize 2011 *Podes* and *Susenas* data as it is the most recent that is complete and available to us[26].

While *Podes* is a panel at the community level (village, district, and province), *Susenas* is a repeated cross-section. Around 75-80 percent of households are from the previous waves of *Susenas*, but the other 20-25 percent comes from different households with similar characteristics to those in the previous *Susenas* sampling. Therefore, we investigate asset and wealth accumulation indicators cross-sectionally.

In the second section, we utilize data with panel characteristics from the Indonesia Family Life Surveys (IFLS), published by Rand Organization, to see the existence of a poverty trap, not only the cross-sectionally difference across individuals on asset accumulation. IFLS has low attrition rates and covers substantial geography with varying conditions allowing us to examine whether the poverty trap phenomenon happens within particular geographic circumstances.

[26] Newer *Susenas* data (2014) is missing the village code, and unfortunately cannot be merged with *Podes* dataset. The year 2008 data does not have similar asset accumulation variables.

3.1.1. *Susenas* and *Podes*

Detailed variables that are used in this article can be seen below in table 1.

Table 1. Variables in the Cross-Sectional Model[27]

Group	Variable	Explanation
Dependent Variable	Asset Total	Measurement of 16 items of asset ownership. Those 16 asset ownership variables are house, land, motorboat, car, personal computer, notebook (laptop), motorcycle, boat, air conditioner, water heater, landline, cellphone, refrigerator, gas stove, cable TV, and bicycle[28].
	Wealth Score	Calculated wealth score using principal component analysis of 16 asset ownership used in the asset total variable
	Livelihood Index	Individual monthly expenditure divided (as income proxy) by the poverty line
Variable of Main Interest		
Geographical Variable	Mountain	Dummy variable =1 if household living in the mountain area
Less Favorable Land (LFL) Variable[29]	Agricultural Land Conversion Rate	Village percentage of land converted into a farming area in the last three years
	Agricultural Land Conversion Dummy	Whether there is land converted into a farming area in the village in the last three years
Market Access	Bank Infrastructure	Dummy variable =1 if there is bank available in the village
Isolation and Remoteness Variable	Distance to Sub-district (Kecamatan)	The village distance to the Sub-district (Kecamatan)[30] in kilometer
	Distance to Bank	Village distance to the nearest bank in kilometer
	Access Quality	Dummy variable =1 if the village has good quality road[31]
Disaster Variable	Flood	Dummy variable =1 if there is flood happen in the village in the last three years (frequency of disaster replace by dummy variable because it has limited data availability)
	Drought	Dummy variable =1 if there is drought happen in the village in the last three years (frequency of disaster replace by dummy variable because it has limited data availability)

[27] Variable proposed here is chosen by the best availability from the dataset, and the closest representative to proxy the channels explained in the earlier part from author's subjective judgment.
[28] The 16 possible assets are weighted in this order. House has the highest weight and bicycle has the lowest weight.
[29] The ideal less-favorable agricultural area proxy variable explained by Barbier and Horchard (2019) which are: difficult terrain, poor soil quality, or limited rainfall, and have limited access to markets. However, due to the data limitation, we tried to proxy land quality by using the conversion rate of the land to farm. We assume that higher rate of conversion means the quality of land is lower thus extensification needed more to increase productivity rather than intensification.
[30] Equal to county capital
[31] The good quality road variable is defined by roads with access throughout the year. These roads are usually hardened by asphalt, cement, or rocks.

Group	Variable	Explanation
Control Variable		
Health	Distance to *Puskesmas*	Village distance to the nearest *puskesmas*[32] in kilometer
Education	Secondary School	Number of Secondary Schools in the Village[33]
Household Characteristics	Household Size	The size of the household
	Household Expenditure	Household Expenditure Monthly
	Female-Headed household	Household has a female head
Government Program	PNPM program within the village	Dummy variable =1 if there is PNPM[34] program in the village

Source: author

We focus on the subsample of rural areas to isolate the geographically related poverty dynamics of interest in this research. Summary statistics in table 2 indicate that households own between three to four assets (out of a total of 16) on average. It can also be seen that 23.6 percent of households live in the mountains with the remainder living on flat land or coastal area. Regarding infrastructure, banks are only available in some villages (around 1.5 percent of households have access). The distance to bank and sub-district capital on average 11.2 kilometers and 52.8 kilometers.

Table 2. Summary Statistics of Variables in the Cross Section Model – Rural Area

Group	Variables Name	Explanation	Obs,	Mean	SD	Min	Max
Dependent Variable	Asset Total	Total Asset	172687	3.7429	1.867	0	14
	Wealth Score	Wealth Score	172687	-.5310	1.3067	-2.1147	9.6930
	Livelihood Index	Livelihood Index	172687	.8208	1.2680	.0192	91.9034
Geographic Variable	Mountain	Mountain Area	172687	.1966	.39746	0	1

[32] *Puskesmas* is a government owned clinic. Minimum facilities and services in *Puskesmas* include vaccination, general practice, dental, and optometrist.
[33] There is no or less variation on elementary school number in the village. Each village usually has at least one primary school (results of "Inpres Desa Tertinggal" program in the 1990s).
[34] PNPM or *Program Nasional Pemberdayaan Masyarakat* is community-based government program. The community is expected to submit a proposal of community activities or programs with detailed budget. An approved activity or program will receive a financial disbursement. These activities or programs range from roadworks, school construction, credit rolling, and more.

Group	Variables Name	Explanation	Obs,	Mean	SD	Min	Max
Less Favorable Land (Land Quality)	Agricultural Land Conversion Rate	Dummy Land Conversion (to Farm)	172687	.0815	.2736	0	1
	Agricultural Land Conversion Dummy	% Land Conversion (to Farm)	172677	1.0900	6.6975	0	100
Market Access	Bank Infrastructure	Dummy Bank	172687	.0158	.1250	0	1
Isolation and Remoteness Variables	Distance to Bank	Distance to Bank	172687	11.1820	21.7406	.1	295
	Distance to Sub-district (Kecamatan)	Distance to Sub-district	170539	52.8282	95.8067	.1	905
	Easy to access	Dummy Road Quality	167794	.8759	.3296	0	1
Disaster Variables	Flood	Dummy Flood	172677	.1974	.3980	0	1
	Drought	Dummy Drought	172687	.0313	.1743	0	1
Health Variables	Distance to *Puskesmas*	Distance to *Puskesmas*	131935	6.9622	7.9614	.1	97
Education Variables	Secondary School	Number of SMP (Middle School)	172687	.6978	.9072	0	11
Household Characteristics	Household Size	Household Size	172687	3.9267	1.7465	1	24
	Household Expenditure	Household Expenditure	172687	498531.8	489863.6	59208.33	4.50e+07
	Female-Headed Household	Dummy Female-Headed Household	172687	.04174	.1999	0	1
Government Program	PNPM program within the village	Dummy PNPM Program	167794	.8950	.3065	0	1

Source: *Podes* 2011, *Susenas* 2011

In comparison to the full sample encompassing both rural and urban areas, (appendix table 13), the number of total assets owned by rural households is lower than the values for the overall sample. The livelihood index is also shown to be lower than the whole sample (0.82 compared to 0.98), showing that majorities of individuals living below poverty line. Furthermore, the number of rural households living in the mountain area is much higher. The

rate of land conversion for agricultural purposes is much higher than the whole sample, which aligns with the high number of individuals working as farmers (95 percent). In terms of isolation and infrastructure availability, rural households are located farther from facilities such as hospitals, *puskesmas*, banks, markets, and sub-district compared to the whole sample, which includes urban households. Therefore, it is also expected that rural households have more limited access to those infrastructures.

3.1.2. Indonesia Family Life Survey (IFLS)

Detailed variables from IFLS can be seen below in table 3. The addition of this dataset allows us to examine changes over time in the key variables of interest.

Table 3. Variables in the Panel Model

Group	Variable Name	Explanation
Dependent Variable	Asset Total	Measurement of 11 items of asset ownership. Those 11 asset ownership variables are house, other buildings, land, livestock, savings, jewelry, vehicles, poultry, and appliances.
	Wealth Score	Calculated wealth score using principal component analysis of 11 asset ownership used in the asset total variable
	Livelihood Index	Individual monthly expenditure divided by the poverty line
Variable of Main Interest		
Geographical Variable	Mountain	Dummy variable =1 if household living in the mountain area
	MASL (Meters Above Sea Level)[35]	Village location (in meters) calculated from sea level
	Temperature	Village average temperature in a year (in Celsius)
Less Favorable Land Variable (LFL)	Agricultural Land Conversion Rate	Village percentage of land converted into a farming area in the last few years
	Agricultural Land Conversion	Whether there is land converted into a farming area in the village in the last three years
Market Access[36] Variable	Market Infrastructure	Dummy variable =1 if there is a permanent market available in the village
Isolation and Remoteness Variable	Distance to District	The village's distance to the district capital in kilometers
	Access Quality	Dummy variable =1 if the village has good quality road
	Distance to Bank	Village distance to the nearest bank in kilometers

[35] In Indonesian MDPL *(Meter Di atas Permukaan Laut)*

[36] No bank data available in the community. Thus, we use market as proxy of market access. The assumption is that every permanent market usually have financial institution like bank or micro credit institution.

Group	Variable Name	Explanation
Disaster Variable	Flood	Dummy variable =1 if there has been a flood happened in the village in the last five years
	Drought	Dummy variable =1 if there has been a drought happened in the village in the last five years
Control Variable		
Health	Number of *Puskesmas*	The number of *puskesmas* commonly utilized by the villager
Education	Secondary School	Number of Secondary Schools in the Village
Household Characteristics	Household Size	The size of the household
	Household Expenditure	Household Expenditure Monthly
	Female-Headed household	Household has a female head
Government Program	PNPM program within the village	Dummy variable =1 if there is a PNPM program in the village

Source: author

Table 4. Summary Statistics of Variables in the Panel Model – Rural Households

		Wave 4					Wave 5				
Group	**Variables Name**	**Freq**	**Mean**	**SD**	**Min**	**Max**	**Freq**	**Mean**	**SD**	**Min**	**Max**
Dependent Variable	Asset Total	2745	4.97	1.61	0.00	10.00	2905	5.43	1.59	0.00	11.00
	Wealth Score	2745	-0.28	1.37	-4.09	4.44	2905	-0.16	1.37	-5.50	4.33
	Livelihood Index	2718	2.81	2.13	0.18	19.87	2551	6.16	17.88	0.54	788.77
Geographical Variable	Mountain	2745	0.12	0.33	0.00	1.00	2905	0.11	0.31	0.00	1.00
	MASL (MDPL)	2130	352.313	328.286	5	2000	2129	352.344	328.360	5	2000
	Temperature	2130	28.919	3.858	16	40	2129	28.919	3.859	16	40
Less Favorable Land Variable	Agricultural Land Conversion Rate	2745	0.20	0.40	0.00	1.00	2905	0.14	0.35	0.00	1.00
	Agricultural Land Conversion	2745	4.75	14.97	0.00	100.00	2905	3.54	11.45	0.00	60.00
Market Access	Market Infrastructure	2745	0.29	0.46	0.00	1.00	2905	0.31	0.46	0.00	1.00
Isolation Variables	Distance to Bank (in KM)	2716	7.73	9.42	0.01	50.00	2887	6.16	7.35	0.01	40.00
	Distance to District (in KM)	2745	34.57	28.62	1.00	165.00	2865	33.24	27.50	1.00	150.00
	Access Quality	2745	0.88	0.33	0.00	1.00	2905	0.98	0.17	0.00	1.00
Disaster Variables	Flood (dummy)	2745	0.20	0.40	0.00	1.00	2905	0.26	0.44	0.00	1.00
	Drought (dummy)	2745	0.18	0.38	0.00	1.00	2905	0.19	0.40	0.00	1.00
Health Variables	Number of *Puskesmas*	2745	2.18	1.04	1.00	5.00	2905	2.33	1.32	1.00	6.00
Education Variables	Secondary School	2711	3.12	1.38	1.00	10.00	2905	4.02	2.01	1.00	10.00
Household Characteristics	Female-Headed household	2745	0.04	0.18	0.00	1.00	2905	0.04	0.19	0.00	1.00
	Household Size	2745	4.18	1.59	2.00	12.00	2905	4.14	1.53	2.00	16.00
	Household Expenditure	2718	1,576,454	1,232,298	138,700	13,400,000	2551	5,254,668	12,600,00	429,750	501,000,000
Government Program	PNPM program within the village	2745	0.63	0.49	0.00	1.00	2905	0.95	0.23	0.00	1.00

Source: IFLS Wave 4 and 5

Based on table 4 IFLS wave 4 and wave 5, on average, households own five assets. The percentage of land conversion is declining around three percent (from 20 percent to 14 percent) between IFLS wave 4 and wave 5. Between the two waves, access quality seems to be increasing too, as shown by the percentage of households with good quality road increase from 88 percent to 98 percent. Furthermore, education infrastructure (secondary school) is increasing steadily. Households headed by females stayed at 4 percent level in IFLS wave 5 (a feature that we return to in an extension of the results later in this article). The number of individuals in the household is stable at 4.1 on average. There is an increase in living standards (variable of asset total and living index) between wave 4 (2007) and wave 5 (2017). Both education and health infrastructure are increasing in the two periods. On the other hand, access quality and ease of access variables show declines over time, indicative of limits to regular maintenance of infrastructure.

Although we restrict to the rural subsample for this descriptive analysis, we also compare to national average statistics (appendix table 14). We find that households living in rural areas have total asset accumulation and living indices that are much lower than the whole average (urban and rural). This again highlights differences between rural and urban areas and supports our restriction to the rural subsample to isolate the dynamics of interest in this paper. The distance data also shows that rural households are different in that they live much farther than the overall household average. Rural households have lower access to education and health facilities than the national average. Lastly, the disaster variables reveal that rural households face a higher probability of drought rather than flood than what is reflected in the national average.

3.2. Empirical Approach

3.2.1. Cross-Section Models

The cross-sectional model is used to test whether all variable of interest significantly affect wealth accumulation (poverty). The model is derived from Jalan and Ravallion (2002) with the main change being independent variable (the use of asset ownership) and the nature of the cross-section model instead of panel[37]. The first model serves as the sense of direction regarding the relationship between variables of interest, such as geographic variables, economic infrastructure, and others, with asset accumulation as a wealth proxy. This first model then shows the impact of those variables of interest on the poverty status of the household. The cross-sectional model specification is as follow:

$$A_i = \alpha + \gamma g_i + \theta s_i + \varphi d_i + \beta x_i + \varepsilon_i \qquad \text{(Eq. 1)}$$

Where *A* is an asset; *g* is a classical geographic variable; *s* is the isolation variable; *d* is the disaster variable, and *x* is another exogenous explanatory variable. This model is estimated using simple OLS regression to document associations between environment and economic status.

Furthermore, in addition to the model, we follow the livelihood index from Mullan et al. (2018), where:

$$L_{it} = A_{it} + \beta x_{it} + \varepsilon_{it} \qquad \text{(Eq. 2)}$$

$$A_{it} = f(g_{it}, s_{it}, d_{it}) \qquad \text{(Eq. 3)}$$

Where *A* is an asset that is a function of a classical geographic variable *g*; an isolation variable *s*; a disaster variable *d*, and exogenous explanatory variables *x*. *L* is the index

[37] Jalan and Ravallion (2002) estimate the poverty trap using panel data (changes in household income) and GMM model.

$(^{Income}/_{Poverty\ Line})$. This model is estimated by simultaneous equation regression under the assumption that geographical factors affect both asset accumulation and livelihood simultaneously. The livelihood index ranges from 0 to ∞ with a value of 1 means that the individual/household is living exactly at the poverty line. For example, if individuals have livelihood index score as two, it means that they have expenditure 100 percent higher than poverty line. Therefore, we can focus on individuals with livelihoods index less than 1.5 (where their expenditure is 50 percent above the poverty line).

One exogenous variable of particular interest is that of female-headed household status. Female-headed households tend to have different demographic, sociological, and microeconomic characteristics when compared to male-headed households, which leads to unique needs (Barros, Fox, & Mendoça, 1997). Female-headed households in Indonesia face limited access to the labor market. The World Bank (2020) explains that in Indonesia, the role of women as wives, mothers, and caregivers, has been reinforced through both formal and informal institutions and perpetuated the social norms that continue to restrict women's participation in economic activity[38]. The lack of land ownership, job and agricultural opportunities, and limited community development roles make female-headed households especially vulnerable to poverty

[38] In some instances, the culture forbids females from owning land. Based on the 2014 data from the National Land Agency, from 44 million acres of registered land certificates, only 15.88 percent of the land ownership is female. In 2020, the number slightly increased to 24.2 percent. In the agricultural sector, the Agricultural Census of 2013 found that only three million out of 26 million (or 11.5 percent) of agricultural households reported having women as the main farmers. The number again only slightly increased to 13 percent in 2020. Statistics also show that in 2020, among 74,953 villages in Indonesia, only 6,500 (or less than 10 percent) were headed by a female. For 32 years in Indonesia, the New Order regime's legacy has been "domesticating" women's role policy, limiting women's role in the traditional role as the leading household primary care and domestic caretaker. Due to lack of representation in leadership roles, women are rarely involved in community development planning. Village bureaucrats regularly position women's empowerment issues as the last during the development planning (Kushandajani & Alfirdaus, 2019). Kushandajani and Alfirdaus (2019) found that village heads, most of them men, still dictate village policymaking. Most village fund programs also lack empowerment programs that potentially directly impact the improvement of gender equality (Kushandajani & Alfirdaus, 2019).

and economic shocks. These channels can lead to a lower level of wealth accumulation that can be measured through assets.

Four percent of households are headed by a female in rural areas, and on average, there are four household family members in one house. There are two alternate definitions of headship (Barros, Fox, & Mendoça, 1997). First, headship can be defined as the person who has the highest income in the household. Alternately, other work defines headship in terms of the person that provides most efforts on behalf of and commitment to the household (Rosenhouse, 1994). In this article, the headship definition follows the available survey definitions. Headship in both surveys is defined by the first definition and complements the administrative definition of headship[39]. Therefore, we use variables that define the headship of the household and then connect this to gender information to determine whether it is a female or male-headed household.

3.2.2. Panel Models

Like the cross-section model, the main difference in our panel specification when compared to Jalan and Ravallion is the set of variables in the model specification. The primary variable to be included is proxy variables of less favorable land, a proxy variable of market access, proxy variables of isolation and remoteness, and proxy variables for disasters[40], asset accumulation (wealth index), and government policy-related variables.

In this case, we estimate the change of asset accumulation (ΔA) following insights from Jalan and Ravallion (2002), Adato, Carter, and May (2006), and Mullan et al. (2018). We examine two sets of specifications[41]:

[39] Due to patriarchal society, Indonesian administrative headship definition is the oldest male in the family.
[40] This is different from Jalan and Ravallion due to the addition of asset as wealth accumulation and livelihood index as control variables for income.
[41] For this first section, all specifications show non-dynamic version of the model. For example, we use an asset instead of change of asset in the dependent variable.

1. A model with a change in an asset as the dependent variable

$$\Delta A_{it} = \alpha + \gamma g_{it} + \theta s_{it} + \varphi d_{it} + \beta x_{it} + \varepsilon_{it} \qquad \text{(Eq. 4)}^{42}$$

Where *A* is an asset; *g* is a classical geographic variable; *s* is the isolation variable; *d* is the disaster variable, and *x* is another exogenous explanatory variable. This model is estimated using OLS estimation.

2. A multinomial logit model with poverty category as dependent variable

$$\hat{y}_i = \begin{cases} 1 & \hat{y}_i^* \le \hat{c}_o \\ 2 & \hat{c}_o \le \hat{y}_i^* \le \hat{c}_1 \\ : & : \\ 4 & \hat{c}_4 \le \hat{y}_i^* \end{cases}, \qquad \hat{y}_i^* = x_i'\hat{\beta} \qquad \text{(Eq. 5)}$$

$$(\Pr(Y_i) = 1,\ 2,\ 3, 4) = \beta_1 + \beta_2 g_{id} + \beta_3 s_{id} + \beta_4 d_{id} + \beta_5 x_{id} + \varepsilon_2 \text{ (Eq.6)}$$

Where y_i is the poverty category defined by the change between the two periods (1 = always in poverty, 2 = fall into poverty, 3 = out of poverty, and 4 =never in poverty); *g* is a classical geographic variable; *s* is the isolation variable; *d* is the disaster variable, and x_{id} represents independent variables including distance, access, and disasters and demographic variables. We are interested in always poor household category which relates to the "poverty trap" concept.

For each of the two sets of specifications above, we test three different sets of hypotheses: first, whether geographical location ("classical" geographic variables) has an impact on individual wealth/asset accumulation status (our measurement of poverty). The null hypothesis for each test is that the main variables of interest do not affect wealth accumulation or poverty status. For example, if the coefficient of variable *g* (geographical variable) is negative and rejected the null hypothesis (significant), then people in those specific geographic

[42] For the one-year cross-section data, there is no change on asset. Therefore, the dependent variable is only asset number.

characteristics are worse in asset accumulation (poor) compared to the people living outside those characteristics. The second hypotheses tests whether the proxy of less favorable land affect the household wealth accumulation (poverty). If the coefficient of those variables is negative and significant (reject the null hypothesis), living in the less favorable land (higher rate of land conversion) negatively affects individual asset accumulation. The third and fourth hypotheses surround whether market access and isolation affect individual asset. If the coefficient of those variables is negative and significant (reject the null hypothesis), living with market access and/or in isolation negatively affects individual asset accumulation. Fifth, we test whether the disaster shocks in the village affect individual asset accumulation status. If the variable *d* is negative and significant, having a disaster in the village for the time negatively impacts individual asset accumulation. We expect the main variables in the hypotheses to adversely impact the dependent variables and to be statistically significant. All hypotheses are tested either by each variable individually or by groups of variables.

3.2.3. Robustness Checks

As robustness checks, we first perform bivariate regression of the main interest variable without the control variables *x.* Second, we assign different weights to asset ownership. For example, owning a house or land has a higher weight than owning a bicycle or refrigerator. The assignment of asset ownership weight is done by utilizing Principal Component Analysis (PCA)[43]. Later, we use the value coming from weighting assets differently to construct a wealth score. Then, the wealth score is used as a replacement for measuring asset accumulation. Robustness check regressions can be found in the appendix.

[43] Principal component analysis (PCA) simplifies the complexity in high-dimensional data with multivariable while retaining trends and patterns (Lever, Krzywinski, & Altman, 2017). Variables for the PCA and Kaiser-Meyer-Olkin (KMO) results appear in the appendix.

4. Results

4.1. *Susenas* Results

4.1.1. First Regression Model: Ordinary Least Squares Regression

Three regression tables will be shown in this section[44]. Asset total as the main dependent variable will be discussed in this section, while wealth score and livelihood index as a dependent will be shown in the appendix. The results of the single variate regression stemmed from equation 1 of the main variable of interest can be seen in table 5.

Table 5. Single Variate Regression of Main Variable of Interest (Total Asset as Dependent Variable)

Dependent= Total Asset	Geographic Variable	Less Favorable Land		Market Access		
	Mountain	Farm Conversion (Dummy)	Farm Conversion (% Total)	Bank		
Coefficient	-0.800***	-0.0901***	-0.00253***	0.683***		
t-stat	(-76.97)	(-5.486)	(-3.775)	(19.04)		
Constant	3.932***	3.750***	3.746***	3.732***		
t-stat	(777.7)	(800.1)	(822.9)	(824.9)		
Observations	172,687	172,687	172,677	172,687		
R-Squared	0.033	0.000	0.000	0.002		
F-Stat	5924	30.10	14.25	362.5		
Dependent= Total Asset	**Isolation & Remoteness**			**Disaster**		
	Distance to Sub-district	**Distance to Bank**	**Quality Road**	**Flood**	**Drought**	**Female-Headed Household**
Coefficient	-0.00962***	-0.00265***	0.739***	0.158***	-0.491***	-0.778***
t-stat	(-33.62)	(-56.65)	(53.69)	(14.00)	(-19.08)	(-59.39)
Constant	3.829***	3.890***	3.119***	3.712***	3.758***	3.846***
t-stat	(743.0)	(761.1)	(242.2)	(740.5)	(824.2)	(805.3)
Observations	172,501	170,539	167,794	172,677	172,687	172,687
R-Squared	0.007	0.018	0.017	0.001	0.002	0.020
F-Stat	1130	3209	2883	196	364	3527

Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: author

Based on the single variate linear regression in table 5, we can see that every main variable of interest shows the right direction with the prior expectation of the hypotheses.

[44] One regression with interaction terms between the main variables of interest appears in the appendix.

Geographical variables show a negative sign and are statistically significant. This shows that living in those areas is worse off for an individual in terms of asset accumulation. Living in mountain areas leads households to have one asset less than those who are not on average. Less favorable land proxy by farm conversion shows a negatively statistically significant coefficient. This means that a village with worse land quality needs a higher rate of land conversion to a farm to achieve higher production to accumulate more wealth/assets. Market access show a positive and significant effect on asset accumulation. This aligns with previous literature and prior expectations.

Furthermore, the isolation variable coefficients show the anticipated direction. Thus, when the village is located far away from the central city or economic infrastructure (bank and government office), it is associated with worse wealth accumulation for an individual living in the village. Individuals will be better off if the village is considered to have easy access, such as good frequent transportation and good road quality. The magnitude of good road quality variable is on par with the geographical variable (mountain). People living in the village with good road quality close to have one more asset accumulation on average compared with people who do not.

Lastly, our results for disaster variables are mixed. The flood indicator shows a significant positive effect, whereas drought reveals the opposite. The speculative explanation of the flood result is that floods result in different effects depending on when it happens. If most floods happen during the growing seasons, the impact of floods would be expected to increase agricultural production, leading to significantly higher asset accumulation. Unfortunately, we cannot confirm this explanation with certainty since we do not have access to data on the timing of the floods at the individual flood level.

Robustness checks with the different dependent variables, with welfare score, which weighs each asset differently, and with a livelihood index as previously defined, can be found in the appendix. Finally, table 6 presents the result from a group regression of the main interest variables.

Table 6. Group Regression of Main Variable of Interest
(Total Asset as Dependent Variable)

Classical Geographical	Coefficient	Less Favorable Land	Coefficient	Market Access	Coefficient	Isolation	Coefficient	Disaster	Coefficient
Mountain	-0.807***	Dummy Land Conversion (to Farm)	-0.0824***	Bank	0.674***	Distance to Sub-district	-0.00584***	Dummy Flood	0.190***
	(-85.88)		(-4.236)		(16.79)		(-12.72)		(16.87)
		% Land Conversion (to Farm)	-0.00102			Distance to Bank	-0.00206***	Dummy Drought	-0.552***
			(-1.350)				(-49.93)		(-22.78)
						Dummy Road Quality	0.527***		
							(38.71)		
Female Head	-0.789***	Female Head	-0.779***	Female Head	-0.777***	Female Head	-0.843***	Female Head	-0.779***
	(-66.64)		(-65.34)		(-65.22)		(-69.59)		(-65.44)
Constant	4.039***	Constant	4.455***			Constant	3.292***	Constant	3.723***
	(730.1)		(199.6)				(171.0)		(739.7)
Observations	172,687	Observations	172,677			Observations	166,093		172,677
R-squared	0.054	R-squared	0.015			R-squared	0.038	Observations	0.004
F-Stat	5808	F-Stat	373.7			F-Stat	1312	F-Stat	321.5

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: author

The coefficient magnitudes are smaller, although the statistical significance does not change as controls are added. For example, the availability of banks positively affects total asset accumulation 0.64. This is a much lower magnitude than the single variable model, which shows bank magnitude to asset accumulation is 0.683. The isolation and remoteness proxy coefficient value for road quality variable in the group regression also becomes smaller (0.527 compared to 0.739 in the single variable model). Moreover, the robustness check with the welfare score and livelihood index can be found in the appendix section.

For comparison, we add five groups of control variables: household characteristics, education facility availability, health facility availability, and government programs in table 7. The household characteristics include household size and monthly household expenditure. The health facility controls include distance to the *puskesmas*. Lastly, the education facility controls incorporate the number of middle schools within the village and government policy represented by the availability of the PNPM program in the village.

Table 7. Regression of Main Interest Variables with Control Variables with Female-Headed Household Variable

VARIABLES (Dependent=Asset Total)	Geo No Control (1)	Geo & LFL (2)	Geo & Market Access (3)	Geo & Isolation (4)	Geo & Disaster (5)	Geo with control (6)	All Main Interest Variables (7)	All Main Interest Variables with control (8)
Mountain	-0.807***	-0.806***	-0.803***	-0.751***	-0.795***	-0.658***	-0.741***	-0.618***
	(-85.88)	(-85.81)	(-85.53)	(-72.14)	(-77.16)	(-51.05)	(-77.85)	(-47.95)
Female Head	-0.789***	-0.789***	-0.787***	-0.847***		-0.491***	-0.846***	-0.504***
	(-66.64)	(-66.69)	(-66.58)	(-65.44)		(-34.34)	(-70.36)	(-35.07)
Dummy Land Conversion (to Farm)		-0.0760***					-0.0179	0.00354
		(-3.985)					(-0.933)	(0.173)
% Land Conversion (to Farm)		-0.00103					0.000422	-0.00239***
		(-1.391)					(0.548)	(-2.933)
Bank			0.618***				0.419***	0.477***
			(15.60)				(10.54)	(7.106)
Distance to Sub-district				-0.00520***			-0.00508***	-0.00310***
				(-15.38)			(-12.11)	(-5.363)
Distance to Bank				-0.00183***			-0.00175***	-0.00213***
				(-36.51)			(-43.08)	(-41.87)
Dummy Road Quality				0.470***			0.468***	0.249***
				(32.54)			(35.82)	(16.27)
Dummy Flood					0.116***		0.0933***	0.0537***
					(10.43)		(8.288)	(4.556)
Dummy Drought					-0.510***		-0.452***	-0.493***
					(-20.21)		(-18.87)	(-19.53)
Constant	4.039***	4.046***	4.028***	3.785***	4.029***	2.588***	3.769***	2.407***
	(730.1)	(713.0)	(725.8)	(247.5)	(692.7)	(36.63)	(256.9)	(33.67)
Observations	172,687	172,677	172,687	166,093	172,677	131,935	166,073	129,269
R-squared	0.054	0.054	0.055	0.079	0.056	0.174	0.082	0.188
F-Stat	5808	2915	3948	2859	2575	2315	1985	1358
Household Control	No	No	No	No	No	Yes	No	Yes

VARIABLES (Dependent=Asset Total)	Geo No Control (1)	Geo & LFL (2)	Geo & Market Access (3)	Geo & Isolation (4)	Geo & Disaster (5)	Geo with control (6)	All Main Interest Variables (7)	All Main Interest Variables with control (8)
Education Control	No	No	No	No	No	Yes	No	Yes
Health Control	No	No	No	No	No	Yes	No	Yes
Government Program	No	No	No	No	No	Yes	No	Yes

Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: author

The most notable results from the regression are that the variables for land quality (dummy land conversion) have become statistically not significant, even though the sign of the coefficient is still consistent with the previous result. On the other hand, percent of land conversion is negative and significant in affecting asset accumulation when the model use full set of variables and controls. Furthermore, all the other variables are still statistically significant and show the expected relationship with the dependent variable, although estimated coefficients are smaller. The complete regression (Column (8)) shows that living in the mountain significantly affects wealth accumulation. An individual residing in the mountain has half an asset less than the one not living in the mountain. The results magnitude is followed by female-headed household and the existence of drought and (0.50 and 0.493 fewer assets, respectively). Banks, as proxy of market access, shows positively significant affecting the asset accumulation. Furthermore, complete results and regression results with wealth score as the dependent variable can be found in the appendix[45].

[45] Some regressions with an interaction variable are found in the appendix section.

4.1.2. Second Regression Model: Simultaneous Equation Model

Since we suspect there could be simultaneity between asset accumulation and the livelihood index, we run a simultaneous equation model. In this exercise, geographic location, remoteness, and other household characteristics affect total assets. At the same time, another equation measures the impact of asset accumulation, distance, education and health facilities, and social protection programs on the livelihood index of the household. The result from the second model originated from equation 2 and 3 can be seen in table 8.

Table 8. Simultaneous Equation Result
Livelihood Index as Dependent

	Less Favorable Land	**Market Access**	**Isolation**	**Disaster**	**All**
Total Asset	0.0121***	0.0121***	0.0123***	0.0121***	0.0123***
	(0.00191)	(0.00191)	(0.00192)	(0.00191)	(0.00193)
Distance to *Puskesmas*	-0.000863*	-0.000866**	-0.000964**	-0.000867**	-0.000961**
	(0.000441)	(0.000441)	(0.000467)	(0.000441)	(0.000467)
Number of Middle School	-0.00850**	-0.00849**	-0.00843**	-0.00848**	-0.00844**
	(0.00414)	(0.00414)	(0.00418)	(0.00414)	(0.00418)
Dummy PNPM	-0.168***	-0.169***	-0.169***	-0.169***	-0.168***
	(0.0177)	(0.0176)	(0.0179)	(0.0176)	(0.0179)
Constant	0.786***	0.786***	0.787***	0.786***	0.787***
	(0.00910)	(0.00910)	(0.00923)	(0.00910)	(0.00923)
Total Asset	**LFL**	**Market Access**	**Isolation**	**Disaster**	**All**
Mountain	-0.687***	-0.685***	-0.634***	-0.682***	-0.626***
	(0.0108)	(0.0108)	(0.0109)	(0.0109)	(0.0109)
Dummy Land Conversion (to Farm)	-0.0782***				0.0110
	(0.0207)				(0.0207)
% Land Conversion (to Farm)	-0.00489***				-0.00231**
	(0.000898)				(0.000906)
Bank (=1)		0.669***			0.522***
		(0.0599)			(0.0593)
Distance to Sub-district			-0.00794***		-0.00781***
			(0.000512)		(0.000513)
Distance to Bank			-0.00226***		-0.00221***
			(6.27e-05)		(6.32e-05)
Dummy Road Quality			0.275***		0.274***

	Less Favorable Land	Market Access	Isolation	Disaster	All
			(0.0165)		(0.0165)
Dummy Flood				0.0577***	0.0530***
				(0.0118)	(0.0118)
Dummy Drought				-0.530***	-0.498***
				(0.0273)	(0.0276)
Household Size	0.248***	0.248***	0.255***	0.249***	0.256***
	(0.00284)	(0.00284)	(0.00286)	(0.00284)	(0.00285)
Household Expenditure	1.10e-06***	1.10e-06***	1.10e-06***	1.10e-06***	1.10e-06***
	(9.75e-09)	(9.75e-09)	(9.72e-09)	(9.74e-09)	(9.71e-09)
Female-Headed Household	-0.477***	-0.476***	-0.502***	-0.476***	-0.502***
	(0.0140)	(0.0140)	(0.0140)	(0.0140)	(0.0140)
Constant	2.514***	2.500***	2.387***	2.507***	2.384***
	(0.0147)	(0.0147)	(0.0220)	(0.0148)	(0.0222)
Variance (Livelihood Index)	1.611***	1.611***	1.615***	1.611***	1.615***
	(0.00627)	(0.00627)	(0.00635)	(0.00627)	(0.00635)
Variance (Total Asset)	2.829***	2.828***	2.776***	2.823***	2.767***
	(0.0110)	(0.0110)	(0.0109)	(0.0110)	(0.0109)

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: author

The result from the second model once again shows the consistency and robustness of the model. The classical geographic variable is negatively significant, affecting the asset accumulation variable. Isolation, remoteness, and land quality result in the simultaneous model aligning with the earlier OLS estimation. Living in the rural mountainous area is associated with a household having 0.627 less total assets than those living outside those areas. In the livelihood index equation, the total asset affecting the living index 0.01. This means that with one more asset held by the household, their living index increase by 0.01 (much further away from poverty)[46]. Since the average of individuals living below poverty line (average livelihood index 0.8-0.9), therefore an addition of asset will make them move towards the poverty line and above.

[46] Recall that the livelihood index ranges from 0 to ∞ with a value of 1 means that the individual/household is living exactly at the poverty line, while less than 1 means in poverty and greater than 1 means above the poverty line. The higher number of livelihood index means the farthest individual from poverty.

Furthermore, an interesting finding is how social protection programs have a significant negative effect on the livelihood index. Although this is confounding, the answer might be straightforward. This social protection program targets the middle- and low-income community; thus, their expenditure is much lower overall compared to the one not in the program. Finally, we can say that the results suggest that OLS is robust and consistent to explain the difference in individual wealth accumulation status between specific regions (remote, isolated, and lack of infrastructure).

4.2.IFLS Results

While the cross-section model shows determinant factors affecting people's everyday living and poverty represented by total assets, living index, and wealth score, it does not show the poverty "trap." Therefore, a panel model which shows changes over time is implemented in this section. The result of panel data can be seen in table 9.

Table 9. Regression of Main Interest Variables with Control Variables (Change in Asset Total - IFLS)

Dependent Variables Change in Asset Total	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Mountain			-0.161*	-0.128	-0.167*
			(0.0912)	(0.0897)	(0.0915)
MASL	-0.000226***	-0.000194**	-0.000213**		-0.000217***
	(7.92e-05)	(8.16e-05)	(8.29e-05)		(8.30e-05)
Temperature	0.00508	0.00857	0.00930		0.00913
	(0.00684)	(0.00723)	(0.00726)		(0.00727)
Dummy Land Conversion (to Farm)		-0.00242	-0.00446	0.0287	-0.0129
		(0.132)	(0.131)	(0.129)	(0.131)
% Land Conversion (to Farm)		6.47e-05	0.000923	-0.000427	0.00140
		(0.00402)	(0.00403)	(0.00403)	(0.00406)
Distance to District Capital		0.00176*	0.00107	0.00173	0.00133
		(0.00106)	(0.00110)	(0.00112)	(0.00113)
Distance to Bank		-0.00897**	-0.00911**	-0.0105***	-0.00883**
		(0.00358)	(0.00359)	(0.00361)	(0.00360)
Dummy Access Quality (Road)		0.111	0.117	0.138	0.124
		(0.200)	(0.199)	(0.198)	(0.198)

Dependent Variables Change in Asset Total	(1)	(2)	(3)	(4)	(5)
Dummy Flood		-0.0996	-0.150**	-0.147**	-0.159**
		(0.0630)	(0.0705)	(0.0702)	(0.0711)
Dummy Drought		-0.0330	-0.0395	-0.0290	-0.0390
		(0.0785)	(0.0784)	(0.0776)	(0.0784)
Female-Headed Household (=1)	-0.293*	-0.256	-0.251	-0.239	-0.252
	(0.171)	(0.170)	(0.170)	(0.170)	(0.170)
Constant	1.080***	0.847**	1.043***	1.226***	1.082***
	(0.255)	(0.346)	(0.360)	(0.299)	(0.364)
Observations	1,865	1,825	1,825	1,825	1,825
R-squared	0.016	0.024	0.025	0.021	0.026
Household Control	Yes	Yes	Yes	Yes	Yes
Education Control	Yes	Yes	Yes	Yes	Yes
Health Control	Yes	Yes	Yes	Yes	Yes
Government Program	Yes	Yes	Yes	Yes	Yes

Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: Source: author

Panel data regression results reveal an interesting result comparable to the linear regression utilizing *Susenas* and *Podes* data. The result shows that higher MASL (mountainous area) negatively affected the asset accumulation (-0.000217) significantly. It means every 1000 meters increase; households tend to have an adverse change in their asset accumulation, as much as 0.24. The height also crucial explaining the mountainous area. The table shows that, the effect living on mountain not significant unless household living in the height which can be safely assume as difficult terrain[47]. Distance to bank shows statistically significant, negatively affecting asset accumulation (~0.008). Although another remoteness variable, such as distance to the district capital, shows confounding results, it positively affects asset accumulation. One explanation is the lack of variation in village distance to district capital in the data. The impact of the variable "distance to bank" means that economic infrastructure providing access to capital plays a significant role in a household's ability to accumulate wealth.

[47] This is aligned with Barbier and Hochard (2019) which include rugged terrain as one factor of less-favorable land.

Furthermore, existence of flood within the community where household lived showed negative effect on the asset accumulation. Household living with flood has decreasing asset as much as 0.15 compared to the household without. Lastly, the female-headed household variable reveals a negative and statistically significant association with asset accumulation (0.25 – 0.29). It shows that female-headed households accumulate smaller assets over time compared to male-headed households. This result on the female-headed households variable aligns with the cross-section data, which shows the variable negatively affects long-term wealth accumulation such as total assets and positively affects short-term wealth such as living index. The multinominal logit model utilizing the movement of poverty status between two periods can be seen in the table below.

Table 10. Regression of Main Interest Variables with Control Variables (Poverty Status - IFLS)[48]

VARIABLES	(1) Fall into poverty	(1) Out of poverty	(1) Never poor	(2) Fall into poverty	(2) Out of poverty	(2) Never poor	(3) Fall into poverty	(3) Out of poverty	(3) Never poor
Mountain	-0.0134	-0.0124	0.000378				-0.0220	-0.0192	0.0103
	(0.0325)	(0.0297)	(0.0285)				(0.0308)	(0.0299)	(0.0223)
MASL (MDPL)				-7.19e-05***	-3.56e-05	7.51e-05***	-7.41e-05***	-3.70e-05	7.58e-05***
				(2.78e-05)	(2.51e-05)	(2.06e-05)	(2.73e-05)	(2.52e-05)	(2.12e-05)
Temperature				-0.000944	0.00196	-0.000209	-0.000823	0.00213	-0.000246
				(0.00284)	(0.00202)	(0.00144)	(0.00286)	(0.00202)	(0.00144)
Land Conversion (to farm) (=1)	0.0384	0.0132	-0.00298	0.0419	0.00259	-0.00333	0.0414	0.00373	-0.00240
	(0.0356)	(0.0453)	(0.0402)	(0.0339)	(0.0458)	(0.0447)	(0.0332)	(0.0485)	(0.0450)
% Land Conversion (to Farm)	-0.000152	-0.000680	-0.000722	-4.27e-05	-0.000347	-0.000918	8.41e-05	-0.000332	-0.00101
	(0.000971)	(0.00173)	(0.00101)	(0.000929)	(0.00162)	(0.00111)	(0.000947)	(0.00175)	(0.00111)
Market (=1)	-0.00370	0.0222	-0.00106				-0.00451	0.0214	0.000386
	(0.0199)	(0.0199)	(0.0155)				(0.0188)	(0.0196)	(0.0159)
Distance to District Capital	0.000174	-3.00e-06	-0.000287	8.55e-05	0.000110	-0.000181	-1.26e-06	-5.57e-05	-0.000133
	(0.000336)	(0.000277)	(0.000346)	(0.000280)	(0.000299)	(0.000278)	(0.000321)	(0.000319)	(0.000318)
Distance to Bank	-0.00144	0.000637	-0.000455	-0.000746	0.00102	-0.00120	-0.000724	0.000910	-0.00121
	(0.00112)	(0.000991)	(0.00111)	(0.00113)	(0.00109)	(0.000991)	(0.00109)	(0.00100)	(0.000984)
Good Road (=1)	0.0280	-0.111***	0.0228	0.0241	-0.112***	0.0252	0.0235	-0.113***	0.0251
	(0.0820)	(0.0337)	(0.0688)	(0.0790)	(0.0356)	(0.0639)	(0.0763)	(0.0350)	(0.0618)
Flood (=1)	0.00255	-0.0236	0.00405	0.00647	-0.0219	0.00409	-0.000520	-0.0256	0.00692
	(0.0251)	(0.0277)	(0.0182)	(0.0207)	(0.0245)	(0.0164)	(0.0250)	(0.0264)	(0.0173)
Drought (=1)	-0.00109	-0.0496**	0.0158	-0.00431	-0.0509**	0.0204	-0.00528	-0.0516**	0.0211
	(0.0242)	(0.0248)	(0.0281)	(0.0244)	(0.0237)	(0.0261)	(0.0241)	(0.0247)	(0.0262)
Constant	-0.0486	0.0238	-0.145	-0.0154	-0.0323	-0.160	0.0143	-0.0207	-0.173
	(0.122)	(0.0699)	(0.105)	(0.129)	(0.0856)	(0.0993)	(0.141)	(0.0854)	(0.112)

[48] Results are in marginal value (%) and base category is always poor households.

VARIABLES	(1) Fall into poverty	(1) Out of poverty	(1) Never poor	(2) Fall into poverty	(2) Out of poverty	(2) Never poor	(3) Fall into poverty	(3) Out of poverty	(3) Never poor
Observations	1,825	1,825	1,825	1,825	1,825	1,825	1,825	1,825	1,825
Household Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Health Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Government Program	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Results from the multinomial logit model show two interesting and consistent findings with the previous model. First, living in the higher elevation area represented by MASL (meters above sea level) significantly affects household poverty, albeit the impact is small. For the household that is never poor, living in the higher elevations increases the probability of falling into poverty by ~7.5 percent per additional 1000 meters. On the other hand, the effect is negative for households out of poverty or just falling into poverty. This difference could result from how these households are inter-connected with agricultural sectors. Living at a higher altitude, for example, could lead to different opportunities for farming. However, at the same time, rugged terrain could lead to lower agricultural productivity of rural households due to lower quality of land and lack of access to infrastructure and capital.

The second finding is related to the isolation aspects of these households. Results show, having good quality of road reduces probability to fall into poverty for household that just went out from the poverty. The estimations shows that having good quality of road reduces the probability of "out of poverty" household to fall back into poverty as much 11 percent.

5. Conclusion

The result shows that geographical variables and isolation play a vital role in individual wealth accumulation even after controlling household spending, health and education facilities, and government intervention. While the classical geographical variable is embedded in a location and cannot easily change, the government can do something about the isolation by improving market access for these rural households. Individuals living in isolation and lack infrastructure also have fewer total assets and are more likely to stay in poverty or fall into poverty. This implies that government intervention is needed to help all individuals living in isolation and remote areas. Trends toward more female-headed households also are suggestive of a role for government. Policies could include at least three things: speed up an infrastructure construction that creates access to rural households, an out-migration policy, and a cash transfer program directed to single female-headed households. Improvement of the infrastructure may help alleviate individuals' isolation. Thus, individuals living in isolation can gain economic access and ignite economic growth in the area through trade and increasing job opportunities. Direct cash transfer could be designed to help single female-headed households provide for their families, especially for single female-headed with children.

Building a physical infrastructure usually costs money and time. Creating a social safety net like direct cash transfer also has its problem due to an error in the beneficiary database and targeting issues. Therefore, support from the private sector is another way to eliminate isolation and remoteness that trap rural households in poverty. The GoI can push private firms to create better economic infrastructure access to rural household. Increasing access to economic infrastructures such as bank access, market, or even government office can be provided quickly if government and private sector join with the same purpose.

Finally, the disaster variables show mixed results; thus, it is hard to pin down what kind of government policy best fits this issue. However, since both disaster variables are significant, this suggests that the government can implement mitigation actions to contain the effect of disaster shock on individual wealth status. An introduction of subsidized disaster insurance could be a good starting point for this issue. One way to subsidize the insurance is through tax reduction on the insurance contract. Picard (2008) found that targeted tax cuts on insurance contracts can improve the incentives for prevention while compensating individuals with high prevention cost. In the same article, Picard (2008) also states that the government can improve the trade-off between disaster risk and insurance premium by creating categorization instead of implementing the policy in general. Lastly, Picard (2008) argues that the central government chose compensatory taxes and subsidies to induce distortions in local purchasing insurance decision-making.

Linnerooth-Bayer & Mechler (2006) suggest that developing countries need to provide an insurance program as public-private safety nets for climate-related shocks. Linnerooth-Bayer & Mechler (2006) argue that the main advantage of this proposed climate insurance strategy is its feasibility and its potential for linking with related donor initiatives. Thus, incentives for loss reduction and aversion are directed to the most vulnerable group. Lastly, to approach a Pareto Optimum socially, it is an excellent way to pay conditional grants to the local communities that choose to get involved in costly risk management programs.

Overall, based on the regression results, we show that individual wealth accumulation and poverty traps happened and were affected by living locations. The urgency to help people is

high to avoid the poverty trap and intergenerational poverty for people living in these areas, especially when Indonesia is facing the demographic bonus in future years[49].

[49] We acknowledge that there is internal urbanization case in Indonesia (where adult went to work temporarily in the city and coming back here and there). However, data (IFLS) has only less than one percent individuals that has family member work in the city (leave for work for six months or less). Due to data limitations, we did not take that into consideration in this research.

Chapter 2 - Preventive and Promotive Health Care Utilization in Indonesia: Ex-Post and Ex-Ante Moral Hazard of Insurance Ownership

1. Introduction

The Government of Indonesia (GoI) Law No. 36 of 2009 specified five official categories of health care in Indonesia: 1) promotive health care, 2) preventive health care, 3) curative health care, 4) rehabilitative health care, and 5) traditional health care. The same law defined promotive health care as an activity (or activities) that focuses on health promotion, while preventive health care is an activity that focuses on the prevention of disease or illness. Proper diet, regular exercise, and avoiding tobacco and drugs are examples of promotive health care under these definitions. Immunization and health screening are examples of preventive health care activities.

The financial costs associated with promotive and preventive health care are cheaper than those associated with curative and rehabilitative health care. For example, in Indonesia, the cost to be hospitalized in the room from the lowest class (joint together with other 3-4 patients) starts at 302,000 rupiahs per night (around 20 US dollars[50]), and a consultation with doctor is around 250,000 rupiah per visit (around 16 dollars)[51]. These prices do not include medicine and services, such as IV and nurse services. In comparison, promotive and preventive health care costs almost nothing out of pocket because it is included in most insurance plans. Finally, traditional health care, such as shaman services, varies in cost. It could cost from 300,000 rupiah (20 dollars) to 1,000,000 rupiah (67 dollars). These costs are high compared to income for many Indonesians[52].

[50] Assuming exchange rate $1=Rp15000.
[51] https://www.cekaja.com/info/biaya-rumah-sakit-non-bpjs accessed December 20, 2021.
[52] In March 2020, monthly per capita expenditure for the lowest group or bottom 40 percent individual in Indonesia was 550,000 rupiah (37 dollars) and for the middle 40 percent was 1,100,000 (64 dollars).

Preventive care receives much attention in both academic literature and policy circles because of its effectiveness in promoting people's health in general, social expectancies, and well-being (Godber, Robinson, & Steiner, 1997). The Center for Disease Control and Prevention (CDC) in the USA estimated that 7 of 10 deaths of Americans, which contribute to 75 percent of national health spending, are caused by heart disease, cancer, and diabetes[53]. Those cases sometimes can be prevented with routine promotive and preventive health care. The CDC estimated that health problems linked to absenteeism are associated with employers losing $225.8 billion per year or $1,685 per employee due to illness or injuries[54]. Furthermore, Asay et al. (2016) estimated that absenteeism related to chronic disease costs between $16 to $81 for a small company and between $17 to $286 for a large company per employee annually. Aligned with this result, Starfield, Shi, & Macinko (2005) also find that curative care receives a significant share of most healthcare budgets.

Many researchers argue that health insurance increases outpatient and inpatient care utilization (Farrell & Gottlieb, 2020) (Erlangga, Ali, & Bloor, 2019) (Panpiemras, Puttitanun, Samphantharak, & Thampanishvong, 2011). The increasing utilization of health services and facilities means insurance ownership or coverage is strongly related to ex-post moral hazard, where individuals' behavior changes after receiving coverage from the insurance. In Indonesia, for example, there was an increase in clinic visits from 180 million visits to 284 million in the year 2020 alone[55]. This will lead to a higher cost of curative care spending and creates deficit budgeting for the universal health care program. In 2020, *BPJS-Kesehatan* (Indonesia's

https://databoks.katadata.co.id/datapublish/2021/06/28/rata-rata-pengeluaran-masyarakat-atas-yang-naik-saat-pandemi accessed December 20, 2021.

[53] https://www.cdc.gov/chronicdisease/pdf/2009-power-of-prevention.pdf accessed February 7, 2019

[54] https://tinyurl.com/2b4pt4d4. accessed March 30, 2022.

[55] https://kumparan.com/pandangan-jogja/logika-di-balik-untung-bpjs-kala-pandemi-iuran-naik-tapi-rumah-sakit-malah-sepi-1vCVW3Ww185/1, accessed January 1st, 2022.

Universal Health Care operator) raised the monthly premium to cover losses[56]. There is a need for cheaper alternative preventive treatments to minimize costs due to curative treatments. One alternative is preventive care. Although preventative care sometimes not truly free, it is much cheaper than curative care. In that regard, policymakers need to understand behavioral changes associated with having health insurance. This paper considers changes to using preventive care such as general health check-ups with a doctor and examines changes in healthy diets and exercise.

In this research, we categorized three different groups of individuals with the change of insurance coverage as their main interest: gainer, loser, and stayer. Therefore, we will investigate the insurance coverage change through a mechanism seen in the figure below.

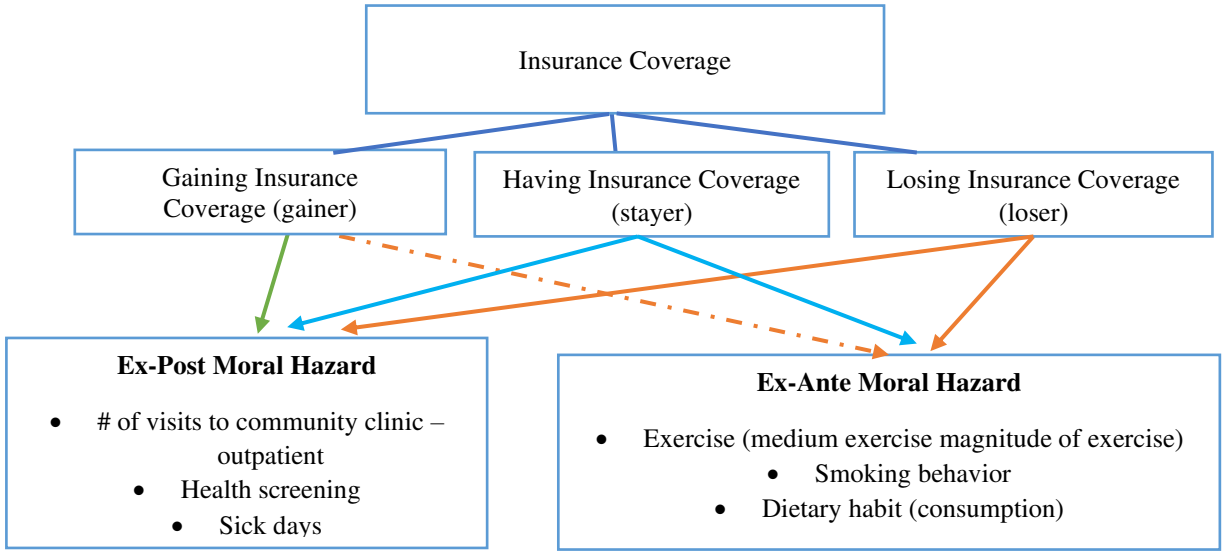

Figure 5. Change Insurance Coverage Affecting Ex-Post and Ex-Ante Moral Hazard
Source: Author
Notes: Solid orange: no change or less / no change or more (depend on the variable type). Dashes orange: different effect between the subsidized and contributory group (smoking regulation), but there are higher probabilities to unhealthy behavior/lifestyle (less preventive, more smoking). Solid green: Will increase/positive relation with the variables (increases outpatient visit, health screening etc.)

[56] *Ibid.*

Ehrlich and Becker (1972) discuss how insurance ownership leads to ex-ante moral hazards such as alcohol consumption, increased smoking behavior, and unhealthy dietary habits. This finding is supported by Stanciole (2008), who argues that health insurance ownership leads to "bad" lifestyle features such as heavy smoking, lack of exercise, and obesity. Both articles include income and household/individual characteristics as the control variable. A recent article from Putra (2020) finds that Indonesia's JKN reduced physical activity by 2.7 percent and positively impacts on smoking spending. However, research in China finds the opposite result, where affordable care reduced nine percent of cigarette consumption (Yu & Zhu, 2018)[57]. The main difference between the two articles is lies within the country context differences and their varying institutions. Both Indonesia and China applied non-smoking requirements in their insurance program (admittedly at different levels of government and enforcement), and Indonesia's regulations faced with a lower level of enforcement and monitoring.

Research has discussed the ex-ante and ex-post effects regarding the differences between gaining and maintaining insurance. For example, in the USA, Kasper, Giovannini, and Hoffman (2000) found that individuals gaining insurance will increase healthcare access. Unlike Kasper, Giovannini, and Hoffman (2000), Burstin, Swartz, O'Neil, Orav, and Brennan (1998) found that individuals who lost or changed insurance were more likely to delay seeking medical care up to four months after visiting emergency care compared to those individuals with insurance status that did not change. Preux (2011) discusses how anticipated changes in future insurance affect an

[57] To be noted, , universal health care participation is interrelated with government control of tobacco consumption in some developing countries. For example, in Indonesia, the subsidized group is required to quit smoking to maintain their eligibility. This non-smoking household requirement usually applies at the regional level (since there are many rejections at the national level). However, this regulation also is known to be lacking in terms of monitoring and enforcement. https://health.detik.com/berita-detikhealth/d-4733471/bpjs-kesehatan-pertimbangkan-wacana-coret-peserta-pbi-yang-merokok and https://regional.kompas.com/read/2019/09/16/14352881/perokok-di-daerah-ini-akan-dikeluarkan-dari-penerima-bantuan-iuran-bpjs?page=all.

individual's lifestyle. Although there is no clear Medicare impact on smoking behavior and alcohol consumption for the group that already had insurance before (maintaining insurance) in that study, there is a reduction in physical activities for the group that gained insurance (previously not covered by insurance) (Preux, 2011). This result aligned with Dave and Kaestner (2009), which found that obtaining Medicare reduces prevention health care utilization and increases unhealthy behaviors among men above 65. In the case of children, some evidence suggests that new enrollment in health insurance programs reduces delayed care from 57 percent to 16 percent and increases physician visits from 59 percent to 64 percent (Lave, et al., 1998).

From the developing country perspective, Maia, Andrade, and Chen (2019) research the impact of potential insurance losses on individuals' health-seeking behavior in Brazil. Number of medical visits in the last five months of insurance loss increased by 17 percent, and diagnostic tests increased 22 percent (Maia, Andrade, & Chein, 2019). Furthermore, Erlangga, Ali, and Bloor (2019) discuss how Indonesia's JKN increased the demand for outpatient and inpatient curative care among the contributory group (non-subsidy). BPJS, the sole provider of JKN, data also shows that Indonesians utilize Puskesmas (Indonesian government clinic) more often than before, primarily for curative and rehabilitative care (BPJS Kesehatan, 2017). Moreover, Bhattacharya and Packalen (2012) identify that the ex-ante and ex-post effects lead to negative externalities. The ex-ante effect causes people to invest insufficiently in self-protection (e.g., lack of exercise and a healthy diet). In comparison, the ex-post effect causes people to consume health care resources at an inefficiently high level (e.g., high clinic utilization).

Few studies analyze insurance coverage changes due to data limitations. One of the benefits of dynamic panel data compared to cross-sectional data is that we can answer whether providing different insurance coverage can improve health or health access in the longer run

(Kasper, Giovannini, & Hoffman, 2000). This paper contributes to the literature by introducing an application for Indonesia based on this dynamic panel data and focusing on two groups: individuals gaining insurance and changing coverage from other types of insurance to universal health insurance[58]. I then compare the marginal change from the gaining insurance group to the marginal change from changing coverage group.

Other control explanatory variables in the following models explain the difference in income, household characteristics, individual attributes (e.g., education, household size, etc.), and residential location (related to the availability of health facilities). These variables will affect health-seeking and lifestyle behavior. Higher income could lead to better food and dietary options and access to better health facilities. Higher education also means higher health awareness, thus reflecting the individual or family's health-seeking behavior and their healthy lifestyle. Lastly, the availability or supply side of health facilities also matters. The supply side of health care will be affecting the ex-post effect of insurance ownership. A doctor or health clinic's availability will affect whether individuals conduct preventive action or utilize the health care facilities when they have insurance. Based on Mboi (2015), on average, Indonesia's ratio of health facilities to population is one of the lowest among countries[59].

This paper contributes to public policy discussions regarding health care in Indonesia by investigating the relationship between Indonesian health-seeking behavior and preventive and promotive health care. This is done by looking at the trends from the Indonesia Family Life

[58] All private firms are obliged to give their employees the universal health care. Small number of private firms does give another private market health insurance in the addition of the Universal Health Care (UHC) policy. There is also small number of individuals that purchase insurance from the private market in addition to their UHC policy. However, there is no data on how many individuals have double policies.

[59] Based on OECD data, Japan has the highest ratio of hospital beds per 1,000 population (13). Only India (0.5) and Mexico (1.0) have a lower ratio number than the Indonesian average. https://data.oecd.org/healthcare/hospital-beds.htm, accessed January 19, 2021.

Surveys (IFLS)[60] datasets. Secondly, the paper documents the extent of health behavior changes (relating to ex-post and ex-ante moral hazard theories as defined in the next section) related to insurance ownership in Indonesia using the same dataset. Both research questions are analyzed under the assumption of asymmetric information and decisions on insurance purchases in the insurance market.

The paper proceeds as follows. The second section reviews the literature on moral hazard and health insurance, empirical findings related to the topic, and theoretical prediction and model mechanism. The third section discusses data and econometrics methodology. The fourth section discusses the results from the model with an additional extended regression model. Lastly, sections five provide the final discussion, conclusions, and policy implication.

1.1. Indonesia History of Insurance

Table 11 and figure 6 summarize the history of public insurance in Indonesia to illustrate the extent of public insurance coverage and how insurance has gained popularity and acceptance in Indonesian society over time.

Table 11. Public Insurance Coverage in Indonesia Pre-Universal Health Care System

Primary Beneficiaries	Health Insurance	Pension
Civil Servants	ASKES[61] (Health Insurance)	TASPEN[62] (Retirement Saving)
Military	ASKES (Health Insurance)	ASABRI[63] (Insurance for Indonesia Military Corps)

[60] IFLS is published and maintained by RAND.
[61] Askes stand for Asuransi Kesehatan or "Health Insurance" in literal English translation. While most Askes beneficiaries are civil servants or in the military, special Askes is also given to the poor household called Askeskin (Asuransi Kesehatan Keluarga Miskin or Insurance for Poor Household in English translation). Askes and Askeskin replaced by BPJS-Kesehatan (Social Security Administrator for Health) in the current system.
[62] Taspen stand for Tabungan Pensiun or "Retirement Saving" in literal English translation. Taspen is replaced by BPJS-Ketenagakerjaaan (Employee Social Security System) in the current system.
[63] Asabri stand for Asuransi Angkatan Bersenjata Republik Indonesia or "Insurance for Indonesia Military Corps" in literal English translation. Asabri replaced by BPJS-Kesehatan (Social Security Administrator for Health in the current system.

Primary Beneficiaries	Health Insurance	Pension
Formal Workers	JAMSOSTEK[64] (Employees Social Security System)	JAMSOSTEK (Employees Social Security System)
Informal Workers	[can buy] ASKES or JAMSOSTEK	[can buy] JAMSOSTEK

Source: (Pisani, Kok, & Nugroho, 2017)

All public health and worker insurance types were eventually centralized into two organizations: BPJS Kesehatan (Health BPJS - Social Security Administrator) and BPJS Ketenagakerjaan (Worker BPJS – Social Security Administrator). Pisani et al. (2017), also highlight the significant changes in the Indonesian health care system from independence to recent years that can be seen in the figure below.

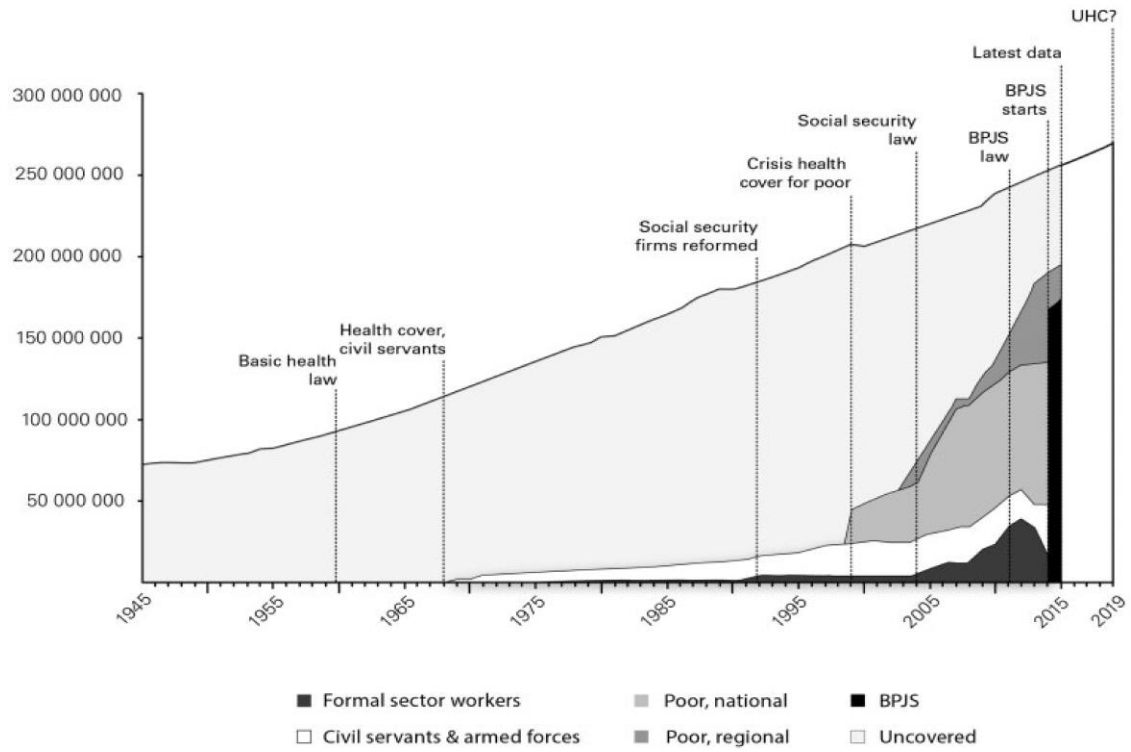

Figure 6. Indonesia Public Insurance Coverage 1945 - 2019

Source: (Pisani, Kok, & Nugroho, 2017)

[64] Jamsostek stand for Jaminan Sosial Tenaga Kerja or Employees Social Security System in English. Transformed into BPJS Ketenagakerjaan (Employees Social Security System) for current system.

Indonesia had multiple types of insurance depending on the beneficiary's work status until 2013. To centralize and increase insurance coverage, Indonesia adopted a universal health care policy in 2014, marked by the enactment of "Jaminan Kesehatan Nasional" (JKN). JKN is a government response to the fact that 22.5 percent of Indonesia's population was still uninsured, and only 40 percent of the poor were insured (Mahendradhata, et al., 2017). JKN gave birth to an operator firm called the *Badan Penyelenggara Jaminan Sosial* (BPJS - Social Security Administrator) with two foci: health and employment. The main task of BPJS-Kesehatan (Social Security Administrator for Health) is providing insurance coverage as the country's biggest single-payer of social health insurance. Until March 31st, 2020, BPJS-Kesehatan covered around 222 million individuals or around 82.4 percent of the Indonesian people.

There are no publicly available data to measure preventive and promotive care utilization in Indonesia, either within BPJS-Kesehatan or other private insurance. However, we can estimate this through the financial report of the BPJS-Kesehatan. BPJS-Kesehatan, as the biggest insurance provider in Indonesia at the moment, has been generating losses in recent years. BPJS-Kesehatan is running on a loss of 3.3 trillion rupiahs in 2014, 5.7 trillion in 2015, 9.7 trillion in 2016, 12 trillion in 2017, and 16.5 trillion in 2018. Most BPJS expense comes from insurance claims on curative and rehabilitative health care, rather than preventive and promotive health care (BPJS Kesehatan, 2017). This suggests preventive and promotive health care underutilize among BPJS members, although BPJS does have preventive and promotive health care such as health screening for diabetes, vaccination (BCG, tetanus, DPT-HB, polio, and measles), cervical cancer screening, education for a healthy lifestyle, and family planning, among other services. Unfortunately, not all BPJS members utilize these facilities.

Related to the discussion of the inadequate supply of health facilities in the previous section, most insurance providers (including BPJS) do not seem to encourage their members to utilize these promotive and preventive care facilities (Widjaja, 2014). Consistent with this, the Government of Indonesia still focuses on a curative approach instead of prevention. It can be seen through inadequate medical facilities for preventive health care. Only around 67 percent of community health centers (Puskesmas) passed the readiness test compared to 82 percent of hospitals (Agustina, et al., 2018).

Table 12. Variation in Coverage of Health Services in Indonesia (2013)

Aspect of Services	Highest Provincial Ratio (Best Coverage)	Lowest Provincial Ratio	Indonesian Average
Ratio of hospital beds/1,000 population	2.9	0.6	1.1
Ratio of general practitioners/100,000 population	155.5	8.8	38.1
The ratio of public health centers per village/urban neighborhood	8.3	0.6	3.4
Number of general practitioners per public health center	4.6	0.4	1.8

Source: (Mboi, 2015)

As table 12 shows, the ratio of health services in Indonesia varies between provinces. Most places have low health services ratios. Only big cities in Java and Bali Island, like Jakarta, Surabaya, Bali Island, fall in the higher end of the health service ratio distribution. The introduction of universal health care is expected not equal for all people therefore due to the lack of services and facilities in Indonesia.

2. Literature Review and Theoretical Considerations

2.1. Moral Hazard and Health Insurance

There are two types of possible behavioral changes regarding health insurance: ex-ante and ex-post moral hazard (Zweifel & Manning, 2000). In the case of ex-ante moral hazard,

health insurance may encourage individuals to exert less (unobserved) effort to maintain their well-being since health insurance will eventually cover the financial costs (Arrow, 1963). Consistent with this, Einav and Finkelstein (2018) show that individuals may have less incentive to maintain well-being and that this translates into exercising less, eating more junk food, and smoking more in the presence of insurance coverage.

Einav and Finkelstein (2018) summarize that ex-post moral hazard is the receptiveness of individual demand for healthcare related to the price they have to pay, conditional on underlying well-being. Furthermore, Einav and Finkelstein (2018) explain that moral hazard in health insurance is related to the "action" (such as healthcare utilization) and is an implication of asymmetric information ("hidden information") that individuals do and keep. In summary, moral hazard (ex-post) is how individuals who demand healthcare act in response to their out-of-pocket costs (Einav & Finkelstein, 2018).

Both ex-ante and ex-post moral hazards, defined in these ways, are associated with negative externalities (Bhattacharya & Packalen, 2012). For example, in the ex-ante moral hazard situation, health insurance ownership would increase the likelihood of risky behaviors occurring due to reduced personal costs (Jerant, Fiscella, Tancredi, & Peters, 2013). While, in the ex-post moral hazard situation, health insurance ownership could increase the utilization of medical facilities or resources, which leads to inefficiency.

The earliest model predicting this moral hazard and health insurance is Ehrlich and Becker (1972), that modeled the relationship between health insurance ownership and preventive medical activities. There are two possible outcomes that this model predicts. First, health insurance ownership makes individuals less concerned about their health, thus reducing the demand for preventive health facilities and increasing risky lifestyle behavior. Second, health

insurance ownership makes individuals more concerned with their health, thus increasing their demand for health care resources and facilities and maintaining a healthy lifestyle. Furthermore, individuals could consider that improved health care access can raise the marginal productivity of their own health behavior and decide to complement health care with additional effort in healthier behaviors, or individuals could consider that health care access can lessen the cost of unhealthy behaviors, thus reduce their effort in healthier lifestyles (Fichera, Gray, & Sutton, 2016). Connecting with the ex-ante and ex-post moral hazard, when individuals become less concerned about their health due to health insurance, they will become less likely to exercise, more likely to have a bad diet, and may increase smoking consumption[65]. It also must be noted that an individual can become more concerned about their health due to health insurance ownership. In terms of ex-ante, this means high-intensity exercise, maintaining a good diet, and less smoking.

Bhattacharya and Packalen (2012) also discuss *other* ex-ante moral hazards that run in the opposite direction. In their article, Bhattacharya and Packalen (2012) argue that *other* ex-ante moral hazards in the form of people spending less than is efficient on self-protection. Another ex-ante moral hazard mechanism is through the increasing demand for treatment of chronic diseases, which directly benefited the innovator. Increasing reward thus leads to accelerated innovation of those treatments. Since the individual does not take positive externalities of this innovation growth when deciding the preventive activities (exercises and a healthy diet) level, they invest too much in preventive action (Bhattacharya & Packalen, 2012)[66].

[65] All ex-ante moral hazard.
[66] Bhattacharya and Packalen (2012) argue that in the absence of policy and intervention individuals overestimate their health due to high level of preventive activities.

Several studies discuss the relationship between healthcare and health/lifestyle behaviors, whether it is a substitute or complement. As an example, Fichera, Gray, and Sutton (2016) used the policy implementation of the Quality and Outcomes Framework (QOF) in the United Kingdom in 2014 as a natural experiment. They argue that with the implementation of the policy, healthcare supply (e.g., doctors' availability) will be increasing. They found that the implementation of QOF in 2014 is linked with a decrease of Body Mass Index (BMI), cigarette smoking, and frequency of alcohol consumption (Fichera, Gray, & Sutton, 2016). However, among those three lifestyle variables, only cigarette is statistically significant, with most individuals reduces the consumption of 0.7 cigarettes per person per day (equal to 18 percent from the mean) after the implementation of the policy. Another research by Fichera et al. (2018) found that, with a sample of around 2000 cardiovascular disease patients aged over 50 in England, patient efforts (through lifestyle choices such as alcohol and cigarette consumption) complemented the doctor's effort. The research suggests that alcohol and cigarette consumption decrease as the doctor's effort increases.

Furthermore, in the ex-post moral hazard, we can expect individuals to be more concerned about their health. This is because of insurance ownerships and coverage, assume to be come along with higher supply/access to services and infrastructure. For example, with insurance, individuals might afford clinics, hospitals, and regular check-ups after the insurance ownership. This will lead to the increasing demand for health care services and facilities with the insurance coverage. However, it is also essential and need to be noted that the increasing demand for health care is not always terrible. For example, increased preventive health care such as general check-ups are a "good" hazard so that long-term health costs will be smaller than without routine check-ups. Another perspective is that switching from traditional curative health services

to modern health services certainly has some benefits that should be weighed versus provision costs.

2.2. Empirical Findings on Moral Hazard and Health Insurance

Many studies examine the relationship between moral hazard and health insurance. For example, the US Panel Study of Income Dynamics between 1999 and 2003 found that health insurance leads to increases in "bad" lifestyles such as heavy smoking, lack of exercise, and obesity (Stanciole, 2008). However, the same study found that the propensity for heavy drinking was decreasing with the existence of health insurance coverage. Using the US Medical Expenditure Surveys from 2000 to 2009, another study found there is an association between having (losing) insurance is the increasing (decreasing) preventive care[67] (Jerant, Fiscella, Tancredi, & Peters, 2013). However, in the same study, the authors did not find that insurance ownership change creates significant changes in health behaviors.

In the developing countries context, asymmetric information in health insurance is a common issue, and most insurance is usually provided exogenously through the employer[68] or government-provided system. Thus, insurance ownership can lead to different results than in developed countries. In Ghana, utilizing 400-panel households, a study found that enrollment in the National Health Insurance Scheme (NHIS) negatively affected the ownership of Malaria prevention items such as insecticide-treated bed nets (Yilma, van Kempen, & de Hoop, 2012). In Iran, a study also found the adverse selection and moral hazard problems with health insurance, whether employer-provided insurance, personal insurance bought from the market, or self-

[67] In this article, preventive actions include influenza vaccination, colorectal cancer screening, mammography, and Papanicolaou and prostate-specific antigen testing.
[68] Employer provided insurance in Indonesia mostly like other countries. However, it is also common in Indonesia that firm or government organization offer health coverage through a free on-site health clinic, access to an off-site clinic with an approval from in-site doctor, and coverage through a company's own insurance and hospital (e.g., Toyota Astra companies with sub-company Astra Garda Medika).

employed insurance (Haddad & Anbaji, 2010). In addition, a direct impact of health insurance on cigarette consumption was found in China, where the new cooperative medical scheme, which provides affordable care, reduced cigarette consumption by nine percent (Yu & Zhu, 2018).

In Thailand, the universal health care program successfully increased outpatient demand for health care, particularly the demand from the elderly and the poor. However, outpatient demand for health care only dramatically increased during the first year of the program and faded away quickly in subsequent years (Panpiemras, Puttitanun, Samphantharak, & Thampanishvong, 2011). In Indonesia, a recent and early study by the Indonesia Universal Health Insurance found that the JKN program increased the probability of individuals seeking outpatient and inpatient care (curative care). The impact has a higher degree of influence among the contributory group (non-subsidy group) (Erlangga, Ali, & Bloor, 2019).

2.3. Theoretical Prediction and Model Mechanism

Based on the literature and figure 5 presented in the earlier section, the theoretical mechanisms that we are envisioned in this study can be seen in the table 13.

Table 13. Theoretical Predictions for Ex Ante and Ex Post Moral Hazard Indicators

Group	Variables	Prediction	Explanation
Ex Ante	Exercise	Gaining: Less	• The potential to get insured regardless of the status would reduce the incentive to make preventive efforts (Zweifel & Manning, 2000) (Ehrlich & Becker, 1972). Putra (2020) finds that Indonesian universal health care (JKN) reduces physical activity by 2.7 percent. De Preux (2011) finds the previously uninsured reduce physical activity just before receiving Medicare.
		Losing: Less or no change	• If individuals own more comprehensive insurance coverage in the base year, they should not change any exercise behavior. If an individual got less comprehensive coverage in the previous insurance, the expectation should be similar to the gaining group. Dave and Kaestner (2008) found changing to Medicare reduces prevention (9.1 percent probability

Group	Variables	Prediction	Explanation
			of engaging in vigorous physical activity) among elderly men (age 65 and above).
	Smoking Behavior	Gaining: More, but less for subsidized groups living in strict municipal rules	• It could be that some people smoke more due to there being no exclusion in the insurance for smoking. Putra (2020) finds that Indonesia's universal health care (JKN) positively affects smoking spending. De Preux (2011) finds no apparent effect of Medicare's recipient or its potential recipient on alcohol consumption or smoking behavior. • For subsidized groups: Some municipal governments apply strict rules for the subsidized group (they'll be expulsed from the program if caught smoking). Yu and Zhu (2018) found that cigarette consumption was reduced by 9 percent (a combination of a new coop medical scheme and government regulation forbidding low-income households from smoking).
		Losing: Could be more or less or no change	• Depend on the previous insurance. Some corporations conduct yearly health checks, which increase individuals' incentive to smoke. Thus, these individuals would potentially increase smoking due to switching to UHC. Dave and Kaestner (2008) found changing to Medicare increases unhealthy behavior (cigarettes and alcohol consumption) among elderly men (age 65 and above).
	Dietary Habit	Gaining: Healthier	• Because of insurance coverage and some free counseling education, the free budget would improve the gaining group's dietary lifestyle (they can purchase better quality and more variety food).
		Losing: No change	• There is no change in the budget for losing groups and no extra health care access. The prediction is no change.
Ex Post	Outpatient Visit	Gaining: More visit	• The change in access to health care will increase the outpatient visit for the gaining group. Erlangga, Ali, and Bloor (2019) discuss how Indonesia's universal health insurance (JKN) increases the demand for outpatient and inpatient curative care among the contributory group (non-subsidy).
		Losing: More than come back to normal or less than before	• Maia, Andrade, and Chein's (2019) results show an increase of up to 17 percent in medical visits and 22 percent in diagnostic tests due to the loss of health insurance (switching from old coverage to universal ones). Medical visits start to increase five months before the individual leaves the health insurance pool, reaching their peak two months before exit. In

Group	Variables	Prediction	Explanation
			general, the final output of the losing group will be fewer outpatient visits.
	Health Screening	Gaining: More	• The change in access to health care will increase the health screening for gaining group. (Would be similar to an outpatient visit)
		Losing Could be more or less or no change	• The impact depends on previous insurance coverage and access. (Would be similar to an outpatient visit)
	Sick Days	Gaining: No prediction Changing: No prediction	• Sick days are interrelated with other output (outpatient care and preventive effort – dietary, smoking behavior, vaccination, health screening, exercise etc.)

Source: author

Table 13 summarizes predictions following the literature review of the effect of insurance ownership on lifestyle and health-seeking behavior. Variables of interest are divided into two groups: ex-ante and ex-post. Ex-ante includes indicators of lifestyle behaviors such as exercising, smoking, and dietary habits. Ex-post includes primarily health-seeking behavior indicators such as outpatient visits, health screenings (general check-ups), and the number of sick days.

3. Data and Methodology

We investigate the association between insurance ownership and five behavioral changes: smoking behavior, outpatient & general check-up as health seeking behavior, physical activities/working out, dietary habits, and number of sick days. Depending on the structure of these behavior variables or the dependent variables, we use two main modeling frameworks: 1) multivariate probit when the dependent variable is smoking behavior, outpatient health seeking behavior, or physical activities, and 2) linear regression when the dependent variable is dietary habits or number of sick days.

As an extension to the above modeling frameworks, depending on the data structure of individuals' insurance coverage, we specify panel and pooled cross-sectional multivariate probit

and linear regression models. More specifically,in the panel models, the insurance coverage is represented by a dummy variable and in the cross-sectional models, insurance coverage over time is represented by 3 insurance categories: the "gainer" group of individuals who did not have insurance in the base year but did have insurance in the end year; the "loser" group of individuals that lost insurance coverage in the survey end year; and the "stayer" group of individuals that maintained insurance coverage in both years. Based on the IFLS wave 4 and 5 datasets, 31.73 percent of individuals belong in the gainer group, 6.97 percent in the loser group, and 19.32 percent in the stayer group. Approximately 42 percent of individuals did not have insurance coverage for both years.

3.1. Probit Model

We adapt the empirical model proposed by Stanciole (2008) for the empirical specification. The latent variable model we use can be expressed as,

$$\Pr(Y_i = h \mid X_{1i,} \dots\dots, X_{ki}) = \mathrm{p}_{i,h} \;\; for\; i = 1, \dots., n \text{ individuals} \qquad \text{(Eq. 1)}$$

$$\begin{aligned} Y_i^{1*} &= c^1 + \sum_{k=1}^{K} \beta^{1k} X_i^k + \varepsilon_i^1 \\ Y_i^{2*} &= c^2 + \sum_{k=1}^{K} \beta^{2k} X_i^k + \varepsilon_i^2 \\ &\vdots \\ Y_i^{M*} &= c^m + \sum_{k=1}^{K} \beta^{mk} X_i^k + \varepsilon_i^m \end{aligned} \qquad \text{(Eq. 2)}$$

Where $\epsilon \sim N(0, \Sigma)$

$$Y_i^m = \begin{cases} 1\ if\ Y_i^{1*} > Y_i^{2*}, \dots\dots, Y_i^{M*} \\ 2\ if\ Y_i^{2*} > Y_i^{1*}, Y_i^{3*} \dots\dots, Y_i^{M*} \\ \dots \\ m \qquad otherwise \end{cases} \qquad \text{(Eq. 3)}$$

The model in equation (2) is estimated by multivariate probit framework where Y_i is the variable of interest representing i^{th} individual's (M number of) behavioral choices - smoking behavior, outpatient health seeking behavior, physical activities, and dietary habits. X_1 is insurance ownership and X_2 to X_k are other explanatory variables. β and c are parameters and constants to be estimated, respectively, and ε represents unobserved heterogeneity.

Individuals' exogenous or endogenous insurance purchase decisions are represented by equation (1). Assuming that an individual's decision to purchase insurance is exogenous, lead us not to estiamte equation (1). Further, by assuming exogenous decision-making on the insurance purchase in our first version of the model, we do not need to worry about endogeneity between explanatory variables explaining the decision on insurance purchase and lifestyle choice as the dependent variable in equation (2).

Similar to Tavares (2014), equation (3) translates into an empirical model (written linearly) as equation (4) below:

$$Exercise = c_1 + \beta_1 InsuranceOwn + \beta_1 x_D + \varepsilon_1$$

$$Smoking = c_2 + \beta_2 InsuranceOwn + \beta_2 x_D + \varepsilon_2$$

$$Outpatient = c_3 + \beta_3 InsuranceOwn + \beta_3 x_D + \varepsilon_3 \qquad \text{(Eq. 4)}$$

$$General\ Check\ up = c_4 + \beta_4 InsuranceOwn + \beta_4 x_D + \varepsilon_4$$

Where c's are the constants, x_D is individual/household characteristics, x_s is health facilities (supply side) such as Puskesmas availability, and ε's are the residuals/error terms. The

main dependent is *InsuranceOwn* is a dummy variable whether an individual owns insurance, *smoking* is a dummy variable whether individual smoking, *outpatient* is a dummy variable whether an individual utilizing an outpatient health facility, and *diet* is dummy variable whether individual is conducting a proper diet or not. All models will be studied in a pooled cross-section data structure. Furthermore, for this empirical specification, the covariates serve as an explanatory variable followed from Stanciole (2008), Aday and Andersen (1974)[69], Jerant et al. (2013), and Tavares (2014).

3.2. Linear Model

Due to the nature of the data and the dependent variable types, some specifications are estimated using a linear model: diet as a dependent variable (food share) and the number of sick days. Both variables are continuous variables that could not be changed into categorical variable like other dependent variables. Panel data (insurance dummy as the variable of interest) estimates the change of *Y* regarding insurance ownership between two years. The pooled cross-section model is used instead to estimate the value of Y in respect to insurance ownership group (no insurance, gainer – gain insurance in the end year, loser – losing insurance in the end year, and stayer – in insurance coverage for both years). Following equation 4, in general, the linear model is as follows.

$$Diet = c_5 + \beta_5 InsuranceOwn + \beta_5 x_D + \varepsilon_5$$

$$Sick\ Days = c_6 + \beta_6 InsuranceOwn + \beta_6 x_D + \varepsilon_6 \qquad \text{(Eq. 5)}$$

Where Y is food share (protein and vegetable purchase compared to total food expenditures) and sick days (number of sick days and sick days that makes an individual cannot

[69] Aday & Andersen (1974) has set of covariates determining individual's access to medical care (health seeking behavior) which informs the variable selection in this article.

do any primary activity). All the independent variables are similar to the previous model. These include age, education, household expenditure, and other variables.)

3.3. Variables from Indonesia Family Life Survey (IFLS)

The list of variables used are derived from IFLS wave 4 and 5. The list source of variables can be seen in the table below.

Table 14. List of Variables (IFLS)

Variables Roles	Variables	Detail	Source
Dependent	Smoking Behavior (~)	Cigarette consumption – Monetary value	IFLS – Consumption Section (BK1KS)
		# of Cigarette sticks consumption per day	IFLS – Tobacco Consumption Section (B3BKM)
Dependent	Outpatient Health Seeking Behavior (+)	# of Sick Days (Inpatient/Outpatient)	IFLS – Health Section (BK3BRN/RJ)
		Whether an individual doing general health screening in the past 5 year	IFLS – Health Section (BK3BRJ)
		Whether and individual getting outpatient service for curative treatment	IFLS – Health Section (BK3BRJ)
Dependent	Dietary Habits (~)	The ratio of protein consumption over other food	IFLS – Consumption Section (BK1KS)
		The ratio of vegetables and fruits consumption over other food	IFLS – Consumption Section (BK1KS)
Dependent	Physical Activities (-)	Whether an individual doing moderate physical activities (exercise) in the past 7 days.	IFLS – Health Condition Section (BK3BKK)
Independent (Main Interest)	Insurance Ownership	Whether an individual has insurance	IFLS – Health Section (B3KBAK)
		Whether an individual has Public Vs. Private insurance	IFLS – Health Section (BK3BAK)

Variables Roles	Variables	Detail	Source
Independent	Healthcare Facilities	Number of Puskesmas available and open in the community	IFLS – Community Section (BK1A1)
Independent	Household Characteristics	# of Family member	IFLS – Household Rooster Section (BK1AR1)
		Household economic status (household expenditure)	IFLS – Consumption Section (BK1KS)
		Highest education or mean of education in the household (and any other related characteristics)	IFLS – Household Rooster Section (BK1AR1)

Source: author

4. Results

Results are divided into two main parts: the results from the panel model—where the main independent variable of interest is a dummy variable of insurance ownership. The second part of this section shows the result from the pooled cross-section model—with the main interest independent variable being a categorical variable of insurance status (never having insurance, losing insurance, gaining insurance, and staying in insurance coverage for both years).

Each dependent variable will be estimated using a panel and cross-section perspective. In the panel data type primary interest variable, insurance ownership, is a dummy variable in the base and end year. The change of coverage (gaining, losing, or staying) is captured indirectly in the regression. In the cross-section, the primary interest variable, insurance ownership, is a categorical variable in the base and end year. The change of coverage gaining, losing, or staying is captured directly in each category.

4.1. Ex-Ante Results

This section will present a summary of Ex-Ante moral hazard on insurance coverage. Full regression results can be seen in the appendix.

Table 15. Ex-Ante Results from the Panel and Cross-Section Model

Variable of Interest	Insurance Dummy (Panel)	Insurance Category (=0 no insurance, =1 losing insurance, =2 gain insurance, 3=stay in the insurance coverage) (Cross-Section)
Workout Intensity	An individual with insurance coverage (for both or one of the periods) has less workout intensity than an individual without insurance. The probability of an individual with insurance having less workout ranges from 1.4 – 5 percent. Full results can be found in the appendix table 39 and 40.	Individuals with insurance coverage have less workout intensity than those without insurance. An individual with insurance coverage (in both or any year) has 0.9 to 1.8 percent, on average, between three groups, lower probability of having less workout intensity. Full results can be found in the appendix table 41.
Smoking Behavior	There is no significant effect on insurance coverage with smoking behavior. There is an issue to the model convergence.	Very limited result. Only individuals with insurance coverage (stayer group) have less smoking intensity compared to individuals without insurance (0.05% in marginal effect).
Dietary Habits	Individual with insurance coverage (for both or one of the periods) has higher share consumption of protein & fruits+vegetables compared to individual with no insurance (0.02% - 1.3% for protein; 0.07 % for vegetables; 0.05% - 2% for both). Full results can be found in the appendix table 42, 43, and 44.	Individuals with insurance coverage (all groups) have lower share consumption of protein & fruits+vegetables compared to individuals without insurance. The highest magnitude is the gainer group (1 – 1.3% less share protein and vegetables-fruits consumption with no insurance group. Specification with interaction variables shows that only gainer group affected by the insurance coverage[70]. Full results can be found in the appendix table 45, 46, and 47.

Source: Author

4.2. Ex-Post Results

This section will present a summary of Ex-Post moral hazard on insurance coverage. Full regression results can be seen in the appendix.

[70] Due to the limited sample size of private insurance, the variable of public insurance showing limited results.

Table 16. Summary Ex-Post Results from the Panel and Cross-Section Model

Variable of Interest	Insurance Dummy (Panel)	Insurance Category (=0 no insurance, =1 losing insurance, =2 gain insurance, 3=stay in the insurance coverage) (Cross-Section)
Outpatient	An individual with insurance coverage (for both or one of the periods) has a higher marginal probability of utilizing an outpatient facility (3 – 3.6%). Full results can be found in the appendix table 52 and 53.	Individuals with insurance coverage are more likely to utilize outpatient facilities than those with no insurance. The stayer group is more likely to utilize outpatient facilities (2.8-5.8%). However, there is no significant effect found for the loser group. A higher magnitude was found in the stayer group, showing that outpatient utilization is more about familiarity than "access abuse". Full results can be found in the appendix table 56.
General Check-up	Individuals with insurance coverage (for both or one of the periods) have a higher probability of doing health screening/general check-ups (4.7 – 6.1%) compared to individuals without insurance. Full results can be found in the appendix table 54 and 55.	An individual with insurance has a higher probability of doing a general check-up compared to the group with no insurance. However, there is no significant effect found for the loser group. The stayer group has a higher probability of utilizing outpatient (5.8 - 11%) compared to gainer group (2-7.7%). Full results can be found in the appendix table 57.
Sick Days	Although the sign is positive, there is no consistent significant effect of insurance ownership on the number of sick days and days that make individuals unable to do regular activities (sick primary). Full results can be found in the appendix table 48 and 49.	The insurance gainer group has a higher number of sick days and days that make individuals unable to do regular activities (sick primary) compared to people with no insurance (9-10 days for overall sick days & 33 days for sick primary). Full results can be found in the appendix table 50 and 51.

Source: Author

5. Conclusion and Implications

Based on the review of the literature and the regression analysis in this paper, ex-ante moral hazard associated with insurance ownership has heterogeneous effects in Indonesia. On one side, it affects negatively by making people work out less. On the other side, albeit with limited results, it affects positively by making people smoke less[71]. The result results are mixed in terms of dietary choices (protein, fruits, and vegetables) between the panel and cross-section model, making it difficult to withdraw a solid conclusion. However, insurance coverage overall has a positive effect on consumption. In the separate group analysis, the gainer group (especially the one with public insurance) has less consumption reduction than the loser group or no-insurance group. This leads to the question of whether the mandatory universal health care in 2014 makes middle-income families (a non-subsidized group) allocate money to pay the insurance premium at the expense of consumption. If this is the case, careful analysis of the premium setup is warranted.

BPJS used article 34, president decree number 64, the year 2020[72] , which separates the insurance premium into three class categories when this research was written[73]. As an example, assume that there are four household members, and the family owns 2nd class of insurance. Therefore, this family needs to pay 400,000 Indonesian Rupiah per month. The minimum income or wage per month is around 2.6 million Indonesian Rupiah on the national average[74]. Thus, each month, this family needs to allocate 15-16 percent of their income to pay the insurance premium.

[71] The effect is clearer for the stayer and gainer groups (smoking less and working out less compared to no-insurance and loser groups).
[72] Pasal 34 Perpres Nomor 64 Tahun 2020. https://mediaindonesia.com/humaniora/435234/bpjs-kesehatan-iuran-premi-tetap-belum-ada-relaksasi. Accessed November 20th, 2021.
[73] 3rd class Rp35000 ($2.5), 2nd class Rp100000 ($7), and 1st class Rp150000 ($10).
[74] https://gajimu.com/gaji/gaji-minimum/daftar-upah-minimum-provinsi-ump-2020. Accessed November 20th, 2021.

On the other hand, with a minimum standard living of $1.90/day[75], this family need to spend 3.4 million Indonesian Rupiah per month on living cost. In the absence of price adjustments, partial subsidies based on income for the near-poor (e.g., the bottom 30 percent group) could be considered.

Furthermore, while it is true that having insurance increase the utilization of outpatient (mentioned as a source of income loss), the probability of individual getting preventive care (general check-ups) also is increasing which potentially lowers the higher curative cost in the future. It is also worth noting that the higher group with outpatient utilization is the stayer group. Thus, the high number of utilization can be viewed as being more about familiarity rather than abuse by the gainer group. It is also shown that public insurance has a negative effect on check-ups. This could show a "crowding out effect" on health services due to universal health care without a proper "gatekeeper" (e.g., primary care provider system) filtering out the patient. In the current situation, the established primary care is not working as expected, and many insurance beneficiaries still bypass the system by going directly to hospitals or specialists.

We also see mixed results on the sick days variable, so we could not draw a concrete conclusion. Only the gainer group has a significant positive increase in sick days. The gainer results could also mean two things. First, this could indicate a moral hazard due to people being more comfortable getting sick days/primary because insurance will cover them. Alternatively, it could be because people take less care of their health/hygiene because insurance will cover them when they get sick.

[75] World Bank living cost per day.

The primary policy purpose of this research is to offer input for policymakers toward examining alternatives to tackle the remaining insurance and health system problems in Indonesia. Until now, the government has addressed the health issue chiefly through policy implementation through the pricing and market. Although, there is another option by creating a good health culture or creating an incentive for individuals to maintain a good healthy life. When this dissertation was written, the GoI and BPJS-Kesehatan implemented a new integrated class of health services and differentiated the services into subsidized and non-subsidized groups[76]. They are hoping that deficit can be reduced with this scenario by pushing the non-subsidized group to purchase additional private insurance, thus lowering the utilization of health services through BPJS[77]. However, this policy could backfire. As our results show, the utilization rate could increase despite this policy. Without an increased supply of health facilities, the subsidized group could face "bottlenecking" of health services, especially in the majority of poor areas. Creating a bad experience with insurance and the health system can lead to the reluctance of individuals and households to have insurance in general. Furthermore, this policy could lead to service discrimination between the have and have not, which in turn could further reduce confidence in having insurance in the future.

The Government of Indonesia and BPJS should not address the insurance issue in Indonesia by only utilizing pricing strategies. From this research, the answer to minimizing cost and maximizing people's health may relate to reinforcing positive behavior and creating incentives to promote good and healthy habits. Therefore, the central policy should strengthen

[76] https://www.cnbcindonesia.com/market/20210916135946-17-276827/penyatuan-kelas-bpjs-kesehatan-ini-update-terbarunya. Accessed 2/22/2022.

[77] Non-class services from BPJS means that BPJS only cover the lowest class for hospitalization. As an example, lowest class hospitalization commonly is a share room with 3-5 other patients. People with stable employment or at least in the middle class usually try to avoid this situation and pick higher class such share room with max 2 people or get hospital room by themselves.

preventive and promotive care within the healthcare system and providers. For example, the government can establish a primary care provider system and offer a routine free general health check.

Another example is that individuals have to do rhythm gymnastics in their office or school every Friday during the new order government. This simple policy can be implemented and revived as mandatory through BPJS ownership to promote a healthy lifestyle. GoI needs to think out of the box to tackle the insurance issue, depend on pricing strategies, and hope the market can fix itself. As the research and history explain, it may not happen in the private health industry alone.

Chapter 3 - Spending More on the Girls? Post-Conflict Education Discrimination? Evidence from Timor-Leste

1. Introduction

Recent work has revisited the question of gender discrimination favoring boys in education expenditures in the developing world (e.g., Khanal (2018) for the case of Nepal; Curran, Chung, Cadge, and Varangrat (2003) for Thailand; and Hannum, Kong, and Zhang (2009) for China). The presence of these gendered patterns varies widely with institutional features of economies, cultural contexts, and political histories. In this article, we consider the case of Timor-Leste, a country with a history of conflicts and civil war which dramatically impacted the roles of women. Utsumi (2021) found that the major conflicts that occurred during, before, and after the Indonesian occupation period have had a short-term and long-term impact on education in Timor-Leste. Children who were born within the 10-year period of conflict of 1975 were found to have lower completion rates in secondary education than in primary education in the long run.

Furthermore, Justino, Leone, and Salardi (2011) find an adverse impact of the Indonesia 25-year long occupation conflict and violence exposure on school-age boys' primary school completion. The effect is much more severe for boys who are attending the last three grades of primary school. This result shows a substantial loss of human capital among young males in Timor Leste, thus forcing households to face an investment trade-off between education and economic survival. We then compare empirical evidence from Timor-Leste to the differing experience of its neighbor Indonesia while considering political and historical linkages across these countries.

1.2. Timor-Leste and Status of Women and Education

Timor-Leste or East Timor (officially the Democratic Republic of Timor-Leste) is a small island country in Southeast Asia with a population of 1.3 million people that shares a border with Indonesia[78]. Violence, conflicts, and war characterize the history of Timor-Leste starting from 1797 during the Portuguese occupation (Frédéric, 2011). After decades of colonization by Portugal, Timor-Leste declared independence on November 28, 1975[79]. However, in a few days later, Indonesia occupied the area and incorporated Timor-Leste as its youngest province.

In 1998, Indonesia suffered a financial crisis followed by stepping down of their president, General Soeharto's[80]. In 1999, the Indonesian government granted Timor-Leste the opportunity to hold a referendum for independence[81]. With the supervision of the United Nations, Timor-Leste became an independent country on August 30, 1999 and because of that around 300,000 people had to move into West Timor (Indonesian side) as refugees. Timor-Leste was internationally recognized as a new state in May 2002. However, civil wars and rebel attacks still continued from 2002 until 2015[82].

To understand the role of women in Timor-Leste within this context, we distinguish between the pre-conflict and conflict periods[83]. In the pre-conflict period, as a patriarchal society, cultural and religious values reinforced male authority while women had restricted choices and

[78] https://data.worldbank.org/country/Timor-Leste accessed on March 8th, 2019
[79] https://www.cia.gov/library/publications/the-world-factbook/geos/tt.html accessed on March 8th, 2019
[80] General Soeharto ruled from 1966 to 1998. Although his government was associated with bettering the Indonesian economic situation through capitalism and foreign direct investment in early years, the later years of his rule were characterized by dictatorship.
[81] B.J. Habibie, the last vice president of General Soeharto, granted this referendum despite it being strongly opposed by many politicians and military.
[82] *Ibid (4)*
[83] (Chaney, 2016) and (Hill, 2001) define 2001 is post-conflict period for Timor-Leste. Conflict after 2001 is considered not major, although there is an attempt at a coup in 2006.

options. Polygamy, bride price, and male-only property rights were common practice, highlighting gender differences and male dominance in Timorese societal norms. During the conflict and struggle for independence however, women took an increasingly significant role in society by transporting arms and supplies, establishing clinics, and spreading news about injustice in Timor-Leste internationally (Hall, 2009).

Recent school enrollment in Timor-Leste is high for both male and female students with around 94 percent of school-age girls and 92 percent of school-age boys enrolled in primary school (Asian Development Bank, 2014). At the same time though, high dropout rates and class repetitions signal educational sector issues. Sexual harassment, violence at school, and low transition to tertiary or higher education highlight difficulties faced by female students in this context. One study finds that one-third of female students in grades 4 to 6 were afraid of going to and from school because of concerns about harassment and violence (Creative Associates International, 2013). Gender gaps in adult literacy may also reflect these problems[84]. The level of literacy for females is 52.5 percent but 63.1 percent for males (Asian Development Bank, 2014). This literacy gap alongside remaining patriarchal cultural norms also may relate to women's limited job market opportunities. Data shows that only 27 percent of women are in the labor force compared to 56 percent of men. Furthermore, 87 and 54 percent of rural and urban women respectively experience income instability (Asian Development Bank, 2014).

Besides violence and sexual harassment concerns, family perspectives and decisions regarding household-level investments in education also may relate to education investment decisions. We evaluate for differential household spending on the educations of male and female children in Timor-Leste during the pre-and post-conflict periods in this paper.

[84] defined for individuals 15 years old or more

1.3. Indonesia and Status of Women and Education

As the most populous Muslim nation globally, Islam and Indonesia can be compared to two sides of the same coin in terms of female roles in society. Some researchers describe Indonesia as an egalitarian society, while others consider Indonesia patriarchal (Kevane & Levine, 2000). This heterogeneity regarding gender and gender attitudes in Indonesia interrelates with the number and characteristics of tribes and ethnicities residing in Indonesia. The dominant ethnicity, Javanese, promotes female economic freedom and equal bargaining strength within the household. However, inequities across genders are still remain in term of food and clothing provision with male household members often receiving the highest quality (Kevane & Levine, 2000).

Like the Javanese, the Bataknese ethnicity also has features of a patriarchal society. In their culture, inheritances remain on the male side of a family. However, the Batak people also promote investing in girls' education (Ihromi, 1994). One possible explanation is the practice of bride price since it may be increasing in education level (Ashraf, Bau, Nunn, & Voena, 2016).

Overall, Indonesia can be characterized as comparatively gender-neutral in terms of economics and politics (Kevane & Levine, 2000). Women have contributed to economic growth in the New Order Regime (1965-1997) despite societal norms, including in education, still favoring boys over girls in some cases (Kevane & Levine, 2000). Other research suggests that households with school-age girls decrease their mean education expenditure around 45 percent in the time of crisis (Cameron & Worswick, 2001) as Indonesian parents may protect their sons' school enrollment over that of their daughters in a time of crisis (Levine & Ames, 2003). Contextual differences suggest that the extent of gendered spending on education may vary between Timor-Leste and its neighbor of Indonesia, but also that spending on education by

gender is an empirical question in both countries given competing pressures within the countries themselves.

2. Literature Review and Theoretical Background

A common theme in the cross-country development literature is that household spending on education often differs for male versus female students. In recent research for Nepal for example, spending on boys more than on girls in documented for both rural and urban areas (Khanal, 2018). Similar gender differentials have also been shown for school enrollment and participation and in the quality of the education that is provided (Global Campaign for Education, 2012)[85]. In India for example, fewer females are enrolled in private schools compared to public schools and this relates to spending differentials (Sahoo, 2017).

A recent study in Timor-Leste offers a perspective at odds with conventional wisdom on biased intra-household allocations in developing countries by documenting no allocation bias between boys and girls for overall spending on a wide variety of resources (Dawsey & Bookwalter, 2016)[86]. The authors argue that social norms and religious practices, which are usually associated with biased intra-household allocation, are less predominant in Timor-Leste. However, with subpopulation data, they do find some evidence that females may still have less bargaining power (Dawsey & Bookwalter, 2016). This work points out then that intra-household allocation bias may vary between subpopulations and spending types.

For Indonesia, a long tradition of social and financial discrimination against women still exists (Levine & Ames, 2003). Although there is no documented "missing girls" phenomenon[87]

[85] (Khanal, 2018)
[86] In this article, the author measured general spending inclusive of food, clothing, and so forth instead of focusing on education as we do here.
[87] World Bank data shows that females in 2018 made up 49.6% population in Indonesia. Although the number is a decline from 1960 (50.3%), the ratio male and female are not showing inequality preferences between boys and girls

in Indonesia like what has been shown for India and China, girls may still become vulnerable during crisis periods when households protect spending for their sons over that for their daughters (Levine & Ames, 2003) (Cameron & Worswick, 2001). In many parts of Indonesia, both boys and girls from low-income families in Indonesia are expected to help and work part-time after school (Hsin, 2007). Girls are more likely to participate in nonmarket work such as caring for other children, performing domestic chores like cooking and cleaning, and other household responsibilities in comparison to boys, and girls may spend less time in leisure (Hsin, 2007).

2.1. **Women and Investment in Education in Developing Countries**

Women, on average, make up 43 percent agricultural labor force in developing countries[88]. In contrast, less than 20 percent of the world's landholders are women[89]. Statistics from the traditional agricultural sector show that labor market barriers, often related to culture, may discourage women in developing countries. Furthermore, research finds that cultural practices such as bride prices, cousin marriage, and marriage at an immature age shape female long-run economic and noneconomic outcomes (Lowes, 2019). The World Bank reports that out of 189 economies assessed in 2018, 104 economies still have laws preventing women from working in specific jobs, 59 economies have no sexual harassment laws in the workplace, and in the 18 economies, husbands can legally prevent their wives from working (World Bank Group, 2018). Gender gaps and the missing women in the labor market are estimated to cost the economy around 15 percent of GDP (Cuberes & Teignier, 2016). Research findings also suggest

compared to India (48%) and China (48.6%). (https://data.worldbank.org/indicator/SP.POP.TOTL.FE.ZS?locations=ID-IN-CN)

[88] https://www.unwomen.org/en/news/in-focus/commission-on-the-status-of-women-2012/facts-and-figures, accessed May 15th, 2020.

[89] Women represent fewer than 5 percent of all agricultural landholders in North Africa and West Asia, while in sub-Saharan Africa they make up an average of 15 percent.

that increasing women's economic empowerment boosts productivity, increases economic diversification, and reduces income equality (International Monetary Fund, 2018).

The primary source of gender inequality in the labor market besides barriers to entry is rooted in investment in education inequality between girls and boys. The United Nations recorded that two-thirds of 796 million illiterate adults are women[90]. Rural girls tend to experience poorer conditions than boys or urban girls. Global statistics show that only 39 percent of rural girls attend secondary school and that rural girls are twice as likely to be out of school[91]. These numbers are lower than rural boys (45 percent), urban girls (59 percent), and urban boys (60 percent).

The United Nations notes that increasing women's and girls' educational attainment contributes not only to women's economic empowerment but also to more inclusive economic growth[92]. Education and employment play an essential role in determining women's input in financial decisions (Malhotra & Mather, 1997). Having a voice in the household's financial decision-making process is significant for women since it is a part of increased bargaining power, which affects the future of children directly through education investment, consumption of good nutrition food, and more. Therefore, women's education can often be seen to not only benefit women themselves but also to offer positive spillover effects to future generations[93].

[90] https://www.unwomen.org/en/news/in-focus/commission-on-the-status-of-women-2012/facts-and-figures accessed May 15th, 2020.
[91] *Ibid.*
[92] https://www.unwomen.org/en/what-we-do/economic-empowerment/facts-and-figures, accessed May 18, 2020.
[93] *Ibid.* Data from 68 countries indicates that a woman's education is a key factor in determining a child's survival.

3. Micro Data from Living Standards Surveys

3.1. Education Spending in the Timor-Leste Survey of Living Standards

The Timor-Leste Survey of Living Standards (TLSLS) is collected by the Government of the Democratic Republic of Timor-Leste through the National Statistics Department (NSD) of the ministry of planning and finance[94]. The most recent available TLSLS was conducted from April 2006 to March 2007[95] with a sample of 5,250 households drawn from Timor Leste's five regions. Around 4,500 household observations in the survey are cross-sectional, while data on an additional 900 households was collected in a panel format[96,97]. We compare 2006 to the earlier 2001 wave to document changes over time.

In Table 17, based on the TLSLS 2001 and 2006 data, we confirm that most students are enrolled in public school (more than 78 percent across genders and years)[98]. Private religious schools are popular in Timor-Leste in comparison to other types of private schools[99]. While enrollment differences across genders are limited, total expenditure on education varies for boys versus for girls with a notable increase in spending on girls relative to on boys in religious schools by 2006 (spending on girls in this educational category is almost 17 percent higher). We also note that higher education expenditure is reported in urban areas than in rural areas for both girls and boys, but that the relatively higher spending on girls in comparison to boys is concentrated in urban areas.

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[94] This is the second TLSLS collected by NSD with the help of World Bank. Data can be downloaded at http://microdata.worldbank.org/index.php/catalog/78

[95] To capture seasonal variation in different indicators

[96] The first TLSLS consists of 1,800 households. The NSD aimed to resurvey 50 percent of the households from the first TLSLS selected randomly.

[97] Based on the TLSLS final statistics book, several households stopped surveys before they were finished because of conflicts in that particular period. Despite follow-up attempts, 34 households remained missing and 41 new households were added as replacement.

[98] Public schooling is free in Timor-Leste up to secondary level.

[99] Private religious schools are dominated by Catholic schools, which also matches the Timorese religious majority.

3.2. Education Spending in the Indonesian Family Life Survey

Table 18 presents data over the same time period for Indonesia based on the Indonesian Family Life Survey (IFLS) wave 3 (year 2000) and wave 4 (year 2007)[100]. The IFLS is an ongoing longitudinal survey in Indonesia collected by the Rand organization through a collaboration with the Center for Population and Policy Studies (CPPS) of the University of Gadjah Mada and Survey Meter.

As in Timor-Leste, most Indonesian students are enrolled in public non-religious schools (more than three-fourths across genders). The second most popular enrollment is a private Islamic school, followed by a private non-religious school. Spending on girls versus on boys is roughly equal with the exception of for Catholic and Protestant schools where spending on girls is notably higher in both 2000 and in 2007.

[100] There are five different waves of IFLS currently, with a supplementary survey to cover the impact of the Asian financial crisis 1998 (IFLS 2+).

Table 17. Summary Statistics of Education Enrollment and Total Education Spending across School Categories for All-Area, Urban Area and Rural Area in Timor-Leste 2001 and 2006

2001 Enrollment (%)						
	All		Urban		Rural	
School Category	Boys	Girls	Boys	Girls	Boys	Girls
Public	79.91	78.94	70.4	70	83.2	81.9
Private secular	5.00	5.29	5.2	5.9	4.5	5.3
Private religious	15.09	15.77	24.3	24.1	12.3	12.8
Other	-	-	-	-	-	-
Total	100	100	100	100	100	100
Total Students	1,140	1,040	273	267	867	773

2006 Enrollment (%)						
	All		Urban		Rural	
School Category	Boys	Girls	Boys	Girls	Boys	Girls
Public	83.29	81.91	80.54	78.43	86.48	86.19
Private secular	2.54	2.97	3.03	3.39	1.98	2.45
Private religious	14.13	15.06	16.43	18.12	11.48	11.29
Other	0.03	0.06	0	0.06	0.06	0.07
Total	100	100	100	100	100	100
Total Students	3,382	3,101	1,814	1,711	1,568	1,390

2001 Total Expenditure on Education ($)						
	All		Urban		Rural	
School Category	Boys	Girls	Boys	Girls	Boys	Girls
Public	11.27	11.26	14.91	19.97	10.31	8.67
Private secular	27.09	24.25	52.87	43.12	15.19	17.80
Private religious	30.50	28.55	43.31	47.09	22.72	16.38
Other	-	-	-	-	-	-
Total Expenditure	14.96	14.67	24.17	27.79	12.06	10.14

2006 Total Expenditure on Education ($)						
	All		Urban		Rural	
School Category	Boys	Girls	Boys	Girls	Boys	Girls
Public	19.993	19.766	22.17	22.48	17.64	16.73
Private secular	40.153	47.989	48.51	53.54	25.33	38.52
Private religious	45.274	52.83	54.39	64.39	30.19	30.01
Other	20.00[1)]	262.50[1)]	0	502.00[2)]	20.00[3)]	23.00[3)]
Total Expenditure	24.079	25.739	28.26	31.4	19.24	18.77

Notes: Expenditure for the "Other" school category is suppressed due to a limited number of students. Expenditure measured is for the whole academic year (2004/2005). Expenditure is measured in US dollars to facilitate comparison with Indonesia by using a common currency.

Source: Author's calculation based on Timor-Leste Survey of Living Standards (TLSLS) 2006.

Table 18. Summary Statistics of Education Enrollment and Total Education Spending across School Categories for All-Area, Urban Area and Rural Area in Indonesia 2000 and 2007

2000 Enrollment (%)

	All		Urban		Rural	
School Category	Boys	Girls	Boys	Girls	Boys	Girls
Public Non-Religious	77.42	75.55	70.34	68.87	83.17	80.95
Public Religious	2.26	2.51	2.01	2.38	2.47	2.62
Private Non-Religious	4.91	5.88	7.25	8.13	3.00	4.07
Private Islam	12.22	12.92	14.83	14.94	10.10	11.29
Private Catholic	2.12	2.01	3.56	3.64	0.95	0.70
Private Protestant and Others	0.93	1.03	1.68	1.85	0.32	0.37
Private Buddhist	0.12	0.09	0.26	0.20	-	-
Others	0.03	0.00	0.06	0.00	-	-
Total Students	3,445	3,382	1,544	1,513	1,901	1,869

2007 Enrollment (%)

	All		Urban		Rural	
School Category	Boys	Girls	Boys	Girls	Boys	Girls
Public Non-Religious	79.17	79.17	75.26	74.85	83.13	83.43
Public Religious	2.95	2.4	2.71	2.84	3.19	1.97
Private Non-Religious	3.85	4	5.55	6.58	2.13	1.46
Private Islam	12.29	12.76	13.76	13.35	10.81	12.19
Private Catholic	0.9	0.8	1.48	1.1	0.31	0.51
Private Protestant and Others	0.71	0.8	1	1	0.38	0.44
Private Buddhist	0.09	0.03	0.12	0.06	0.06	-
Others	0.03	0.03	0.06	0.06	-	-
Total Students	3,221	3,126	1,621	1,551	1,600	1,575

2000 Total Expenditure on Education ($)

	All		Urban		Rural	
School Category	Boys	Girls	Boys	Girls	Boys	Girls
Public Non-Religious	30.27	31.27	39.98	38.88	23.60	26.03
Public Religious	38.58	40.96	51.66	50.29	29.94	34.10
Private Non-Religious	49.69	55.44	63.82	70.35	21.93	31.29
Private Islam	40.05	37.60	45.96	45.40	33.01	29.25
Private Catholic	76.64	111.62	91.09	127.64	32.49	43.81
Private Protestant and Others	55.17	59.09	62.25	67.99	24.52	23.52
Private Buddhist	69.00	71.68	69.00	71.68	-	-
Others	110.05	-	110.05	-	-	-
Total Expenditure	33.89	35.69	45.14	46.51	24.74	26.93

2007 Total Expenditure on Education ($)

	All		Urban		Rural	
School Category	Boys	Girls	Boys	Girls	Boys	Girls
Public Non-Religious	102.50	102.50	130.02	131.66	77.81	77.37
Public Religious	122.78	152.94	138.42	165.36	109.95	135.14
Private Non-Religious	262.81	271.82	320.19	300.80	112.19	147.99
Private Islam	189.92	161.81	257.48	224.42	104.86	97.55
Private Catholic	332.17	356.88	372.03	458.94	172.75	152.77
Private Protestant and Others	189.01	286.82	211.80	360.50	135.83	107.88
Private Buddhist	126.35	-	208.95	-	43.76	-
Others	796.41	679.36	796.41	679.36	-	-
Total Expenditure	122.65	121.55	162.85	162.37	83.02	82.53

Source: Author's calculation based on Indonesia Family Life Survey (IFLS) Wave 3 and 4

4. Empirical Models

We follow an empirical framework from previous literature (Khanal, 2018) (Aslam & Kingdon, 2008) (Himaz, 2010). Particularly, we estimate

$$\log(Exp)_{ijt} = \alpha_{ijt} + \beta_1 Female_{ij} + \beta_2 Income_{jt} + \beta_3 Poor + \beta_4 Birthorder_{ijt} + \beta_5 HHsize_{jt} + \beta_6 Currentclass_{jt} + \beta_7 Distschool_{ijt} + \beta_8 Schooltype_{it} + \beta_9 Rural_{jt} + \beta_{10} Center_{jt} + \beta_{11} East_{jt} + \varepsilon_{ijt}$$

Where *i* is a notation for the child and *j* is a notation for the household. In contrast to some of the previous research, income is proxied by total expenditure of the household due to data availability. Secondly, we do not include ethnicity in our Timorese model since the ethnic majority is Austronesian (Malay-Polynesian), with only a small number with Papuan and Chinese ethnicity. We also do not include parental education directly due to missing responses in our available data[101]. In addition, our variable corresponding to school distance is measured by hours and time instead of length, such as in kilometers[102] and our variable for birth order reflects heterogeneity in family structure. We treat birth order separately for different families in the same household (e.g., extended family). Variable definitions are presented in Table 3. We use these variables in both Ordinary Least Squares (OLS) estimation and in Blinder-Oaxaca decomposition for additional results.

Table 19. Description of Variables

Variable Name	Description
Education expenditure	Total Expenditure on Education
Female	Dummy variable 1 is female and 0 is male
Household expenditure	Total Expenditure per Month in terms of USD as a Proxy of Income
Poor	Dummy variable where 1 implies poor (lower threshold)
Birth order	Birth Order of Child, 1 represent firstborn, 2 represent the 2nd child, and so forth. Different children from different parents

[101] If parents' education were included, observations would drop around 4,000 for all samples to 90 observations.
[102] This variable has a large number of missing responses and is dropped from the model.

Variable Name	Description
	treat separately. However, a child with a parent will follow the household head list.
Household size	Household Size
Student current grade	Current Grade of The Student
School distance	Distance from Home to School (in Hours & Minutes)
Private	Dummy variable where 1 and 0 is enrollment in private and public schools, respectively
Rural	Dummy variable where 1 represents rural and 0 represents urban
Center	Dummy variable where 1 represents household living in the central area[103]
East	Dummy variable where 1 represents household living in the eastern area[104]
West	Dummy variable where 1 represents household living in the eastern area

Source: Authors' compilation

5. Results

5.1. Ordinary Least Squares Regressions by Country

Tables 20 and 21 present results from our OLS models for the years 2001 and 2006 respectively for the Timor-Leste samples. The gender indicator in the 2001 sample is not statistically significantly related to education expenditure. Instead, living in rural areas, going to public school, being second born or higher in terms of birth order, and poverty status of the household translates into less spending all else equal[105]. Using the World Bank poverty line, around 90 percent of Timorese individuals in the sample are considered poor. That result could be overestimated since the Timor-Leste poverty rate in the year 2001 is 36.3 percent officially[106].

[103] The western area is the base since it has the highest poverty pocket among three different area in the Timor-Leste.
[104] The eastern area is the base for Indonesian data since it has the highest poverty pocket among three different regions.
[105] In 2001, there was no official poverty reporting in Timor-Leste given the continued conflicts. We estimate the poverty line using the World Bank $1/day which may overestimate the poverty rate or not show much variation across families.
[106] https://borgenproject.org/questions-answers-poverty-rate-east-timor/. Accessed September 8th, 2019

The boys and girls subsample results in columns (2) and (3) are qualitatively similar to the overall results in column (1) for 2001.

While general patterns across key variables persist and are still seen in the 2006 data in table 5, the gender indicator in the 2006 sample is statistically significant and positive at the 10 percent significance level. This is notably different from the earlier sample. Girls are found to have 2.9 percent higher spending on education compared to boys. This is a striking difference from both the earlier result for Timor-Leste and in comparison, to cross-country results such as the earlier cited Nepal study, which showed gendered expenditure patterns in the opposite direction (Khanal, 2018).

Other general patterns across key variables persist in 2006 and are similar to what was found for 2001. Poor households, for example, have 11.8 percent less spending than do non-poor household, which is an expected pattern. Spending in private schools is 56 percent higher than education spending in public schools. The birth order variable shows that younger children tend to have lower educational spending compared to their older siblings. Aligning with the birth order variable result, the school-level variable of current grade in school reveals a significant positive relationship to education expenditure (corresponding to how higher education levels cost more). Furthermore, individuals living in the western part of Timor-Leste have less spending on education than those living in the east and center of Timor-Leste. These areas share direct borders with Indonesia and have a higher concentration of poverty.

Table 20. Ordinary Least Squares Regressions with Separate Results for the Population Cohorts Year 2001 & 2006 (Timor-Leste)

	2001			2006		
Dependent: Log Education Expenditure	**(1) All**	**(2) Boys**	**(3) Girls**	**(1) All**	**(2) Boys**	**(3) Girls**
Female	0.00719			0.0290*		
	(0.0442)			(0.0175)		
Household Expenditure	0.00307***	0.00283***	0.00340***	0.000645***	0.000425**	0.00117***
	(0.000538)	(0.000743)	(0.000684)	(0.000177)	(0.000167)	(0.000140)
Poor	-1.154***	-1.196***	-1.107***	-0.118***	-0.155***	-0.0509
	(0.0649)	(0.0922)	(0.0917)	(0.0274)	(0.0341)	(0.0335)
Birth Order	-0.165***	-0.157***	-0.175***	-0.0441***	-0.0485***	-0.0386***
	(0.0189)	(0.0272)	(0.0263)	(0.00793)	(0.0113)	(0.0111)
Household size	0.0544***	0.0423**	0.0655***	-0.00318	0.00106	-0.0126*
	(0.0133)	(0.0192)	(0.0181)	(0.00560)	(0.00688)	(0.00731)
Current school grade	0.0103	0.0136	0.00716	0.113***	0.110***	0.115***
	(0.0131)	(0.0175)	(0.0200)	(0.00322)	(0.00444)	(0.00468)
Private	0.765***	0.733***	0.798***	0.560***	0.497***	0.606***
	(0.0643)	(0.0932)	(0.0871)	(0.0279)	(0.0368)	(0.0380)
Rural	-0.445***	-0.405***	-0.485***	-0.0811***	-0.0952***	-0.0467*
	(0.0588)	(0.0827)	(0.0834)	(0.0214)	(0.0269)	(0.0279)
Center	-0.161***	-0.168**	-0.151**	0.151***	0.154***	0.135***
	(0.0485)	(0.0710)	(0.0652)	(0.0215)	(0.0295)	(0.0312)
East	-0.893***	-0.885***	-0.901***	0.133***	0.133***	0.135***
	(0.0698)	(0.0959)	(0.102)	(0.0248)	(0.0337)	(0.0363)
Constant	2.472***	2.513***	2.441***	1.935***	2.003***	1.862***
	(0.101)	(0.141)	(0.140)	(0.0486)	(0.0614)	(0.0633)
	0.00719	0.00153	0.00172**			
Observations	2,137	1,114	1,023	5,714	2,944	2,770
R-squared	0.343	0.318	0.374	0.353	0.325	0.388

Source: Author's compilation

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 21. Ordinary Least Squares Regressions with Separate Results for the Population Cohorts Year 2000 & Year 2007 (Indonesia)

	2000			2007		
Dependent: Log Education Expenditure	**(1) All**	**(2) Boys**	**(3) Girls**	**(1) All**	**(2) Boys**	**(3) Girls**
Female	-0.0199			-0.0134		
	(0.0235)			(0.0210)		
Household Expenditure	1.70e-07***	1.78e-07***	1.64e-07***	1.22e-07***	1.22e-07***	1.22e-07***
	(1.73e-08)	(2.56e-08)	(2.27e-08)	(7.81e-09)	(1.10e-08)	(1.10e-08)
Poor	-0.417***	-0.421***	-0.414***	-0.399***	-0.395***	-0.401***
	(0.0400)	(0.0546)	(0.0587)	(0.0349)	(0.0476)	(0.0510)
Birth Order	-0.0742***	-0.0639***	-0.0844***	-0.103***	-0.109***	-0.0980***
	(0.0112)	(0.0161)	(0.0155)	(0.0101)	(0.0138)	(0.0150)
Household size	-0.0154**	-0.0276***	-0.00344	-0.00792*	-0.00894	-0.00640
	(0.00623)	(0.00849)	(0.00908)	(0.00461)	(0.00592)	(0.00721)
Current school grade	0.0787***	0.0703***	0.0870***	0.0774***	0.0689***	0.0862***
	(0.00521)	(0.00729)	(0.00741)	(0.00495)	(0.00696)	(0.00708)
Private	0.236***	0.227***	0.242***	0.248***	0.275***	0.220***
	(0.0321)	(0.0457)	(0.0448)	(0.0299)	(0.0406)	(0.0442)
Rural	-0.426***	-0.427***	-0.425***	-0.384***	-0.361***	-0.409***
	(0.0243)	(0.0344)	(0.0347)	(0.0218)	(0.0297)	(0.0321)
West	0.335***	0.362***	0.307***	0.262***	0.191***	0.333***
	(0.0456)	(0.0573)	(0.0717)	(0.0371)	(0.0502)	(0.0546)
Central	-0.345***	-0.307***	-0.384***	0.228***	0.180***	0.274***
	(0.0600)	(0.0772)	(0.0924)	(0.0462)	(0.0644)	(0.0662)
Constant	12.13***	12.18***	12.05***	13.24***	13.34***	13.12***
	(0.0639)	(0.0868)	(0.0956)	(0.0544)	(0.0722)	(0.0809)
Observations	5,370	2,722	2,648	4,396	2,262	2,134
R-squared	0.299	0.295	0.304	0.353	0.351	0.357

Source: Author's compilation

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 21 presents results for Indonesia for comparison. Patterns parallel those for Indonesia with coefficients that are consistent with our theoretical priors and generally statistically significant at conventional significance levels. The exception, however, occurs in our primary variable of interest of gender. In Indonesia, spending on the education of girls in less than that of boys though the difference is not statistically significant. This pattern is true in both 2000 and 2007. It is further interesting to note that the 2001-year data for Timor-Leste (table 20) is reveals a pattern in Timor-Leste in the earlier period that mimics that of Indonesia. This is relevant because Timor-Leste had just started its independence in 2000 (at the time that the 2001 data was starting to be collected) and Timor Leste education systems still followed the Indonesian curriculum.

5.2. Blinder-Oaxaca Decomposition Estimation Results

Following Khanal (2018), we conduct Blinder-Oaxaca decompositions to analyze the explained versus unexplained components of our estimation. Jann (2008) mentions that Blinder-Oaxaca is often used as a methodology to study labor-market outcomes by groups (sex, race, etc.) by decomposing the mean differences in log wages based on linear regression models in a counterfactual approach (Blinder (1973), Oaxaca (1973))[107]. This article applies a similar concept and uses the log education expenditure mean differences to analyze the spending gap between boys and girls.

From Table 22, we see that in 2001, girls in overall and urban regressions had higher spending than boys, although the difference is not statistically significant. From the year 2006 data, girls are seen to have higher education spending compared to boys at a level that is statistically and economically significant (5.3 percent difference). From that difference, we find

[107] We are utilizing the command *Oaxaca* in Stata written by Ben Jann (2008).

that 45.9 percent is explained by the endowment that girls have, as represented by the covariates in the OLS regression. This means that 54.1 percent remains unexplained. It is this portion that could be argued to be related to discrimination as per the Blinder-Oaxaca methodology.

In urban areas, this difference is higher than in rural areas[108]. Girls consistently have higher spending than boys, and there is an 8 percent difference (and statistically significant) for urban area households and a 1 percent difference for rural area households. Part of the difference (4.76 of the 8 percent) in urban areas can be explained from endowment differences (covariates), and the remainder (3.34 of the 8 percent) is found to be unexplained by the regressors included in our model.

Table 22. Results from Blinder-Oaxaca Decomposition

Timor-Leste	**2001**			**2006**		
Log Education Expenditure	**All**	**Rural**	**Urban**	**All**	**Rural**	**Urban**
Prediction for Boys	1.920***	1.732***	2.524***	2.762***	2.634***	2.880***
	(0.0377)	(0.0418)	(0.0737)	(0.0146)	(0.0196)	(0.0212)
Prediction for Girls	1.929***	1.692***	2.604***	2.816***	2.644***	2.961***
	(0.0394)	(0.0421)	(0.0792)	(0.0162)	(0.0216)	(0.0230)
Difference	-0.00901	0.0407	-0.0804	-0.0537**	-0.0104	-0.0809***
	(0.0545)	(0.0594)	(0.108)	(0.0218)	(0.0291)	(0.0313)
Explained	-0.00182	0.0275	0.00900	-0.0247*	0.0162	-0.0476**
	(0.0321)	(0.0332)	(0.0577)	(0.0130)	(0.0164)	(0.0189)
Unexplained	-0.00719	0.0132	-0.0894	-0.0290*	-0.0266	-0.0334
	(0.0441)	(0.0493)	(0.0918)	(0.0175)	(0.0241)	(0.0248)

Source: Author's compilation

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Indonesia	**2000**			**2007**		
Log Education Expenditure	**All**	**Rural**	**Urban**	**All**	**Rural**	**Urban**
Prediction for Boys	12.26***	11.97***	12.63***	13.56***	13.27***	13.87***
	(0.0191)	(0.0250)	(0.0260)	(0.0177)	(0.0224)	(0.0243)
Prediction for Girls	12.26***	11.97***	12.62***	13.55***	13.25***	13.88***
	(0.0205)	(0.0270)	(0.0279)	(0.0190)	(0.0239)	(0.0264)
Difference	0.00458	0.00168	0.00536	0.00652	0.0167	-0.0161
	(0.0280)	(0.0368)	(0.0381)	(0.0260)	(0.0328)	(0.0359)

[108] Appendix tables A1-A4 show full OLS results for the rural and urban subsamples for each country respectively for the interested reader.

Explained	0.00458	0.00168	0.00536	0.00652	0.0167	-0.0161
	(0.0280)	(0.0368)	(0.0381)	(0.0260)	(0.0328)	(0.0359)
Unexplained	3.98E-15	1.46E-15	5.90E-17	2.94e-15	-4.87e-15	5.55e-17
	(0.00133)	(0.00172)	(0.00354)	(0.00138)	(0.00217)	(0.00207)

Source: Author's compilation
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5.3. Robustness Check with Hurdle Model

Other entries in the previous literature utilize hurdle models to decompose education spending in the household (Aslam & Kingdon, 2008) (Himaz, 2010). The Hurdle model is a combination of a selection model that determines the boundaries of dependent variables and an outcome model that determines unbounded values (StataCorp, 2019). The empirical model specification follows Cragg (1971)[109]:

$$y_i = s_i h_i^*$$

Where y_i is the observed value of the dependent variable (log education expenditure), s_i are the selection variables, and h_i^* are continuous latent variables. Following Cragg (1971), the selection model is:

$$s_i = \begin{cases} 1 \; if \; z_i\gamma + \; \epsilon_i \\ 0 \; otherwise \end{cases}$$

Where, z_i is the vector of explanatory variables such as gender (female), household size, living in a rural area, living in Central Timor-Leste, and living in East Timor-Leste. The continuous latent variables h_i^* can be expressed:

$$h_i^* = x_i\beta + \upsilon_i$$

[109] The hurdle model we are using is Cragg's Hurdle Model (*Churdle).* A main different between this model and Heckman's selection model involves the treatment of zeros. In the hurdle model, zero has true "meaning," while in Heckman zeros are treated as unobserved (Humphreys, 2010).

Where x_i is the vector of explanatory variables such as gender (female), monthly household expenditure, poverty status, birth order, household size, student's current grade, and whether they go to private school.

We estimate a hurdle model and present results in table 23. Our results are consistent with those from OLS regression and Blinder-Oaxaca decomposition. Girls are shown to receive statistically significant higher spending than do boys in Timor-Leste in 2007 in contrast to both earlier in Timor-Leste and in Indonesia over the longer period. Spending for private schools is higher than for public across time and countries as expected. Also, as expected, poor households have lower spending on education all else equal across time and countries in this research. Lastly, living in a rural area is negatively related to school spending across countries and times, also consistent with the earlier results.

Table 23. Results from Hurdle Models by Country and Year

Dependent: Log Education Expenditure	**Timor-Leste 2001**	**Timor-Leste 2007**	**Indonesia 2000**	**Indonesia 2007**
Female	-0.000803	0.0323*	-0.0304441	-0.0236
	(0.0581)	(0.0167)	(0.025)	(0.0218)
Household Expenditure	0.00301***	0.000535***	0.0000002***	1.38e-07***
	(0.000367)	(5.69e-05)	(0.000)	(5.88e-09)
Poor	-1.267***	-0.200***	-0.5225691***	-0.469***
	(0.123)	(0.0202)	(0.040)	(0.0347)
Birth Order	-0.0849***	-0.0327***	-0.0877556***	-0.126***
	(0.0242)	(0.00702)	(0.011)	(0.0101)
Household Size	0.0333**	0.0173***	-0.0098860	-0.00470
	(0.0154)	(0.00424)	(0.007)	(0.00478)
Current grade	-0.124***	0.109***	0.0814341***	0.0784***
	(0.0188)	(0.00290)	(0.005)	(0.00502)
Private	0.740***	0.553***	0.3663646***	0.296***
	(0.0681)	(0.0226)	(0.033)	(0.0287)
Constant	2.394***	1.935***	12.0457920***	13.27***
	(0.107)	(0.0335)	(0.043)	(0.0386)
Dependent: Schooling Decision				
Female	-0.0225	-0.0844	3.1012381	0.0857
	(0.0570)	(0.124)	(157.940)	(0.0695)
Household Size	0.0943***	-0.0277	-0.0945446	-0.0640***
	(0.0136)	(0.0262)	(0.088)	(0.0181)
Rural	-0.368***	-0.299**	-0.0007425	-0.218***
	(0.0718)	(0.129)	(0.430)	(0.0705)
Center	-0.279***	0.586***	-0.0226650	0.360**
	(0.0796)	(0.147)	(362.566)	(0.151)
East (Timor-Leste)/West (Indonesia)	-0.257***	0.362**	-2.9003369	0.132
	(0.0911)	(0.161)	(265.305)	(0.103)
Constant	0.396***	2.608***	6.5962702	2.045***
	(0.125)	(0.235)	(265.306)	(0.151)
Ln Sigma Constant	0.0331	-0.464***	-0.0880935***	-0.338***
	(0.0222)	(0.00941)	(0.010)	(0.0108)
Observations	2,157	5,714	5,370	4,497

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.4. Private versus Public Schools

Post-independence, most public schools in Timor-Leste were destroyed physically and administratively, and Timor-Leste began to build the education system from the ground up (Justino, Leone, & Salardi, 2011). Around 20 percent of primary teachers and 80 percent of seconsdary teachers permanently left their teaching positions and moved back to Indonesia (Shah, 2011). In this situation, private Catholic schools, which remained in operation, may have played an essential and distinctive role.

Private Catholic schools tend to provide a higher quality of services than public schools, and their infrastructure is more likely to remain intact even after war and conflicts (The World Bank, 2004). Furthermore, data from Primary School Assessment Survey (PSAS) year 2003[110] shows that the private schools have lower teacher absenteeism, higher teachers' qualifications, extended teachers' experience, and slightly higher test scores than public schools (The World Bank, 2004).

In addition to being a dominant and resilient part of the supply side of schooling provision in Timor-Leste following independence, we also hypothesize that private (costly) Catholic schools could have been perceived as safer for girls during these times of continued conflict given the prevalence of sexual harassment and violence noted in the literature (Creative Associates International, 2013). Furthermore, as history suggested, the Catholic church has been an integral part of the religious and social institution in Timor-Leste (The World Bank, 2004). Contemporary Timorese identity is tied with Catholicism, and religion is viewed as one of the

[110] Primary School Assessment Survey year 2003 is survey conducted by the collaboration between the World Bank and the Timor-Leste Ministry of Education, Culture, Youth, and Sports (MECYS) through its Fundamental School Quality Project (FSQP).

critical aspects of Timorese life (Leach, 2007). In Timor-Leste, the Catholic church provided an alternative non-governmental educational service, ranging from preschool to university.

With the length of historical influence and perceptions of offering a better option for schooling, it is expected that some fraction of Timorese chose private Catholic schools over public schools during the period corresponding to our data. Therefore, it is noteworthy and crucial to analyze the subpopulation based on the type of school. This section contrasts regression results for each school type (public versus private school).

Based on the results, we can see that girls tend to have statistically significantly higher spending in private schools. Furthermore, although not statistically significant, boys have higher spending associated with them than girls in public schools overall. Other coefficient results are similar compared to the previous OLS regression. These results contrast to other literature that suggests that female participation in private schools is often lower than in public schools in the developing world (Harma, 2011; Woodhead, Frost, & James, 2013). We therefore view the church as having a potentially distinctive role in Timor-Leste and its education systems during the transition to independence.

Table 24. Ordinary Least Squares Regressions Public Vs. Private Schools (Year 2006), Time-Leste

	Public School			Private School		
Dependent:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Log Education Expenditure	**All**	**Boys**	**Girls**	**All**	**Boys**	**Girls**
Female	0.00186			0.128***		
	(0.0185)			(0.0466)		
Household Expenditure	0.000394***	0.000241**	0.000818***	0.00141***	0.00117***	0.00172***
	(0.000135)	(0.000114)	(0.000140)	(0.000185)	(0.000240)	(0.000282)
Poor	-0.127***	-0.151***	-0.0772**	-0.103	-0.177*	-0.0211
	(0.0260)	(0.0335)	(0.0349)	(0.0693)	(0.101)	(0.0946)
Birth Order	-0.0425***	-0.0475***	-0.0372***	-0.0243	-0.0387	-0.0105
	(0.00856)	(0.0122)	(0.0121)	(0.0196)	(0.0278)	(0.0280)
Household Size	-0.000662	0.00818	-0.0136*	-0.0156	-0.0308*	-0.00848
	(0.00534)	(0.00680)	(0.00763)	(0.0123)	(0.0184)	(0.0163)
Current grade	0.110***	0.110***	0.111***	0.122***	0.110***	0.131***
	(0.00342)	(0.00477)	(0.00490)	(0.00829)	(0.0111)	(0.0124)
Private	-0.0581***	-0.0647**	-0.0360	0.128***	-0.194**	-0.0826
	(0.0207)	(0.0271)	(0.0293)	(0.0466)	(0.0815)	(0.0841)
Center	0.0885***	0.0930***	0.0812**	-0.135**	0.403***	0.433***
	(0.0226)	(0.0309)	(0.0331)	(0.0591)	(0.0814)	(0.0928)
East	0.134***	0.115***	0.159***	0.418***	0.313***	0.216**
	(0.0263)	(0.0360)	(0.0385)	(0.0610)	(0.0908)	(0.0983)
Constant	2.017***	2.010***	1.989***	0.256***	2.379***	1.927***
	(0.0486)	(0.0631)	(0.0654)	(0.0675)	(0.161)	(0.182)
Observations	4,738	2,458	2,280	976	486	490
R-squared	0.255	0.250	0.266	0.407	0.383	0.424

Source: Author's compilation

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

6. Discussion and Conclusions

The empirical patterns of educational spending on boys and girls in Timor-Leste differ from results from Nepal drawn from similar methodologies in previous literature (Khanal, 2018). In Timor-Leste, discrimination affecting girls in terms of education spending is not evident. In fact, the data suggest the opposite, where boys tend to have lower spending associated with their educations than do girls. Furthermore, we find a significant jump between the year 2000 and the year 2007 in terms of educational spending directed at girls in the country of Timor-Leste.

There are several explanations for this gendered educational spending increase. In the previous subsection, we considered the potential role of Catholic schooling as a differential factor between the Timor-Leste and Indonesia cases and presented some descriptive evidence drawn from a comparison of private to public schools as those are the indicators available in our data. We argue that girls in Timor-Leste tend to go to private Catholic schools rather than public schools especially at times when safety is in question. Given higher educational costs for private Catholic schools in comparison to public schools, the influence of these factors together may be captured by our estimations. Historical documents also show that, in 2004, the Timor-Leste government implemented a new education curriculum excluding the teaching of religion (Shah, 2012). The vision of a modern and secular state implemented in education was closely tied to Catholicism and represented a significant shift in the scope of education in Timor-Leste.

There are at least two other explanations, however, for the changes in educational spending on girls relative to boys in Time-Leste between 2000 and 2007 which we also consider here. Our review of the literature and of contextual evidence suggests that some boys who entered military service did not return to school post-war. This explanation offers a mechanical population shift possibility related to our result. Finally, we consider that the gendered foci of

some international aid programs could have feasibility contributed to the empirical patterns that we observe in this paper. Some foreign aid in the post-conflict period, for example, targeted females, especially in terms of programs promoting gender mainstreaming and gender equity. These billions of dollars of aid money targeted toward female wellbeing could lead us to see a pattern consistent with a type of "reverse" gender discrimination in Timor-Leste in terms of education. Unfortunately, we are unable to test this hypothesis formally since there is no available data on the individual or community level about who has received and benefited directly and indirectly from foreign aid. We therefore hope that these findings influence continued research as data become available. Another limitation of this research is that we treat children in the base year as different individuals in the end year (if any). Since both data used naturally not a panel data, we cannot really track down which household has repeated interview. Thus, the potential two children/individuals showing up for both years is a possibility.

Furthermore, the historical example of Timor-Leste's integration and separation from Indonesia presented in this paper is relevant to understanding contemporary dynamics between these two countries even after conflict. Shah (2012), for example, argues that there has been no significant improvement on education after a decade of independence. This suggests that our findings are relevant for understanding today's situation in addition to the historical context.

In addition to differences with Indonesia, there are some aspects to highlight between Timor-Leste and the similar recent study for the case of Nepal that helped motivate this research (Khanal, 2018). First, while Nepal is already established as a country, Timor-Leste still struggled as a newly established country at the time of data collection. This timing has the implication that some households were dropped from the surveys because they went missing between survey rounds. Furthermore, high numbers in terms of foreign aid and United Nations projects also

could affect the socioeconomic condition of Timor-Leste compared to Nepal, also contributing to our prior of different results from Timor-Leste and related to our gendered foreign aid hypothesis above[111,112]. Secondly, considerable gaps in government education policy in Timor-Leste persist. As a result, Timor-Leste has a lower adult literacy rate and a higher student dropout rate than Nepal and other Southeast Asian countries. Different government policies in education also affect education quality, and continuing conflicts also likely affect education quality in both public school and in private school contexts.

[111] $18.5 million in total foreign aid in 2006, $50.8 million at 2007, $47.3 million at 2008, and $133 million at 2009. https://aidtransparency.gov.tl/TEMPLATE/ampTemplate/dashboard/build/index.html?language=en accessed at 3/11/19

[112] From total $2.5 billion from 2006-2018, around 10 percent of those foreign aid goes into education sector. While 22 percent of it goes to "other" sector such as women empowerment, addressing domestic violence and gender mainstreaming project.

References

Agustina, R., Dartanto, T., Sitompul, R., Susiloretni, K. A., Suparmi, A. E., Taher, A., . . . Thabrany, H. (2018). Universal health coverage in Indonesia: concept, progress, and challenges. *Lancet*, 75-102.

Ahluwalia, M. S., Carter, N. G., & Chenery, H. B. (1978). Growth and Poverty in Developing Countries. *Journal of Development Economics*, 2990341.

Arouri, M., Nguyen, C., & Ben Youssef, A. (2015). Natural Disasters, Household Welfare, and Resilience: Evidence from Rural Vietnam. *World Development*, 59-77.

Arrow, K. J. (1963). Uncertainty and The Welfare Economics of Medical Care. *American, 53*(5), 941-973.

Asay, G. R., Roy, K., Lang, J. E., Payne, R. L., & Howard, D. H. (2016, October 6). Absenteeism and Employer Costs Associated With Chronic Diseases and Health Risk Factors in the US Workforce. *Preventing Chronic Diseases, 13*(150503). doi:http://dx.doi.org/10.5888/pcd13.150503

Ashraf, N., Bau, N., Nunn, N., & Voena, A. (2016). Bride Price and Female Education. *NBER Working Paper Series*, 1-77.

Asian Development Bank. (2014). *Timor Leste Country Gender Assessment.* Phillippines.

Aslam, M., & Kingdon, G. G. (2008). Gender and Household Education Expenditure in Pakistan. *Applied Economics*, 2573-2591.

Balisacan, A. M., Edillon, R. G., & Piza, S. F. (2005). Rural Poverty in Southeast Asia: Issues, Policies, and Challenges. *Asian Journal of Agriculture and Development, 2*(1), 25-38.

Barbier, E. (2010). Poverty, Development, and Environment. *Environment and Development Economics*, 635-660.

Barbier, E. B., & Hochard, J. (2019). Poverty-Environment Traps. *Environmental and Resource Economics*, 1-33.

Barbier, E. B., & Hochard, J. P. (2018). Poverty, Rural Population Distribution and Climate Change. *Environment and Development Economics*, 234-256.

Barbier, E., & Hochard, J. (2018). The Impacts of Climate Change on the Poor in Disadvantaged Regions. *Review of Environmental Economics and Policy*, 26-47.

Barrett, C. B., & Carter, M. R. (2013). The Economics of Poverty Traps and Persistent Poverty: Empirical and Policy Implications. *The Journal of Development Studies*, 976-990.

Barrett, C. B., Carter, M. R., & Chavas, J.-P. (2018). Introduction. In C. B. Barrett, M. R. Carter, & J.-P. Chavas, *The Economics of Poverty Traps* (pp. 1-19). Chicago: The University of Chicago Press.

Barros, R., Fox, L., & Mendoça, R. (1997). Female-Headed Households, Poverty, and the Welfare of Children in Urban Brazil. *Economic Development and Cultural Change*, 231-257.

Bhattacharya, J., & Packalen, M. (2012). The Other Ex Ante Moral Hazard in Health. *Journal of Health Economics*, 135-146.

Bird, K. (2019). *Addressing Spatial Poverty Traps.* Overseas Development Institute, Division for Inclusive Social Development. London: Chronic Poverty Advisory Network.

Blinder, A. S. (1973). Wage Discimination: Reduced Form and Structural Estimates. *Journal of Human Resources, 8*, 436-455.

BPJS Kesehatan. (2017). *Laporan Pengelolaan Program dan Laporan Keuangan Jaminan Sosial Kesehatan Tahun 2017.* BPJS Kesehatan.

Cameron, L. A., & Worswick, C. (2001). Education Expenditure Response to Crop Loss in Indonesia: Gender Bias. *Economic Development and Cultural Change*, 351-363.

Carter, M. R., & Barrett, C. B. (2006). The Economics of Poverty Traps and Persistent Poverty: An Asset-Based Approach. *The Journal of Development Studies*, 178-199.

Carter, M. R., Little, P. D., & Negatu, T. M. (2007). Poverty Traps and Natural Disasters in Ethiopia and Honduras. *World Development*, 835-856.

Caruso, G. D. (2017). The Legacy of Natural Disasters: The Intergenerational Impact of 100 Years of Disasters in Latin America. *Journal of Development Economics*, 209-233.

CAVR. (2013). *Chega!: the final report of the Timor-Leste Commission for Reception, Truth, And Reconciliation (CAVR).* Jakarta: KPG in cooperation with STP-CAVR.

Cook, S., & Pincus, J. (2014). Poverty, Inequality, and Social Protection in Southeast Asia. *Journal of Southeast Asian Economies, 31*(1), 1-17.

Cragg, J. G. (1971). Some Statistical Models for Limited Dependent Variables with Application to The Demand for Durable Goods. *Econometrica, 39*, 829-844.

Creative Associates International. (2013). *School Dropout Prevention Pilot Program: Timor-Leste Situational Analysis.* Washington, DC: USAID.

Cuberes, D., & Teignier, M. (2016). Aggregate Effects of Gender Gaps in the Labor Market: A Quantitative Estimate. *Journal of Human Capital*, 1-32.

Curran, S., Chung, C., Cadge, W., & Varangrat, A. (2003). Educational Opportunities for Boys and Girls In Thailand. In D. Baker, B. Fuller, E. Hannum, & R. Werum, *Inequality Across Societies: Familes, Schools and Persisting Stratification (Research in the Sociology of Education)* (pp. 59-102). Bingley: Emerald Group Publishing Limited.

Daimon, T. (2001). The Spatial Dimension of Welfare and Poverty: Lessons from a Regional Targeting Programme in Indonesia. *Asian Economic Journal*, 345-367.

Dartanto, T., & Nurkholis. (2013). The Determinants of Poverty Dynamics in Indonesia: Evidence from Panel Data. *Bulletin of Indonesian Economic Studies, 49*(1), 61-84.

Dasgupta, A. (2007). Floods and Poverty Traps: Evidence from Bangladesh. *Economic & Political Weekly*, 3166-3171.

Dave, D., & Kaestner, R. (2009). Health Insurance and Ex Ante Moral Hazard: Evidence from Medicare. *International Journal of Health Care Finance and Economics*, 367-390.

Dawsey, A., & Bookwalter, J. (2016). Determinants of Intra-Household Gender Bias: Evidence from Timor-Leste. *Journal of International Development*, 938-952.

Ehrlich, I., & Becker, G. S. (1972). Market Insurance, Self-insurance, and Self-Protection . *Journal of Political Economy* , 623-648.

Einav, L., & Finkelstein, A. (2018). Moral Hazard in Health Insurance: What We Know and How We Know it. *Journal of the European Economic Association, 16*(4), 957-982.

Erlangga, D., Ali, S., & Bloor, K. (2019). The Impact of Public Health Insurance on Healthcare Utilisation. *International Journal of Public Health*, 603-613.

Farrell, C. M., & Gottlieb, A. (2020). The Effect of Health Insurance on Health Care Utilization in the Justice-Involved Population: United States, 2014–2016. *Am J Public Health, 110*(Suppl 1), S78–S84.

Fichera, E., Banks, J., Siciliani, L., & Sutton, M. (2018). Does Patient Health Behaviour Respond to Doctor Effort? *Journal of Economic Behavior and Organization*, 225-251.

Fichera, E., Gray, E., & Sutton, M. (2016). How Do Individuals' Health Behaviours Respond to an Increase In The Supply of Health Care? Evidence from A Natural Experiment. *Social Science & Medicine*, 170-179.

Frédéric, D. (2011, October 14). *SciencesPo*. Retrieved from sciencespo.fr: https://www.sciencespo.fr/mass-violence-war-massacre-resistance/en/document/three-centuries-violence-and-struggle-east-timor-1726-2008.html

Gignoux, J., & Menendez, M. (2016). Benefit in the Wake Disaster: Long-run Effects of Earthquakes on Welfare in Rural Indonesia. *Journal of Development Economics*, 26-44.

Global Campaign for Education. (2012). *Gender Discrimination in Education: The Violation of Rights of women and Girls.* Johannesburg.

Godber, E., Robinson, R., & Steiner, A. (1997). Economic Evaluation and the Shifting Balance Towards Primary Care: Definitions, Evidence, and Methodological Issues. *Health Economics*, 275-294.

Haddad, G. K., & Anbaji, M. Z. (2010). Analysis of Adverse Selection and Moral Hazard in the Health Insurance Market of Iran. *The Geneva Paper*, 581-599.

Hall, N. (2009). East Timorese Women Challenge Domestic Violence. *Australian Journal of Political Science*, 309-325.

Hallegatte, S., Vogt-Schilb, A., Rozenberg, J., Bangalore, M., & Beaudet, C. (2020). From Poverty to Disaster and Back: From Poverty to Disaster and Back:. *Economics of Disasters and Climate Change*, 223–247.

Hannum, E., Kong, P., & Zhang, Y. (2009). Family Sources of Educational Gender Inequality In Rural China: A Critical Assessment. *International Journal of Educational Development*, 474-486.

Harma, J. (2011). Low Cost Private Schooling in India: Is It Pro Poor and Equitable? *International Journal of Educational Development*, 350-356.

Hayes, A., & Setyonaluri, D. (2014). *Taking Advantage of The Demographic Divident in Indonesia: A Brief Introduction to Theory and Practice.* New York: The United Nations Population Fund.

Hill, H. (2021). What's Happened to Poverty and Inequality in Indonesia over Half a Century. *Asian Development Review*, 68-97.

Himaz, R. (2010). Intrahousehold Allocation of Education Expenditure: The Case of Sri Lanka. *Economic Development and Cultural Change*, 231-258.

Hsin, A. (2007). Children's Time Use: Labor Divisions and Schooling in Indonesia. *Journal of Marriage and Family*, 1297-1306.

Hulme, D., & Shepherd, A. (2003). Conceptualizing Chronic Poverty. *World Development, 31*(3), 403-423.

Hulme, D., Moore, K., & Shepherd, A. (2001). Chronic Poverty: Meanings and Analytical Frameworks. *CPRC Working Paper 2*, 1-41.

Ihromi, T. O. (1994). Inheritance and Equal Rights for Toba Batak Daughters. *Law & Society Review*, 525-538.

International Monetary Fund. (2018). *Pursuing Women's Economic Empowerment.* Washington D.C.: International Monetary Fund.

Jalan, J., & Ravallion, M. (2002). Geographic Poverty Traps? A Micro Model of Consumption Growth in Rural China. *Journal of Applied Econometrics*, 329-346. doi:10.1002/jae.645

Jann, B. (2008). The Blinder–Oaxaca Decomposition for Linear Regression Models. *The Stata Journal, 8*(4), 453-479.

Jerant, A., Fiscella, K., Tancredi, D. J., & Peters, F. (2013). Health Insurance is Associated with Preventive Care but Not Personal Health Behaviors. *Journal of American Board of Family Medicine*, 759-767.

Justino, P., Leone, M., & Salardi, P. (2011). Education and Conflict Recovery: The Case of Timor Leste. *IDS WORKING PAPER, 2011*(381), 1-50.

Justino, P., Leone, M., & Salardi, P. (2011). Education and Conflict Recovery: The Case of Timor Leste. *Institute of Development Studies Working Paper*, 1-50.

Kasper, J. D., Giovannini, T. A., & Hoffman, C. (2000). Gaining and Losing Health Insurance: Strengthening the Evidence for Effects on Access to Care and Health Outcomes. *Medical Care Research and Review*, 298-318.

Kementerian Perencanaan Pembangunan Nasional/Badan Perencanaan Pembangunan Nasional (BAPPENAS). (2015). *Rencana Pembangunan Jangka Menengah Nasional (RPJMN) 2015-2019.* Jakarta: Kementrian PPN/Bappenas.

Kevane, M., & Levine, D. I. (2000). The Changing Status of Daughters in Indonesia. *UC Berkely Working Paper Series*, 1-13.

Khanal, S. (2018). Gender Discrimination in Education Expenditure in Nepal: Evidence from Living Standards Surveys. *Asian Development Review*, 155-174.

Klasen, S., & Waibel, H. (2015). Vulnerability to Poverty in South-East Asia: Drivers, Measurement, Responses, and Policy Issues. *World Development, 71*, 1-3. doi:10.1016/j.worlddev.2014.01.007

Kraay, A., & McKenzie, D. (2014). Do Poverty Traps Exist? Assessing the Evidence. *Journal of Economic Perspectives*, 127-148.

Lave, J. R., Keane, C. R., Lin, C. J., Ricci, E. M., Amersbach, G., & LaVallee, C. P. (1998). Impact of a Children's Health Insurance Program on Newly Enrolled Children. *Journal of American Medical Association (JAMA)*, 1820-1825.

Leach, M. (2007). Surveying East Timorese Tertiary Student Attitudes to National Identity: 2002-2007. *Sout East Asia Research*, 405-431.

Levine, D. I., & Ames, M. (2003). Gender Bias and The Indonesian Financial Crisis: Were Girls Hit Hardest? *UC Berkeley Recent Work*, 1-29.

Linnerooth-Bayer, J., & Mechler, R. (2006). Insurance for assisting adaptation to climate change in. *Climate Policy, 6*(6), 621-636.

Lowes, S. (2019). Kinship Structure & Women: Evidence from Economics. *Daedalus: Journal of the American Academy of Arts and Science*, 119-133.

Mahendradhata, Y., Trisnantoro, L., Listyadewi, S., Soewondo, P., Marthias, T., Pandu Harimurti, & Prawira, J. (2017). *The Republic of Indonesia Health System Review.* New Delhi: Asia Pacific Observatory on Health System and Policies.

Maia, A. C., Andrade, M. V., & Chein, F. (2019). Ex-Ante Moral Hazard:. *Nova Economia*, 987-1008.

Malhotra, A., & Mather, M. (1997). Do Schooling and Work Empower Women in Developing Countries? Gender and Domestic Decisions in Sri Lanka. *Sociological Forum*, 599-630.

Mboi, N. (2015). Indonesia: On the Way to Universal Health Care. *Health Systems & Reform*, 91-97.

McKay, A., & Perge, E. (2013). How Strong is the Evidence for the Existence of Poverty Traps? A Multicountry Assessment. *The Journal of Development Studies*, 877-897.

Mullan, K., Sills, E., Pattanayak, S. K., & Caviglia-Harris, J. (2018). Converting Forests to Farms: The Economic Benefits of Clearing Forests in Agricultural Settlements in the Amazon. *Environ Resource Econ*, 427-455.

Oaxaca, R. (1973). Male–Female Wage Differentials in Urban Labor Markets. *International Economic Review, 14*, 693-709.

Panpiemras, J., Puttitanun, T., Samphantharak, K., & Thampanishvong, K. (2011). Impact of Universal Health Care Coverage on patient demand for health care services in Thailand. *Health Policy*, 228-235.

Picard, P. (2008). Natural Disaster Insurance and The Equity-Efficiency Trade-Off. *The Journal of Risk and Insurance*, 17-38.

Pisani, E., Kok, M. O., & Nugroho, K. (2017, March). Indonesia's Road to Universal Health Coverage: A Political Journey. *Health Policy Plan, 32*(2), 267–276. doi:10.1093/heapol/czw120

Preux, L. B. (2011). Anticipatory Ex Ante Moral Hazard and The Effect of Medicare on Prevention. *Health Economics*, 1056-1072.

Ravallion, M., & Chen, S. (1997). What Can New Survey Data Tell Us about Recent Changes in Distribution and Poverty? *The World Bank Economic Review*, 357-382.

Ravallion, M., & Wodon, Q. (1999). Poor Areas, or Only Poor People? *Journal of Regional Science*, 689-711.

Rodriguez-Oreggia, E., De La Fuente, A., De La Torre, R., & Moreno, H. A. (2013). Natural Disasters, Human Development and Poverty at the Municipal Level in Mexico. *The Journal of Development Studies*, 442-455.

Rosenhouse, S. (1994). Identifying the Poor: Is "Headship" a Useful Concept? *LSMS Working Paper*, 1-42.

Sahoo, S. (2017). An Assesment of Gender Discrimination in Household Expenditure on Education in India. *The Journal of Development Studies*, 1714-1730.

Santos, P., & Barrett, C. B. (2018). Heterogeneous Wealth Dynamics On the Roles of Risk and Ability. In C. B. Barrett, M. R. Carter, & J.-P. Chavas, *The Economics of Poverty Traps* (pp. 1-27). Chicago: Chicago Scholarship Online.

Sen, A. (1983). Poor, Relatively Speaking. *Oxford Economic Papers*, 153-169.

Shah, R. (2011). It Takes Two (or More) to Tango: Partnerships within The Education Sector in Timor-Leste. *International Education Journal: Comparative Perspective*, 71-85.

Shah, R. (2012). Goodbye Conflict, Hello Development? Curriculum Reform in Timor-Leste. *International Journal of Educational Development*, 31-38.

Stanciole, A. E. (2008). Health Insurance and Lifestyle Choice: Identifying Ex-Ante Moral Hazard in the US Market. *The Geneva Papers*, 627-644.

Starfield, B., Shi, L., & Macinko, J. (2005). Contribution of Primary Care to Health Systems and Health. *The Milbank Quarterly*, 457-502.

StataCorp. (2019). *Stata 16 Base Reference Manual.* College Station, TX: Stata Press.

Strauss, J., & Witoelar, F. (2019). Indonesia Family Life Survey. In G. D., & D. M., *Encyclopedia of Gerontology and Population Aging.* Springer, Cham. doi:https://doi.org/10.1007/978-3-319-69892-2_339-1

Tavares, A. I. (2014). Health insurance and lifestyles. *Applied Economics*, 1910-1023.

The World Bank. (2004). *Timor Leste: Education Since Independence Education Since Independence.* Human Development Sector Unit East Asia and Pacific Region. Washington DC: The World Bank.

The World Bank. (2011). *Vulnerability, Risk Reduction, and Adaptation to Climate Change: Indonesia.* Washington DC: The World Bank.

Utsumi, Y. (2021). Impact of Armed Conflict on Education in Timor-Leste. In F. Peddie, & J. Liu, *Education and Migration in an Asian Context* (pp. 153-185). Singapore: Springer. doi:https://doi.org/10.1007/978-981-33-6288-8

Warr, P. (2006). Poverty and Growth in Southeast Asia. *ASEAN Economic Bulletin, 23*(3), 279-302.

Warr, P., & Yusuf, A. A. (2013). World Food Prices and Poverty in Indonesia. *The Australian Journal of Agricultural and Resource Economics*, 1-21.

Widjaja, F. F. (2014). Universal Health Coverage in Indonesia - the Forgotten Prevention. *Medical Journal of Indonesia*, 125-126.

Woodhead, M., Frost, M., & James, Z. (2013). Does Growth in Private Schooling Contribute to Education for All? Evidence from Longitudinal, Two Cohort Study in Andhra Pradesh, India. *International Journal of Educational Development*, 65-73.

World Bank. (2013). *Global monitoring report.* Washington, DC: The World Bank.

World Bank Group. (2018). *Women, Business, and The Law 2018.* Washington D.C.: The World Bank.

Yilma, Z., van Kempen, L., & de Hoop, T. (2012). A Perverse 'net' Effect? Health Insurance and ex-ante Moral Hazard in Ghana. *Social Science & Medicine*, 138-147.

Yu, N. N., & Zhu, X. (2018). Affordable Care Encourages Healthy Living: Theory and Evidence from China's New Cooperative Medical Scheme. *Health Economics*, 2051-2066.

Zweifel, P., & Manning, W. G. (2000). Moral Hazard and Consumer Incentives in Health Care. In A. Culyer, & J. Newhouse (Eds.), *Handbook of Health Economics* (Vol. I, pp. 410-455). Amsterdam: Elsevier.

Appendix A – Chapter 1 Supplemental Information

Indonesia Poverty 1970-2018

Table 25. Poverty in Indonesia, 1970–2018

Year	Number in Poverty (Million)			% of Population			Poverty Line (Per capita, LCY, monthly)		% of Population ($1.9 per day at PPP)	% of Population ($3.2 per day at PPP)
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural		
1970			70			60				
1976	10	44.2	54.2	38.8	40.4	40.1	4,522	2,849		
1978	8.3	38.9	47.2	30.8	33.4	33.3	4,969	2,981		
1980	9.5	32.8	42.3	29	28.4	28.6	6,831	4,449		
1981	9.3	31.3	40.6	28.1	26.5	26.9	9,777	5,877		
1984	9.3	25.7	35	23.1	21.2	21.6	13,731	7,746	71.4	91.7
1987	9.7	20.3	30	20.1	16.1	17.4	17,381	10,294	71.4	92.7
1990	9.4	17.8	27.2	16.8	14.3	15.1	20,614	13,295	58.8	87
1993	8.7	17.2	25.9	13.4	13.8	13.7	27,905	18,244	58.5	86.6
1996	7.2	15.3	22.5	9.7	12.3	11.3	38,246	27,413		
1996	9.42	24.59	34.01	13.39	19.78	17.47	42,032	31,366	47.4	79.7
1998	17.6	31.9	49.5	21.92	25.72	24.2	96,959	72,780	66.7	90.2
1999	15.64	32.33	47.97	19.41	26.03	23.43	92,409	74,272	41.7	80.1
2000	12.31	26.43	38.74	14.6	22.38	19.14	91,632	73,648	39.3	79.9
2001	8.6	29.27	37.87	9.79	24.84	18.41	100,011	80,382	35.5	77.6
2002	13.32	25.08	38.39	14.46	21.1	18.2	130,499	96,512	22.8	65
2003	12.26	25.08	37.34	13.57	20.23	17.42	138,803	105,888	22.6	62.7
2004	11.37	24.78	36.15	12.13	20.11	16.66	143,455	108,725	23.9	62.9
2005	12.4	22.7	35.1	11.68	19.98	15.97	165,565	117,365	21.1	61.3
2006	14.49	24.81	39.3	13.47	21.81	17.75	174,290	130,584	27.4	65.7
2007	13.56	23.61	37.17	12.52	20.37	16.58	187,942	146,837	22.4	58.4
2008	12.77	22.19	34.96	11.65	18.93	15.42	204,896	161,831	21.8	57.3
2009	11.91	20.62	32.53	10.72	17.35	14.15	222,123	179,835	18.2	54.7
2010	11.1	19.93	31.02	9.87	16.56	13.33	232,989	192,354	15.7	48.1
March 2011	11.05	18.97	30.02	9.23	15.72	12.49	253,016	213,395	13.3	45.1
Sep-11	10.95	18.94	29.89	9.09	15.59	12.36	263,594	223,181		
March 2012	10.65	18.49	29.13	8.78	15.12	11.96	267,408	229,226		
Sep-12	10.51	18.09	28.59	8.6	14.7	11.66	277,382	240,441	11.6	43.3
March 2013	10.33	17.74	28.07	8.39	14.32	11.37	289,042	253,273		
Sep-13	10.63	17.92	28.55	8.52	14.42	11.47	308,826	275,779	9.4	40.8
March 2014	10.51	17.77	28.28	8.34	14.17	11.25	318,514	286,097		
Sep-14	10.36	17.37	27.73	8.16	13.76	10.96	326,853	296,681	7.9	37.9
March 2015	10.65	17.94	28.59	8.29	14.21	11.22	342,541	317,881		

Year	Number in Poverty (Million)			% of Population			Poverty Line (Per capita, LCY, monthly)		% of Population ($1.9 per day at PPP)	% of Population ($3.2 per day at PPP)
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural		
Sep-15	10.62	17.89	28.51	8.22	14.09	11.13	356,378	333,034	7.2	33.1
March 2016	10.34	17.67	28.01	7.79	14.11	10.86	364,527	343,647		
Sep-16	10.49	17.28	27.76	7.73	13.96	10.7	372,114	350,420	6.5	31
March 2017	10.67	17.1	27.77	7.72	13.93	10.64	385,621	361,496		
Sep-17	10.27	16.31	26.58	7.26	13.47	10.12	400,995	370,910	5.7	27.3
March 2018	10.14	15.81	25.95	7.02	13.20	9.82	415,614	383,908		

Source: *(Hill, 2021)*

Table 26. Summary Statistics of Variables in the Cross-Sectional Model (Full Sample)

Group	Variables Name	Explanation	Freq.	Mean	SD	Min	Max
Dependent Variable	Asset Total	Total Asset	276267	4.1871	2.2766	0	16
	Wealth Score	Wealth Score	276267	.00553	1.8873	-2.114761	9.693093
	Livelihood Index	Livelihood Index	276267	.9897	1.7074	.019249	210.5999
Geographic Variable	Mountain	Coastal Area	276267	.1863	.3893	0	1
	Rural	Rural Area	276267	.6250	.4841	0	1
Less Favorable Land (Land Quality)	Agricultural Land Conversion Rate	Dummy Land Conversion (to Farm)	276267	.0719	.2584	0	1
	Agricultural Land Conversion Dummy	% Land Conversion (to Farm)	276163	.9476	6.3806	0	100
Market Access	Bank Infrastructure	Dummy Bank	276267	.0365	.1876	0	1
Isolation & Remoteness Variables	Distance to Bank	Distance to Bank	276267	7.7657	18.0062	.1	295
	Distance to Sub-district	Distance to Sub-district	273391	39.5336	84.0523	.1	905
	Road Quality	Dummy Road Quality	271076	.9206	.2702	0	1
Disaster Variables	Flood	Dummy Flood	276257	.1938	.3953	0	1
	Drought	Dummy Drought	276267	.0227	.1489	0	1
Health Variables	Distance to *Puskesmas*	Distance to *Puskesmas*	185458	5.6220	7.1436	.1	97

Group	Variables Name	Explanation	Freq.	Mean	SD	Min	Max
Education Variables	Secondary School	Number of SMP (Middle School)	276267	1.1261	1.5294	0	15
Household Characteristics	Household Size	Household Size	276267	3.9143	1.7530	1	25
	Household Expenditure	Household Expenditure	276267	625550.8	714099.6	59208.33	8.53e+07
	Female-Headed household	Dummy Female-Headed Household	276267	.1398	.3468	0	1
Government Program	PNPM program within the village	Dummy PNPM Program	276267	.03168	.1751	0	1

Source: *Podes* 2011, *Susenas* 2011

Summary statistics in Table 13 indicate that households own approximately four assets (out of a total of 16) on average. It is also can be seen that 18.6 percent of households are living in the mountains, with the remainder living on flat land. Around 65.2 percent of household are in rural areas. General access to bank overall is low. Only 3.6 percent household respectively reported accessing those two economic infrastructures.

Table 27. Summary Statistic of Variables in the Panel Model (Full Sample)

Group		Wave 4					Wave 5				
	Variables Name	**Freq**	**Mean**	**SD**	**Min**	**Max**	**Freq**	**Mean**	**SD**	**Min**	**Max**
Dependent Variable	Asset Total	7538	5.01	1.61	0	11	8755	5.75	2.47	0	42
	Wealth Score	7538	-2.78E-10	1.388	-4.107	4.341	8755	-8.91E-11	1.384	-2.97	22.325
	Livelihood Index	7403	2.91	2.28	0	47	7905	7.48	13.19	0.4354	788.764
Geographical Variable	Mountain	7538	0.08	0.27	0	1	8748	0.07	0.25	0	1
	Rural	7538	0.67	0.47	0	1	8755	0.33	0.47	0	1
	MASL	4280	290.6786	290.0031	1	2000	4280	290.7806	290.0588	1	2000
	Temperature	4280	29.2164	4.4752	10	45	4280	29.2175	4.4760	10	45
Less Favorable Land (Land Quality)	Agricultural Land Conversion Rate	7538	0.09	0.28	0	1	8755	0.06	0.23	0	1
	Agricultural Land Conversion	7538	2.13	9.84	0	100	8755	1.22	6.82	0	60
Market Access	Market Infrastructure	7538	0.50	0.50	0	1	8755	0.47	0.50	0	1
Isolation Variables	Distance to Bank (in KM)	7509	3.51	7.19	0	50	8737	2.48	5.16	0.01	40
	Distance to District (in KM)	7116	19.81	23.33	1	655	8584	17.28	21.56	0.4	157
	Access Quality	7538	0.85	0.36	0	1	8755	0.83	0.38	0	1
Disaster Variables	Flood (dummy)	7538	0.26	0.44	0	1	8755	0.30	0.46	0	1
	Drought (dummy)	7538	0.09	0.28	0	1	8755	0.14	0.34	0	1
Health Variables	Number of *Puskesmas*	7538	2.27	1.10	1	7	8755	2.02	1.51	0	11
Education Variables	Secondary School	7491	3.57	2.02	1	11	7327	5.00	2.89	1	20
Household Characteristics	Female-Headed household	7538	0.04	0.21	0	1	8755	0.05	0.22	0	1
	Household Size	7538	4.37	1.71	2	14	7905	4.35	1.81	2	16
	Household Expenditure	7403	2,129,673	1,855,710	138,700	25,300,000	8755	8,146,150	11,900,000	416,667	501,000,000
Government Program	PNPM program within the village	7525	0.70	0.46	0	1	8755	0.96	0.19	0	1

Source: IFLS Wave 4 and 5

Based on IFLS wave 4 and wave 5, on average, households own five assets. The percentage of land conversion is declining around three percent (from 9.84 percent to 6.82 percent) between IFLS wave 4 and wave 5. Between the two waves, good road quality seems to be declining too, as shown by the percentage of households with easy access dropping from 85 percent to 83 percent. There is no significant change in the number of health infrastructure. On the other hand, education infrastructure (secondary school) is increasing steadily. Households headed by females increase by one percent in IFLS wave 5 (a feature that we return to in an extension of the results later in this article). However, the number of individuals in the household is stable at 4.3 on average.

Regression Robustness Check

Table 28. Single Variate Regression of Main Variable of Interest
(Welfare Score as Dependent Variable)

Dependent= wealth Score	Classical Geographic Variable	Less Favorable Land		Market Access
	Mountain	Farm Conversion (Dummy)	Farm Conversion (% Total)	Bank
Coefficient	-0.503***	-0.0414***	-0.00208***	0.599***
t-stat	(-68.93)	(-3.599)	(-4.432)	(23.86)
Constant	-0.412***	-0.528***	-0.529***	-0.541***
t-stat	(-116.0)	(-160.8)	(-166.0)	(-170.8)
Observations	172,687	172,687	172,677	172,687
R-Squared	0.027	0.000	0.000	0.003
F-Test	4752	12.95	19.64	569.5

Dependent= wealth Score	Isolation and Remoteness			Disaster		Female Headed Household
	Distance to Sub-district	Distance Bank	Quality Road	Flood	Drought	
Coefficient	-0.00836***	-0.00196***	0.592***	0.0673***	-0.312***	-0.484***
t-stat	(-41.79)	(-60.07)	(61.70)	(8.524)	(-17.30)	(-52.63)
Constant	-0.456***	-0.422***	-1.021***	-0.544***	-0.521***	-0.467***
t-stat	(-126.6)	(-118.1)	(-113.8)	(-155.1)	(-163.3)	(-139.3)
Observations	172,501	170,539	167,794	172,677	172,687	172,687
R-Squared	0.010	0.021	0.022	0.000	0.002	0.016
F-Test	1746	3608	3807	72.65	299.4	2770

Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: author

Based on the single variate linear regression with the welfare score, we can see that every main variable of interest shows the direction consistent with the prior expectation of the hypotheses. All classical geographical variables show a negative sign and are statistically significant. This shows that in terms of welfare, living in those areas is worse off for an individual. Market access show a positive and significant effect on welfare score. It means that, rural households living with these economics' infrastructure access tend to have higher welfare. This aligns with previous literature and prior expectations.

Furthermore, the isolation variable coefficients show the anticipated direction. Thus, when the village is located far from the central city or economic infrastructure (bank and market), an individual has worse wealth accumulation. Less favorable land proxy by farm conversion shows a negatively statistically significant coefficient. This means that a village with worse land quality needs a higher rate of land conversion to a farm to achieve higher production to accumulate higher wealth. All infrastructure and market access show a positive and significant effect on asset accumulation. This aligns with previous literature and prior expectations.

Individuals will be better off if the village considered has good road quality. The magnitude good road quality is on par with the geographical location variable. People living in the village with easy access and good road quality have one more asset accumulation on average compared with people who do not.

Lastly, disaster variables show a mixed result. The flood indicator shows a significant positive effect, whereas drought reveals the opposite. The speculative explanation of the flood result is that floods result in different effects depending on when it happens. If most floods happened during the growing seasons, then the impact of floods would be expected to increase

agricultural production, leading to higher asset accumulation significantly. We cannot confirm this explanation with certainty since we do not know when the actual floods have happened.

Table 29. Single Variate Regression of Main Variable of Interest
(Livelihood Index as Dependent Variable)

Dependent= Livelihood Index	Classical Geographic Variable	Less Favorable Land		Market Access
	Mountain	Farm Conversion (Dummy)	Farm Conversion (% Total)	Bank
Coefficient	-0.0995***	0.0201*	0.000753*	0.116***
t-stat	(-13.87)	(1.800)	(1.654)	(4.741)
Constant	0.844***	0.819***	0.820***	0.819***
t-stat	(241.9)	(257.3)	(265.2)	(266.3)
Observations	172,687	172,687	172,677	172,687
R-Squared	0.001	0.000	0.000	0.000
F-Test	192.3	3.239	2.735	22.48

Dependent= Livelihood Index	Isolation & Remoteness			Disaster		Female Headed Household
	Distance to Sub-district	Distance to Bank	Quality Road	Flood	Drought	
Coefficient	-0.00135***	-0.000326***	0.112***	0.0145*	-0.0308*	0.631***
t-stat	(-6.924)	(-10.18)	(11.84)	(1.897)	(-1.761)	(71.23)
Constant	0.833***	0.839***	0.726***	0.818***	0.822***	0.737***
t-stat	(237.2)	(239.3)	(82.30)	(240.1)	(265.1)	(228.2)
Observations	172,501	170,539	167,794	172,677	172,687	172,687
R-Squared	0.000	0.001	0.001	0.000	0.000	0.029
F-Test	47.94	103.6	140.1	3.599	3.099	5074

Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: author

The model with livelihood index shows similar results with the previous two dependent variables. The main difference is that both flood and drought variables show negative magnitude, although it is not significant for the flood. Furthermore, results on female-headed households are also different. In the regression, the female-headed household shown has a higher livelihood index than the male-headed household.

Table 30. Group Regression of Main Variable of Interest
(Welfare Score as Dependent Variable)

Geographical	Coefficient	Less Favorable Land	Coefficient	Market Access	Coefficient	Isolation	Coefficient	Disaster	Coefficient
Mountain	-0.507***	Farm Conversion (dummy)	-0.0205	Bank	0.593***	Distance to Sub-district (KM)	-0.00472***	Disaster Flood (Dummy)	0.0868***
	(-79.26)		(-1.508)		(18.54)		(-12.81)		(11.18)
		Farm Conversion Total	-0.00183***			Distance to Bank (KM)	-0.00131***	Disaster Drought (Dummy)	-0.340***
			(-3.451)				(-47.16)		0.0868***
						Quality Road (Dummy)	0.448***		
							(50.21)		
Female Headed	-0.490***	Female Headed	-0.484***	Female Headed	-0.483***	Female Headed	-0.540***	Female Headed	-0.473***
	(-62.96)		(-61.78)		(-61.67)		(-67.75)		(-124.4)
Constant	-0.346***	Constant	-0.463***	Constant	-0.476***	Constant	-0.715***	Constant	-0.473***
	(-87.19)		(-130.0)		(-138.8)		(-71.29)		(-127.7)
Obs.	172,687	Obs.	172,677	Obs.	172,687	Obs.	166,093	Obs.	172,677
R-squared	0.043	R-squared	0.016	R-squared	0.019	R-squared	0.051	R-squared	0.018
F-Stat	4943	F-Stat	1276	F-Stat	2068	F-Stat	3355	F-Stat	1446

Robust t-statistics in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

The result from group regression with welfare score as the dependent variable is like the model with an asset as the dependent variable. The main difference is that disaster (flood) is positive significant in this model, not in the asset model. In terms of R-squared, all groups in the welfare score model have a higher R-squared than the asset model.

Table 31. Group Regression of Main Variable of Interest (Livelihood Index as Dependent Variable)

Geographical	Coefficient	Less Favorable Land	Coefficient	Market Access	Coefficient	Isolation	Coefficient	Disaster	Coefficient
Mountain	-0.0942***	Farm Conversion (dummy)	-0.196***	Bank	0.123***	Distance to Sub-district (KM)	-0.000223	Disaster Flood (Dummy)	0.0166**
	(-14.04)		(-12.91)		(4.790)		(-0.908)		(2.297)
		Farm Conversion Total	0.0705***			Distance to Bank (KM)	-0.000171***	Disaster Drought (Dummy)	-0.0326*
			(5.693)				(-6.430)		(-1.942)
						Quality Road (Dummy)	0.0657***		
							(7.536)		
							-0.000223		
Female Headed	0.630***	Female Headed	0.631***	Female Headed	0.631***	Female Headed	0.626***	Female Headed	0.631***
	(49.63)		(49.75)		(49.75)		(48.55)		(49.75)
Constant	0.759***	Constant	0.735***	Constant	0.735***	Constant	0.693***	Constant	0.735***
	(217.4)		(238.3)		(251.5)		(75.80)		(221.8)
Obs.	172,687	Obs.	172,677	Obs.	172,687	Obs.	166,093	Obs.	172,677
R-squared	0.030	R-squared	0.029	R-squared	0.029	R-squared	0.029	R-squared	0.029
F-Stat	1399	F-Stat	845.1	F-Stat	1254	F-Stat	634.9	F-Stat	832.4

Robust t-statistics in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

The result from the model with livelihood index as a dependent variable is like the welfare score model. The main difference is that the female-headed household variable shows a significant positive effect on the livelihood index. This is similar to the result of the single-variable model. Other than that, other variables seem consistent with other results. It shows good robustness of the model.

Table 32. Regression of Main Interest Variables with Control Variables (Dependent Asset Total)

VARIABLES	(1) Geographic Location	(2) LFL	(3) Market Access	(4) Isolation	(5) Disaster	(6) All without Disaster	(7) Geo+Control	(8) All without control	(9) All With Control
Mountain	-0.807***	-0.806***	-0.803***	-0.751***	-0.795***	-0.749***	-0.658***	-0.741***	-0.618***
	(-85.88)	(-85.81)	(-85.53)	(-72.14)	(-77.16)	(-79.17)	(-51.05)	(-77.85)	(-47.95)
Dummy Land Conversion (to Farm)		-0.0760***				-0.0204		-0.0179	0.00354
		(-3.985)				(-1.063)		(-0.933)	(0.173)
% Land Conversion (to Farm)		-0.00103				0.000255		0.000422	-0.00239***
		(-1.391)				(0.330)		(0.548)	(-2.933)
Female Head	-0.789***	-0.789***	-0.787***	-0.847***	-0.789***	-0.846***	-0.491***	-0.846***	-0.504***
	(-66.64)	(-66.69)	(-66.58)	(-65.44)	(-61.38)	(-70.30)	(-34.34)	(-70.36)	(-35.07)
Bank (=1)			0.618***			0.426***		0.419***	0.477***
			(15.60)			(10.69)		(10.54)	(7.106)
Distance Kecamatan				-0.00520***		-0.00506***		-0.00508***	-0.00310***
				(-15.38)		(-12.09)		(-12.11)	(-5.363)
Distance Bank				-0.00183***		-0.00179***		-0.00175***	-0.00213***
				(-36.51)		(-44.06)		(-43.08)	(-41.87)
Good Road Quality (=1)				0.470***		0.467***		0.468***	0.249***
				(32.54)		(35.73)		(35.82)	(16.27)
Dummy Flood					0.116***			0.0933***	0.0537***
					(10.43)			(8.288)	(4.556)
Dummy Drought					-0.510***			-0.452***	-0.493***
					(-20.21)			(-18.87)	(-19.53)
Distance to Puskemas							-0.0196***		-0.0106***
							(-33.35)		(-14.59)
Number of SMP							0.0637***		0.0423***
							(11.95)		(7.907)
Household Size							0.249***		0.255***
							(41.54)		(42.55)
Household Expenditure							1.11e-06***		1.10e-06***
							(11.55)		(11.39)

VARIABLES	(1) Geographic Location	(2) LFL	(3) Market Access	(4) Isolation	(5) Disaster	(6) All without Disaster	(7) Geo+Control	(8) All without control	(9) All With Control
PNPM (=1)							0.0820***		0.159***
							(3.534)		(6.851)
Constant	4.039***	4.046***	4.028***	3.785***	4.029***	3.778***	2.588***	3.769***	2.407***
	(730.1)	(713.0)	(725.8)	(247.5)	(692.7)	(261.4)	(36.63)	(256.9)	(33.67)
Observations	172,687	172,677	172,687	166,093	172,677	166,083	131,935	166,073	129,269
R-squared	0.054	0.054	0.055	0.079	0.056	0.080	0.174	0.082	0.188
F test:	5808	2915	3948	2859	2575	2418	2315	1985	1358

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 33. Regression of Main Interest Variable with Control Welfare Score as Dependent Variable

VARIABLES	(1) Geographic Location	(2) LFL	(3) Market Access	(4) Isolation	(5) Disaster	(6) All without Disaster	(7) Geo +Control	(8) All without control	(9) All With Control
Mountain	-0.507***	-0.507***	-0.504***	-0.469***	-0.503***	-0.467***	-0.381***	-0.464***	-0.618***
	(-79.26)	(-79.21)	(-78.81)	(-64.25)	(-69.26)	(-72.66)	(-40.17)	(-71.74)	(-47.95)
Dummy Land Conversion (to Farm)		-0.0165				0.0130		0.0160	0.00354
		(-1.235)				(0.969)		(1.193)	(0.173)
% Land Conversion (to Farm)		-0.00183***				-0.000554		-0.000454	-0.00239***
		(-3.534)				(-1.029)		(-0.846)	(-2.933)
Female Head	-0.490***	-0.491***	-0.489***	-0.543***	-0.491***	-0.541***	-0.326***	-0.541***	-0.504***
	(-62.96)	(-62.98)	(-62.88)	(-59.81)	(-54.20)	(-68.32)	(-33.06)	(-68.36)	(-35.07)
Bank (=1)		-0.507***	0.558***			0.411***		0.408***	0.477***
			(17.66)			(12.94)		(12.89)	(7.106)
Distance Kecamatan				-0.00432***		-0.00420***		-0.00421***	-0.00310***
				(-18.24)		(-12.36)		(-12.40)	(-5.363)
Distance Bank				-0.00117***		-0.00114***		-0.00111***	-0.00213***
				(-33.23)		(-41.17)		(-40.07)	-0.362***
Good Road Quality (=1)				0.412***		0.409***		0.409***	(-38.18)
				(40.74)		(47.53)		(47.59)	0.0126

VARIABLES	(1) Geographic Location	(2) LFL	(3) Market Access	(4) Isolation	(5) Disaster	(6) All without Disaster	(7) Geo +Control	(8) All without control	(9) All With Control
Dummy Flood					0.0402***			0.0249***	(0.910)
					(5.137)			(3.198)	-0.00173***
Dummy Drought					-0.314***			-0.285***	(-3.203)
					(-17.65)			(-17.93)	-0.337***
Distance to Puskemas							-0.0165***		(-33.94)
							(-43.41)		0.435***
Number of SMP							0.0488***		(8.218)
							(13.35)		-0.00314***
Household Size							0.150***		(-8.271)
							(30.87)		-0.00130***
Household Expenditure							9.52e-07***		(-40.26)
							(11.76)		0.240***
PNPM (=1)							-0.0112		(25.17)
							(-0.736)		-0.00961
Constant	-0.346***	-0.342***	-0.356***	-0.583***	-0.345***	-0.590***	-1.336***	-0.589***	-1.526***
	(-87.19)	(-84.22)	(-89.69)	(-54.37)	(-84.21)	(-59.97)	(-22.59)	(-58.87)	(-25.69)
Observations	172,687	172,677	172,687	166,093	172,677	166,083	131,935	166,073	129,269
R-squared	0.043	0.043	0.046	0.074	0.045	0.075	0.199	0.077	0.213
F test:	4943	2478	3381	2651	2023	2449	1936	1986	1200

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix table 33, regression with welfare score, shows a similar result with the previous regression. All classical geographical variables show negative significance affecting the welfare score. Infrastructure shows a positive effect on welfare, and remoteness and isolation negatively affect the welfare score. As expected, female-headed households in this model have lower number of welfare scores than male-headed households.

Principal Component Analysis

The principal component analysis in this article is constructed from sixteen different assets. The list of the asset from 1 to 16:

1. House ownership
2. Land ownership
3. Motorboat ownership
4. Car ownership
5. PC ownership
6. Laptop ownership
7. Motorcycle ownership
8. Boat ownership
9. Air Conditioner ownership
10. Heater ownership
11. Phone ownership
12. Mobile Phone ownership
13. Fridge ownership
14. Gas Stove ownership
15. Cable TV ownership
16. Bicycle ownership

Resulting values as follow:

Table 34. PCA Eigen Value and Proportion

Component	Eigenvalue	Difference	Proportion	Cumulative
House ownership	3.53105	1.67116	0.2207	0.2207
Land ownership	1.85989	0.468714	0.1162	0.3369
Motorboat ownership	1.39118	0.215284	0.0869	0.4239
Car ownership	1.17589	0.139113	0.0735	0.4974
PC ownership	1.03678	0.188553	0.0648	0.5622
Laptop ownership	0.848228	0.0330533	0.053	0.6152
Motorcycle ownership	0.815175	0.00429002	0.0509	0.6661
Boat ownership	0.810885	0.0931118	0.0507	0.7168
Air Conditioner ownership	0.717773	0.00565235	0.0449	0.7617
Heater ownership	0.71212	0.0299294	0.0445	0.8062
Phone ownership	0.682191	0.071272	0.0426	0.8488
Mobile Phone ownership	0.610919	0.0161407	0.0382	0.887
Fridge ownership	0.594778	0.0763231	0.0372	0.9242
Gas Stove ownership	0.518455	0.0168516	0.0324	0.9566
Cable TV ownership	0.501604	0.308524	0.0314	0.9879
Bicycle ownership	0.19308	.	0.0121	1
Number of Observation				285,569
Number of comp.				16
Trace				16
Rho				1

Source: *Susenas* 2011, *Podes* 2011, Author's Calculation

Based on table 34, the first two components (house and land ownership) explain one-third of the wealth score construction. Ownership of a bicycle, on the other hand, as expected, has less impact on the wealth score construction. A correlation check between derived values for each component shows a good result with zero correlation between each component. The last check is conducting a test for sampling adequacy using the Kaiser-Meyer-Olkin method for household survey data. The Kaiser-Meyer-Olkin measure of sampling adequacy shows all the components are adequate to be used as a component and factor analysis, as seen in table 32 below.

Table 35. Kaiser-Meyer-Olkin Measure of Sampling Adequacy

No.	Variable	KMO
1	House ownership	0.5087
2	Land ownership	0.5089
3	Motorboat ownership	0.5125
4	Car ownership	0.887
5	PC ownership	0.8898
6	Laptop ownership	0.8897
7	Motorcycle ownership	0.7695
8	Boat ownership	0.6255
9	Air Conditioner ownership	0.8709
10	Heater ownership	0.8667
11	Phone ownership	0.8904
12	Mobile Phone ownership	0.7682
13	Fridge ownership	0.8673
14	Gas Stove ownership	0.8809
15	Cable TV ownership	0.8601
16	Bicycle ownership	0.8622
	Overall	**0.7767**

Source: *Susenas* 2011, *Podes* 2011, Author's Calculation

As reference, the Kaiser-Meyer-Olkin (KMO) returns values between 0 and 1. A rule of thumb for interpreting the statistic[113]:

- KMO values between 0.8 and 1 indicate the sampling is adequate.
- KMO values less than 0.5 indicate the sampling is not adequate and that remedial action should be taken.
- KMO values close to zero means that there are large partial correlations compared to the sum of correlations (widespread correlation)

Based on the table above, only three variables (land, house, and motorboat ownership) show the value close to 0.5, which is in the low end that the sample not adequate. However, since it is still bigger than 0.5, we can safely assume the variables are adequate to be included in factor

[113] From https://www.statisticshowto.com/kaiser-meyer-olkin/ accessed 12/16/2021

analysis and PCA method. Moreover, 10 out 16 variables show an adequate value for factor analysis (bigger than 0.8). The last three variables (motorcycle, boat, and mobile phone ownership) show the value between 0.6 to 0.7 which means all of them are adequate as factor analysis variables.

Table 36. Interaction Regression of Main Interest Variable (Geographical Variable and Isolation)

VARIABLES (Asset Total as Dependent)	Interaction Regression
Mountain	-0.927***
	(-27.62)
Distance to Sub-district (KM)	-0.000201
	(-0.341)
Mountain*Distance to Sub-district (KM)	-0.00649***
	(-5.994)
Distance to Bank (KM)	-0.00159***
	(-17.97)
Mountain*Distance to Bank (KM)	0.000506***
	(5.061)
Good Quality Access (=1)	0.157***
	(8.387)
Mountain*Good Quality Access (=1)	0.373***
	(12.48)
Farm Conversion (dummy)	-0.00972
	(-0.475)
Farm Conversion Total	-0.00260***
	(-3.154)
Bank (dummy)	0.514***
	(7.652)
Distance to Hospital (KM)	-0.00958***
	(-15.28)
Distance to *Puskesmas* (KM)	0.0380***
	(7.084)
# of Middle School in Village	0.255***
	(42.37)
Household Size	1.10e-06***
	(11.40)
Expenditure per Capita	-0.502***
	(-34.95)
Village Receiving PNPM	0.161***
	(6.973)
Constant	2.469***
	(33.95)
Observations	129,564
R-squared	0.187
F-stat	1391

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 37. Interaction Regression of Main Interest Variable (Classical Geographical Variable and Disaster)

VARIABLES (Asset Total as Dependent)	**Interaction Regression**
Mountain	-0.653***
	(-47.49)
Disaster Flood (Dummy)	0.0692***
	(5.245)
Mountain*Disaster Flood (Dummy)	-0.0508*
	(-1.829)
Disaster Drought (Dummy)	-0.543***
	(-18.12)
Mountain*Disaster Drought (Dummy)	0.172***
	(3.207)
Farm Conversion (dummy)	-0.0639***
	(-3.141)
Farm Conversion Total	-0.00404***
	(-5.115)
Bank (dummy)	0.553***
	(8.239)
Distance to *Puskesmas* (KM)	-0.0159***
	(-31.12)
# of Middle School in Village	0.0625***
	(11.73)
Household Size	0.249***
	(41.70)
Expenditure per Capita	1.11e-06***
	(11.55)
Village Receiving PNPM	0.0866***
	(3.748)
Female Head	-0.490***
	(-34.35)
Constant	2.570***
	(36.56)
Observations	132,262
R-squared	0.176
F-Stat	1202

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix B – Chapter 2 Supplemental Information

Table 38. Summary Statistics Variable Interest

Variables	Freq.	Mean	SD	Min	Max
Working Out Category	28279	0.976	0.732	0	2
Smoking Category	10956	2.735	0.745	0	3
# Cigarette (Smoking)	11974	12.030	8.140	0	81
% Protein Consumption	31246	0.233	0.134	0	1
% Protein and Vegetables Consumption	31246	0.322	0.157	0	1
% Vegetable Consumption	31246	0.089	0.072	0	0.891
Outpatient in the Last Year	31530	0.172	0.377	0	1
Checkup in the Last 5 Year	30996	0.108	0.310	0	1
# of Sick Days	31539	0.336	1.779	0	28
Dummy Insurance (=1)	31550	0.387	0.487	0	1
Insurance Public	31550	0.322	0.467	0	1
Year	31550	2,010.5	3.500	2007	2014
Female	31550	0.506	0.500	0	1
Age	31548	39.833	13.895	14	100
Household Expenditure	29582	4,720,457	10,500,000	205,766.70	514,000,000
Household Size	31550	4.574	1.779	2	22
Female Household Head	31550	0.031	0.173	0	1
Education	31480	8.211	4.395	0	23
# Puskemas	31550	1.663	1.475	0	11

Source: IFLS Wave 4 and 5, the author calculated

Table 39. Estimation Results Working Out (Panel)

	Work Out Intensity			
VARIABLES	**1**	**2**	**3**	**4**
Dummy Insurance (=1)	-0.180***	-0.0475**	-0.0473**	-0.113***
	(0.0173)	(0.0195)	(0.0195)	(0.0386)
Age	-0.0163***	-0.0112***	-0.0113***	-0.0114***
	(0.000701)	(0.000774)	(0.000774)	(0.000775)
Female (=1)	-0.220***	-0.215***	-0.215***	-0.217***
	(0.0169)	(0.0190)	(0.0190)	(0.0190)
Education	-0.0293***	-0.0238***	-0.0233***	-0.0229***
	(0.00209)	(0.00237)	(0.00238)	(0.00239)
Year (=2014)		-0.0965***	-0.0961***	-0.0966***
		(0.00293)	(0.00294)	(0.00295)
Household Expenditure		-1.18e-09	-1.15e-09	-1.11e-09
		(8.67e-10)	(8.66e-10)	(8.67e-10)
Household Size		-0.0186***	-0.0193***	-0.0197***

		(0.00519)	(0.00519)	(0.00520)
# Puskemas			0.0139**	0.0133**
			(0.00625)	(0.00625)
Insurance Public				0.0787**
				(0.0398)
Ln Sigma	-3.292***	-1.978***	-1.987***	-1.991***
	(0.482)	(0.171)	(0.172)	(0.172)
Constant	1.677***	195.5***	194.7***	195.7***
	(0.0439)	(5.896)	(5.901)	(5.926)
Observations	28,221	26,566	26,566	26,566

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 40. Margins Results Working Out (Panel)

Work Out Intensity (Margins)				
VARIABLES	**1**	**2**	**3**	**4**
Dummy Insurance (=1)	-0.0584***	-0.0142*	-0.0141*	-0.0337**
	(-10.52)	(-2.44)	(-2.43)	(-2.93)
Age	-0.00529***	-0.00333***	-0.00336***	-0.00338***
	(-24.59)	(-14.75)	(-14.84)	(-14.93)
Female (=1)	-0.0711***	-0.0640***	-0.0640***	-0.0645***
	(-13.17)	(-11.46)	(-11.45)	(-11.54)
Education	-0.00949***	-0.00708***	-0.00693***	-0.00682***
	(-14.31)	(-10.13)	(-9.87)	(-9.67)
Year (=2014)		-0.0287***	-0.0286***	-0.0288***
		(-36.48)	(-36.29)	(-36.32)
Household Expenditure		-3.52e-10***	-3.43e-10***	-3.31e-10***
		(-4.75)	(-4.63)	(-4.47)
Household Size		-0.00553***	-0.00576***	-0.00587***
		(-3.58)	(-3.73)	(-3.79)
# Puskemas			0.00413*	0.00397*
			-2.22	-2.13
Insurance Public				0.0232*
				(2)
Observations	28221	26566	26566	26566

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 41. Estimation Results of Insurance Category-Working Out (Cross-Section)

Work Out Intensity (Cross-Section Probit)				
VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**
Loser Group	-0.106**	-0.120**	-0.120**	-0.120**
	(0.0447)	(0.0472)	(0.0472)	(0.0472)

Gainer Group	-0.0574**	-0.0754***	-0.0755***	-0.205***
	(0.0259)	(0.0273)	(0.0273)	(0.0678)
Stayer Group	-0.0715**	-0.0852***	-0.0847**	-0.0417
	(0.0310)	(0.0329)	(0.0329)	(0.0725)
Insurance Public				-0.0519
				(0.0750)
Loser Group*Insurance Public				0
				(0)
Gainer Group*Insurance Public				0.196*
				(0.101)
Stayer Group*Insurance Public				0
				(0)
Age	-0.0123***	-0.0121***	-0.0121***	-0.0122***
	(0.000939)	(0.00100)	(0.00101)	(0.00101)
Female (=1)	-0.208***	-0.202***	-0.202***	-0.202***
	(0.0221)	(0.0234)	(0.0234)	(0.0235)
Education	-0.0137***	-0.0116***	-0.0115***	-0.0109***
	(0.00276)	(0.00298)	(0.00299)	(0.00300)
Household Expenditure		-1.35e-09	-1.35e-09	-1.31e-09
		(9.02e-10)	(9.02e-10)	(9.02e-10)
Household Size		0.00156	0.00148	0.00129
		(0.00685)	(0.00686)	(0.00686)
# Puskemas			0.00332	0.00305
			(0.00763)	(0.00763)
Constant	1.041***	1.031***	1.027***	1.026***
	(0.0583)	(0.0703)	(0.0710)	(0.0710)
Observations	13,585	12,166	12,166	12,166

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 42. Estimation Results of Percentage Protein Share (Panel)

	% Protein					
VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Dummy Insurance (=1)	0.00517**	0.00511**	0.00506**	0.00518**	0.0130**	0.0130**
	(0.00227)	(0.00239)	(0.00239)	(0.00240)	(0.00527)	(0.00527)
Insurance Public					-0.00923*	-0.00923*
					(0.00545)	(0.00545)
Year (=2014)	0.00198	-0.0139	-0.0142	-0.0153	-0.0149	-0.0149
	(0.00145)	(0.0109)	(0.0110)	(0.0110)	(0.0110)	(0.0110)
Age		0.00221	0.00230	0.00241	0.00242	0.00242
		(0.00158)	(0.00159)	(0.00159)	(0.00159)	(0.00159)
Household Expenditure		5.22e-11	0	0	0	0
		(6.90e-11)	(6.98e-11)	(7.01e-11)	(7.02e-11)	(7.02e-11)

Household Size			0.00244***	0.00260***	0.00264***	0.00264***
			(0.000731)	(0.000731)	(0.000731)	(0.000731)
Female Head			0.0137*	0.0142**	0.0142**	0.0142**
			(0.00717)	(0.00717)	(0.00717)	(0.00717)
Education				0.00114	0.00108	0.00108
				(0.000860)	(0.000860)	(0.000860)
# Puskemas		-0.00152*	-0.00165*	-0.00162*	-0.00159*	-0.00159*
		(0.000857)	(0.000857)	(0.000857)	(0.000857)	(0.000857)
Constant	0.230***	0.152***	0.137**	0.123**	0.123**	0.123**
	(0.000867)	(0.0574)	(0.0578)	(0.0582)	(0.0582)	(0.0582)
Observations	31,246	29,571	29,571	29,518	29,518	29,518
R-squared	0.001	0.001	0.002	0.002	0.003	0.003
Number of pidlink2	15,771	15,732	15,732	15,731	15,731	15,731

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 43. Estimation Results of Percentage Protein+Vegetables Share (Panel)

	% Protein + Vegetables					
VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Dummy Insurance (=1)	0.00579**	0.00588**	0.00583**	0.00608**	0.0200***	0.0200***
	(0.00264)	(0.00279)	(0.00279)	(0.00279)	(0.00620)	(0.00620)
Insurance Public					-0.0166***	-0.0166***
					(0.00640)	(0.00640)
Year (=2014)	0.0104***	0.00283	0.00303	0.00235	0.00301	0.00301
	(0.00166)	(0.0122)	(0.0122)	(0.0122)	(0.0122)	(0.0122)
Age		0.000936	0.000919	0.000957	0.000973	0.000973
		(0.00175)	(0.00175)	(0.00176)	(0.00175)	(0.00175)
Household Expenditure		2.30e-10**	2.27e-10**	2.26e-10**	2.28e-10**	2.28e-10**
		(1.09e-10)	(1.09e-10)	(1.08e-10)	(1.11e-10)	(1.11e-10)
Household Size			-4.08e-05	8.95e-05	0.000150	0.000150
			(0.000845)	(0.000847)	(0.000846)	(0.000846)
Female Head			0.0198**	0.0209**	0.0209**	0.0209**
			(0.00812)	(0.00811)	(0.00812)	(0.00812)
Education				0.00102	0.000917	0.000917
				(0.000991)	(0.000991)	(0.000991)
# Puskemas		-0.00146	-0.00152	-0.00149	-0.00145	-0.00145
		(0.000972)	(0.000972)	(0.000972)	(0.000972)	(0.000972)
Constant	0.315***	0.282***	0.283***	0.272***	0.272***	0.272***
	(0.00102)	(0.0637)	(0.0639)	(0.0645)	(0.0644)	(0.0644)
Observations	31,246	29,571	29,571	29,518	29,518	29,518
R-squared	0.004	0.005	0.006	0.006	0.006	0.006

Number of pidlink2	15,771	15,732	15,732	15,731	15,731	15,731

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 44. Estimation Results of Percentage Vegetables Share (Panel)

	% Vegetables					
VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Dummy Insurance (=1)	0.000615	0.000778	0.000776	0.000906	0.00707**	0.00707**
	(0.00131)	(0.00139)	(0.00138)	(0.00139)	(0.00295)	(0.00295)
Insurance Public					-0.00732**	-0.00732**
					(0.00300)	(0.00300)
Year (=2014)	0.00844***	0.0167***	0.0172***	0.0176***	0.0179***	0.0179***
	(0.000812)	(0.00615)	(0.00612)	(0.00613)	(0.00614)	(0.00614)
Age		-0.00128	-0.00138	-0.00146*	-0.00145*	-0.00145*
		(0.000880)	(0.000877)	(0.000877)	(0.000877)	(0.000877)
Household Expenditure		1.78e-10*	1.84e-10**	1.87e-10**	1.88e-10**	1.88e-10**
		(9.11e-11)	(9.11e-11)	(9.11e-11)	(9.25e-11)	(9.25e-11)
Household Size			-0.00248***	-0.00252***	-0.00249***	-0.00249***
			(0.000414)	(0.000416)	(0.000416)	(0.000416)
Female Head			0.00613	0.00664*	0.00663*	0.00663*
			(0.00394)	(0.00395)	(0.00395)	(0.00395)
Education				-0.000121	-0.000167	-0.000167
				(0.000505)	(0.000505)	(0.000505)
# Puskemas		6.24e-05	0.000125	0.000125	0.000144	0.000144
		(0.000504)	(0.000504)	(0.000505)	(0.000506)	(0.000506)
Constant	0.0849***	0.131***	0.146***	0.149***	0.149***	0.149***
	(0.000516)	(0.0319)	(0.0319)	(0.0323)	(0.0323)	(0.0323)
Observations	31,246	29,571	29,571	29,518	29,518	29,518
R-squared	0.008	0.010	0.013	0.013	0.013	0.013
Number of pidlink2	15,771	15,732	15,732	15,731	15,731	15,731

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 45. Estimation Results of Percentage Protein Share (Cross-Section)

% Protein (Cross-Section Category)				
VARIABLES	**(1) Cluster REG**	**(2) Reg**	**(3) Cluster Reg**	**(4) Reg**
Loser Group	-0.0138***	-0.0133***	-0.0138***	-0.0133***
	(0.00462)	(0.00467)	(0.00462)	(0.00467)
Gainer Group	-0.00861***	-0.0116***	0.00901	0.00887
	(0.00264)	(0.00263)	(0.00633)	(0.00640)
Stayer Group	-0.0105***	-0.00991***	0.0166**	0.0172**
	(0.00316)	(0.00316)	(0.00737)	(0.00744)
Insurance Public			-0.0314***	-0.0312***

			(0.00763)	(0.00769)
Loser Group*Insurance Public			0	0
			(0)	(0)
Gainer Group*Insurance Public			0.0119	0.00867
			(0.00989)	(0.01000)
Stayer Group*Insurance Public			0	0
			(0)	(0)
Age	0.00113***	0.00103***	0.00115***	0.00106***
	(9.58e-05)	(9.51e-05)	(9.58e-05)	(9.51e-05)
Household Expenditure	3.71e-10***	3.52e-10***	3.60e-10***	3.39e-10***
	(9.65e-11)	(9.76e-11)	(9.46e-11)	(9.54e-11)
Household Size	0.00186***	0.00237***	0.00197***	0.00248***
	(0.000642)	(0.000644)	(0.000640)	(0.000643)
Female Head	0.0234***	0.0233***	0.0236***	0.0235***
	(0.00673)	(0.00677)	(0.00673)	(0.00677)
Education	0.00602***	0.00571***	0.00591***	0.00558***
	(0.000292)	(0.000291)	(0.000293)	(0.000292)
# Puskemas	-6.79e-05	-0.00210***	2.20e-05	-0.00195***
	(0.000782)	(0.000757)	(0.000781)	(0.000756)
Constant	0.129***	0.137***	0.128***	0.136***
	(0.00646)	(0.00635)	(0.00645)	(0.00634)
Observations	14,024	14,024	14,024	14,024
R-squared	0.062	0.037	0.064	0.039

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 46. Estimation Results of Percentage Protein+Vegetables Share (Cross-Section)

% Protein+Vegetables (Cross-Section Category)				
VARIABLES	**(1) Cluster REG**	**(2) Reg**	**(3) Cluster Reg**	**(4) Reg**
Loser Group	-0.0182***	-0.0183***	-0.0183***	-0.0183***
	(0.00538)	(0.00545)	(0.00538)	(0.00545)
Gainer Group	-0.0106***	-0.0125***	0.0132*	0.0133*
	(0.00308)	(0.00307)	(0.00771)	(0.00775)
Stayer Group	-0.0108***	-0.00953**	0.0143*	0.0149*
	(0.00373)	(0.00371)	(0.00847)	(0.00857)
Insurance Public			-0.0290***	-0.0280***
			(0.00880)	(0.00887)
Loser Group*Insurance Public			0	0
			(0)	(0)

Gainer Group*Insurance Public			0.00250	-0.000468
			(0.0117)	(0.0118)
Stayer Group*Insurance Public			0	0
			(0)	(0)
Age	0.00158***	0.00149***	0.00161***	0.00152***
	(0.000112)	(0.000111)	(0.000112)	(0.000111)
Household Expenditure	6.76e-10***	6.70e-10***	6.63e-10***	6.56e-10***
	(1.23e-10)	(1.24e-10)	(1.22e-10)	(1.23e-10)
Household Size	0.000648	0.000887	0.000766	0.000997
	(0.000745)	(0.000746)	(0.000744)	(0.000745)
Female Head	0.0332***	0.0322***	0.0334***	0.0324***
	(0.00786)	(0.00784)	(0.00785)	(0.00783)
Education	0.00802***	0.00761***	0.00788***	0.00747***
	(0.000343)	(0.000341)	(0.000344)	(0.000342)
# Puskemas	-0.00108	-0.00267***	-0.000984	-0.00251***
	(0.000915)	(0.000881)	(0.000914)	(0.000880)
Constant	0.192***	0.201***	0.191***	0.200***
	(0.00760)	(0.00747)	(0.00759)	(0.00746)
Observations	14,024	14,024	14,024	14,024
R-squared	0.068	0.052	0.070	0.053

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 47. Estimation Results of Percentage Vegetables Share (Cross-Section)

% Vegetables (Cross-Section Category)				
VARIABLES	**(1) Cluster REG**	**(2) Reg**	**(3) Cluster Reg**	**(4) Reg**
Loser Group	-0.00443*	-0.00497**	-0.00442*	-0.00496**
	(0.00240)	(0.00241)	(0.00240)	(0.00241)
Gainer Group	-0.00203	-0.000927	0.00423	0.00439
	(0.00153)	(0.00150)	(0.00363)	(0.00362)
Stayer Group	-0.000301	0.000384	-0.00233	-0.00235
	(0.00181)	(0.00179)	(0.00364)	(0.00364)
Insurance Public			0.00243	0.00325
			(0.00381)	(0.00379)
Loser Group*Insurance Public			0	0
			(0)	(0)
Gainer Group*Insurance Public			-0.00937*	-0.00914*
			(0.00523)	(0.00523)
Stayer Group*Insurance Public			0	0
			(0)	(0)
Age	0.000455***	0.000465***	0.000456***	0.000465***
	(5.45e-05)	(5.48e-05)	(5.45e-05)	(5.48e-05)
Household Expenditure	3.05e-10***	3.18e-10***	3.03e-10***	3.17e-10***
	(9.58e-11)	(9.73e-11)	(9.59e-11)	(9.74e-11)
Household Size	-0.00122***	-0.00149***	-0.00120***	-0.00148***

	(0.000367)	(0.000364)	(0.000368)	(0.000364)
Female Head	0.00977**	0.00889**	0.00980**	0.00892**
	(0.00420)	(0.00421)	(0.00420)	(0.00420)
Education	0.00200***	0.00191***	0.00197***	0.00189***
	(0.000176)	(0.000176)	(0.000177)	(0.000177)
# Puskemas	-0.00101**	-0.000564	-0.00101**	-0.000555
	(0.000427)	(0.000410)	(0.000427)	(0.000411)
Constant	0.0634***	0.0638***	0.0635***	0.0638***
	(0.00373)	(0.00366)	(0.00373)	(0.00366)
Observations	14,024	14,024	14,024	14,024
R-squared	0.033	0.021	0.034	0.021

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 48. Estimation Results of Sick Days (Panel)

	Sick Days					
VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Dummy Insurance (=1)	0.0566*	0.0281	0.0276	0.0293	0.0298	-0.0490
	(0.0341)	(0.0354)	(0.0354)	(0.0355)	(0.0355)	(0.0594)
Insurance Public						0.0936
						(0.0636)
Year (=2014)	0.174***	0.233	0.233	0.235	0.251	0.247
	(0.0204)	(0.163)	(0.163)	(0.163)	(0.163)	(0.163)
Year*Female					-0.0280	-0.0284
					(0.0400)	(0.0400)
Age		-0.00866	-0.00857	-0.00875	-0.00896	-0.00905
		(0.0236)	(0.0235)	(0.0235)	(0.0235)	(0.0235)
Household Expenditure		-3.59e-10	-3.99e-10	-3.18e-10	-3.21e-10	-3.31e-10
		(6.59e-10)	(6.59e-10)	(6.60e-10)	(6.61e-10)	(6.61e-10)
Household Size			0.00521	0.00489	0.00496	0.00462
			(0.0128)	(0.0129)	(0.0129)	(0.0129)
Female Head			0.183*	0.187*	0.189*	0.189*
			(0.107)	(0.107)	(0.107)	(0.107)
Education				-0.0145	-0.0146	-0.0140
				(0.0127)	(0.0127)	(0.0127)
# Puskemas		0.0165	0.0157	0.0139	0.0138	0.0136
		(0.0136)	(0.0136)	(0.0136)	(0.0136)	(0.0136)
Constant	0.227***	0.522	0.490	0.617	0.625	0.628
	(0.0139)	(0.860)	(0.860)	(0.871)	(0.871)	(0.871)
Observations	31,539	29,571	29,571	29,518	29,518	29,518
R-squared	0.006	0.006	0.006	0.006	0.006	0.006
Number of pidlink2	15,775	15,735	15,735	15,734	15,734	15,734

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 49. Estimation Results of Sick Primary (Panel)

	Sick Primary					
VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Dummy Insurance (=1)	0.111	0.101	0.1000	0.0931	0.0945	-0.0611
	(0.0836)	(0.0880)	(0.0880)	(0.0880)	(0.0880)	(0.171)
Insurance Public						0.185
						(0.176)
Year (=2014)	0.880***	0.745*	0.746*	0.763*	0.804*	0.797*
	(0.0509)	(0.407)	(0.407)	(0.407)	(0.411)	(0.411)
Year*Female					-0.0741	-0.0749
					(0.0998)	(0.0998)
Age		0.0179	0.0179	0.0182	0.0177	0.0175
		(0.0588)	(0.0589)	(0.0588)	(0.0588)	(0.0588)
Household Expenditure		-3.62e-09*	-3.66e-09*	-3.11e-09	-3.11e-09	-3.13e-09
		(2.01e-09)	(2.01e-09)	(2.00e-09)	(2.00e-09)	(1.98e-09)
Household Size			0.00320	-0.00268	-0.00248	-0.00316
			(0.0277)	(0.0278)	(0.0278)	(0.0278)
Female Head			0.252	0.286	0.290	0.290
			(0.241)	(0.242)	(0.241)	(0.241)
Education				-0.103***	-0.103***	-0.102***
				(0.0326)	(0.0327)	(0.0327)
# Puskemas		0.0146	0.0137	0.0132	0.0130	0.0125
		(0.0327)	(0.0328)	(0.0328)	(0.0328)	(0.0328)
Constant	1.447***	0.778	0.758	1.605	1.624	1.630
	(0.0330)	(2.139)	(2.145)	(2.168)	(2.168)	(2.168)
Observations	31,534	29,567	29,567	29,515	29,515	29,515
R-squared	0.023	0.022	0.022	0.022	0.022	0.023
Number of pidlink2	15,775	15,735	15,735	15,734	15,734	15,734

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 50. Estimation Results of Sick Days (Cross-Section)

Sick Days (Cross-Section Category)				
VARIABLES	**(1) Cluster REG**	**(2) Reg**	**(3) Cluster Reg**	**(4) Reg**
Loser Group	0.0460	0.0427	0.0463	0.0426
	(0.0699)	(0.0696)	(0.0699)	(0.0696)
Gainer Group	0.103**	0.0966**	0.0606	0.0667
	(0.0416)	(0.0406)	(0.0787)	(0.0777)
Stayer Group	0.0484	0.0501	-0.0663	-0.0573
	(0.0504)	(0.0493)	(0.0650)	(0.0630)
Insurance Public			0.134*	0.124*
			(0.0745)	(0.0727)
Loser Group*Insurance Public			0	0
			(0)	(0)
Gainer Group*Insurance Public			-0.0861	-0.0914
			(0.112)	(0.111)
Stayer Group*Insurance Public			0	0

			(0)	(0)
Female	0.0642*	0.0647*	0.0618*	0.0624*
	(0.0349)	(0.0347)	(0.0349)	(0.0347)
Age	0.0146***	0.0145***	0.0145***	0.0144***
	(0.00224)	(0.00221)	(0.00224)	(0.00221)
Household Expenditure	-5.48e-10	-7.75e-10	-5.09e-10	-7.41e-10
	(6.39e-10)	(6.23e-10)	(6.38e-10)	(6.22e-10)
Household Size	0.0108	0.0122	0.0104	0.0119
	(0.0101)	(0.00997)	(0.0101)	(0.00997)
Female Head	0.276*	0.271*	0.276*	0.271*
	(0.147)	(0.147)	(0.147)	(0.147)
Education	-0.0147***	-0.0153***	-0.0144***	-0.0151***
	(0.00432)	(0.00419)	(0.00435)	(0.00421)
# Puskemas	0.0152	0.0105	0.0149	0.0100
	(0.0121)	(0.0118)	(0.0121)	(0.0119)
Constant	-0.241*	-0.224*	-0.236*	-0.219*
	(0.124)	(0.120)	(0.124)	(0.120)
Observations	14,018	14,018	14,018	14,018
R-squared	0.015	0.014	0.016	0.014

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 51. Estimation Results of Sick Primary (Cross-Section)

Sick Primary(Cross-Section Category)				
VARIABLES	**(1) Cluster REG**	**(2) Reg**	**(3) Cluster Reg**	**(4) Reg**
Loser Group	0.142	0.0860	0.142	0.0856
	(0.176)	(0.175)	(0.176)	(0.176)
Gainer Group	0.352***	0.336***	0.125	0.131
	(0.103)	(0.100)	(0.209)	(0.206)
Stayer Group	0.205*	0.165	0.0749	0.0875
	(0.124)	(0.123)	(0.250)	(0.250)
Insurance Public			0.149	0.0869
			(0.265)	(0.264)
Loser Group*Insurance Public			0	0
			(0)	(0)
Gainer Group*Insurance Public			0.103	0.140
			(0.337)	(0.338)
Stayer Group*Insurance Public			0	0
			(0)	(0)
Female	0.478***	0.478***	0.474***	0.475***
	(0.0864)	(0.0865)	(0.0866)	(0.0868)

Age	0.0578***	0.0577***	0.0576***	0.0575***
	(0.00441)	(0.00435)	(0.00442)	(0.00436)
Household Expenditure	-3.38e-09**	-3.88e-09**	-3.27e-09**	-3.79e-09**
	(1.67e-09)	(1.67e-09)	(1.67e-09)	(1.67e-09)
Household Size	0.0235	0.0257	0.0226	0.0251
	(0.0277)	(0.0271)	(0.0277)	(0.0271)
Female Head	0.725**	0.710**	0.724**	0.709**
	(0.309)	(0.309)	(0.309)	(0.309)
Education	-0.0439***	-0.0427***	-0.0427***	-0.0417***
	(0.0112)	(0.0109)	(0.0113)	(0.0109)
# Puskemas	0.00896	0.0255	0.00827	0.0246
	(0.0311)	(0.0294)	(0.0311)	(0.0294)
Constant	-0.296	-0.317	-0.290	-0.311
	(0.281)	(0.270)	(0.281)	(0.271)
Observations	14,017	14,017	14,017	14,017
R-squared	0.034	0.031	0.034	0.031

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 52. Estimation Results of Outpatient Utilization (Panel)

	Outpatient					
VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Dummy Insurance (=1)	0.161***	0.145***	0.146***	0.135***	0.136***	0.189***
	(0.0196)	(0.0204)	(0.0204)	(0.0205)	(0.0205)	(0.0400)
Insurance Public						-0.0630
						(0.0413)
Year (=2014)	0.151***	0.0998***	0.0995***	0.0837***	0.152***	0.155***
	(0.0184)	(0.0203)	(0.0203)	(0.0202)	(0.0296)	(0.0297)
Female				0.423***	0.484***	0.485***
				(0.0207)	(0.0283)	(0.0284)
Female*Year					-0.118***	-0.118***
					(0.0373)	(0.0373)
Age		0.00401***	0.00398***	0.00729***	0.00730***	0.00738***
		(0.000742)	(0.000744)	(0.000805)	(0.000806)	(0.000808)
Household Expenditure		2.78e-09***	2.81e-09***	2.17e-09***	2.16e-09***	2.13e-09**
		(8.13e-10)	(8.13e-10)	(8.35e-10)	(8.34e-10)	(8.34e-10)
Household Size			-0.00624	-0.00594	-0.00586	-0.00554
			(0.00559)	(0.00553)	(0.00554)	(0.00554)
Female Head			0.135**	0.0594	0.0611	0.0613
			(0.0548)	(0.0544)	(0.0545)	(0.0545)
Education				0.0125***	0.0125***	0.0122***
				(0.00249)	(0.00249)	(0.00250)
# Puskemas		-0.00144	-0.00162	0.00132	0.00125	0.00173
		(0.00662)	(0.00664)	(0.00659)	(0.00660)	(0.00661)

Ln Sigma	-1.508***	-1.510***	-1.510***	-1.741***	-1.733***	-1.731***
	(0.112)	(0.121)	(0.121)	(0.145)	(0.144)	(0.144)
Constant	-1.192***	-1.342***	-1.317***	-1.754***	-1.791***	-1.796***
	(0.0186)	(0.0352)	(0.0439)	(0.0579)	(0.0593)	(0.0595)
Observations	31,530	29,568	29,568	29,515	29,515	29,515
Number of pidlink2	15,775	15,735	15,735	15,734	15,734	15,734

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 53. Margins Result of Outpatient Utilization (Panel)

	Outpatient (Margins)				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Dummy Insurance (=1)	0.0368***	0.0327***	0.0328***	0.0305***	0.0307***
	(8.22)	(7.13)	(7.14)	(6.59)	(6.63)
Year (=2014)	0.0346***	0.0225***	0.0225***	0.0189***	0.0181***
	(8.24)	(4.93)	(4.91)	(4.13)	(3.94)
Age		0.000903***	0.000897***	0.00165***	0.00165***
		(5.41)	(5.36)	(9.1)	(9.11)
Household Expenditure		6.27e-10***	6.33e-10***	4.91e-10***	4.87e-10***
		(8.63)	(8.71)	(6.63)	(6.6)
Household Size			-0.00141	-0.00134	-0.00132
			(-1.12)	(-1.07)	(-1.06)
# Puskemas		-0.000324	-0.000365	0.000299	0.000282
		(0.22)	(0.24)	(0.2)	(0.19)
Female Head			0.0304*	0.0134	0.0138
			(2.46)	(1.09)	-1.12
Female				0.0956***	0.0948***
				(21.01)	(20.99)
Education				0.00283***	0.00283***
				(5.04)	(5.04)
Insurance Public					
Observations	31530	29568	29568	29515	29515

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 54. Estimation Results of General Checkup Utilization (Panel)

	Checkup					
VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Dummy Insurance (=1)	0.161***	0.145***	0.146***	0.135***	0.136***	0.625***
	(0.0196)	(0.0204)	(0.0204)	(0.0205)	(0.0205)	(0.0405)
Insurance Public						-0.393***
						(0.0420)
Year (=2014)	-0.384***	-0.427***	-0.429***	-0.459***	-0.400***	-0.377***

	(0.0227)	(0.0248)	(0.0248)	(0.0250)	(0.0326)	(0.0326)
Female				-0.0325	0.0170	0.0286
				(0.0237)	(0.0296)	(0.0295)
Female*Year					-0.123***	-0.118***
					(0.0442)	(0.0441)
Age		0.00265***	0.00251***	0.00941***	0.00941***	0.0102***
		(0.000900)	(0.000902)	(0.000970)	(0.000970)	(0.000969)
Household Expenditure		6.03e-09***	6.08e-09***	3.69e-09***	3.69e-09***	3.58e-09***
		(8.19e-10)	(8.17e-10)	(8.58e-10)	(8.58e-10)	(8.63e-10)
Household Size			-0.0132**	-0.0120*	-0.0120*	-0.00945
			(0.00667)	(0.00664)	(0.00664)	(0.00660)
Female Head			-0.0195	-0.0397	-0.0373	-0.0389
			(0.0688)	(0.0684)	(0.0685)	(0.0681)
Education				0.0637***	0.0637***	0.0616***
				(0.00310)	(0.00310)	(0.00308)
# Puskemas		-0.0165**	-0.0151*	0.00453	0.00452	0.00852
		(0.00789)	(0.00791)	(0.00778)	(0.00778)	(0.00774)
Ln Sigma	-1.508***	-1.510***	-1.510***	-1.741***	-1.733***	-1.731***
	(0.112)	(0.121)	(0.121)	(0.145)	(0.144)	(0.144)
Constant	-1.098***	-1.165***	-1.170***	-1.373***	-1.372***	-1.446***
	(0.109)	(0.121)	(0.122)	(0.142)	(0.142)	(0.151)
Observations	30,996	29,129	29,129	29,082	29,082	29,082
Number of pidlink2	15,774	15,724	15,724	15,723	15,723	15,723

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 55. Margins Result of General Checkup Utilization (Panel)

	Check-up (Margins)					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Dummy Insurance (=1)	0.0614***	0.0610***	0.0612***	0.0472***	0.0474***	0
	-16.9	-16.22	-16.25	-12.72	-12.76	(.)
Year (=2014)	-0.0539***	-0.0606***	-0.0608***	-0.0667***	-0.0665***	-0.0632***
	(-16.45)	(-16.90)	(-16.95)	(-18.34)	(-18.26)	(-17.34)
Age		0.000382**	0.000362**	0.00139***	0.00139***	0.00151***
		-2.94	-2.77	-9.69	-9.69	-10.46
Household Expenditure		8.70e-10***	8.79e-10***	5.46e-10***	5.44e-10***	5.33e-10***
		-10.9	-10.99	-6.7	-6.67	-6.51
Household Size			-0.00191*	-0.00177	-0.00177	-0.00141
			(-1.98)	(-1.80)	(-1.80)	(-1.43)
# Puskemas		-0.00239*	-0.00218	0.000669	0.000668	0.00127
		(-2.09)	(-1.90)	-0.58	-0.58	-1.1
Female Head			-0.00282	-0.00586	-0.00551	-0.00578
			(-0.28)	(-0.58)	(-0.54)	(-0.57)
Female				-0.0048	-0.00442	-0.00249
				(-1.37)	(-1.26)	(-0.71)
Education				0.00941***	0.00941***	0.00916***
				-20.36	-20.37	-19.84
Insurance Public						0
						(.)

Observations	30996	29129	29129	29082	29082	29082

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 56. Estimation Results of Outpatient Utilization (Cross-Section)

	Outpatient (Category)			
VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**
Loser Group	-0.000338	0.000562	0.00203	0.00205
	(0.0133)	(0.0141)	(0.0138)	(0.0138)
Gainer Group	0.0335***	0.0281***	0.0278***	0.0393***
	(0.00747)	(0.00785)	(0.00781)	(0.0151)
Stayer Group	0.0537***	0.0479***	0.0473***	0.0584***
	(0.00879)	(0.00912)	(0.00920)	(0.0156)
Female			0.0911***	0.0914***
			(0.00667)	(0.00667)
Insurance Public				-0.0126
				(0.0143)
Age	0.00158***	0.00144***	0.00198***	0.00200***
	(0.000259)	(0.000272)	(0.000276)	(0.000277)
Household Expenditure		4.70e-10**	4.70e-10**	4.65e-10**
		(1.91e-10)	(1.98e-10)	(1.98e-10)
Household Size		-0.00165	-0.00179	-0.00173
		(0.00198)	(0.00196)	(0.00196)
Female Head		0.0310*	0.0112	0.0112
		(0.0186)	(0.0192)	(0.0192)
Education	0.00119	0.000744	0.00206**	0.00199**
	(0.000790)	(0.000838)	(0.000841)	(0.000844)
# Puskemas	0.00336	0.00424*	0.00452**	0.00459**
	(0.00207)	(0.00217)	(0.00216)	(0.00216)
Constant	-0.342***	-0.314***	-0.409***	-0.410***
	(0.0155)	(0.0189)	(0.0196)	(0.0196)
Observations	15,692	14,017	14,017	14,017

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 57. Estimation Results of Outpatient Utilization (Cross-Section)

	Outpatient (Category)			
VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**
Loser Group	0.0103	0.00895	0.00860	0.00863
	(0.00915)	(0.00978)	(0.00978)	(0.00965)
Gainer Group	0.0205***	0.0217***	0.0217***	0.0768***
	(0.00520)	(0.00550)	(0.00550)	(0.00847)
Stayer Group	0.0581***	0.0581***	0.0580***	0.111***
	(0.00545)	(0.00585)	(0.00583)	(0.00855)
Female			-0.0125***	-0.00941**
			(0.00454)	(0.00452)

Insurance Public				-0.0645***
				(0.00771)
Age	0.00124***	0.00109***	0.00101***	0.00118***
	(0.000181)	(0.000196)	(0.000199)	(0.000199)
Household Expenditure		3.64e-10***	3.69e-10***	3.46e-10***
		(1.23e-10)	(1.24e-10)	(1.17e-10)
Household Size		-0.00319**	-0.00318**	-0.00277*
		(0.00143)	(0.00143)	(0.00142)
Female Head		-0.0411**	-0.0380**	-0.0384**
		(0.0165)	(0.0165)	(0.0164)
Education	0.00926***	0.00880***	0.00863***	0.00827***
	(0.000519)	(0.000562)	(0.000563)	(0.000565)
# Puskemas	-0.00475***	-0.00477***	-0.00478***	-0.00435***
	(0.00142)	(0.00152)	(0.00152)	(0.00150)
Constant	-0.345***	-0.323***	-0.312***	-0.318***
	(0.0110)	(0.0137)	(0.0143)	(0.0143)
Observations	15,168	13,584	13,584	13,584

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix C – Chapter 3 Supplemental Information

Table 58. Ordinary Least Squares Regressions for Rural Areas (Timor-Leste)

	2001			2006		
Dependent:	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Log Education Expenditure	**All**	**Boys**	**Girls**	**All**	**Boys**	**Girls**
Female	-0.0132			0.0266		
	(0.0494)			(0.0241)		
Household Expenditure	0.00401***	0.00335***	0.00558***	0.00107***	0.000994***	0.00111***
	(0.00101)	(0.00113)	(0.000824)	(0.000194)	(0.000239)	(0.000329)
Poor	-1.203***	-1.283***	-1.093***	-0.0956***	-0.120***	-0.0694
	(0.0696)	(0.0988)	(0.0942)	(0.0305)	(0.0419)	(0.0456)
Birth Order	-0.178***	-0.163***	-0.198***	-0.0471***	-0.0497***	-0.0440***
	(0.0228)	(0.0317)	(0.0327)	(0.0117)	(0.0163)	(0.0166)
Household size	0.0275*	0.00604	0.0508**	-0.0168**	-0.00893	-0.0249**
	(0.0160)	(0.0219)	(0.0209)	(0.00695)	(0.00969)	(0.00992)
Current school grade	0.0157	0.0302	-0.00262	0.117***	0.112***	0.121***
	(0.0150)	(0.0194)	(0.0238)	(0.00473)	(0.00631)	(0.00721)
Private	0.581***	0.536***	0.601***	0.345***	0.293***	0.397***
	(0.0810)	(0.117)	(0.111)	(0.0381)	(0.0540)	(0.0533)
Center	-0.136**	-0.114	-0.165**	0.243***	0.230***	0.255***
	(0.0533)	(0.0773)	(0.0704)	(0.0322)	(0.0437)	(0.0471)
East	-0.880***	-0.916***	-0.843***	0.326***	0.304***	0.350***
	(0.0769)	(0.103)	(0.109)	(0.0361)	(0.0501)	(0.0520)
Constant	2.212***	2.307***	2.090***	1.796***	1.810***	1.808***
	(0.0963)	(0.132)	(0.123)	(0.0650)	(0.0884)	(0.0920)

Observations	1,607	850	757	2,681	1,411	1,270
R-squared	0.308	0.296	0.333	0.316	0.294	0.342

Source: Author's compilation

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 59. Ordinary Least Squares Regressions for Rural Areas (Indonesia)

	2000			2007		
Dependent:	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Log Education Expenditure	**All**	**Boys**	**Girls**	**All**	**Boys**	**Girls**
Female	-0.0173			-0.0363		
	(0.0327)			(0.0288)		
Household Expenditure	1.62e-07***	1.67e-07***	1.58e-07***	1.31e-07***	1.35e-07***	1.20e-07***
	(2.96e-08)	(4.63e-08)	(3.71e-08)	(1.56e-08)	(2.08e-08)	(2.35e-08)
Poor	-0.417***	-0.398***	-0.438***	-0.409***	-0.400***	-0.425***
	(0.0494)	(0.0683)	(0.0719)	(0.0434)	(0.0582)	(0.0643)
Birth Order	-0.0699***	-0.0833***	-0.0573**	-0.0968***	-0.0877***	-0.108***
	(0.0169)	(0.0257)	(0.0224)	(0.0138)	(0.0189)	(0.0203)
Household size	-0.0237**	-0.0219	-0.0250*	-0.0132*	-0.0202**	-0.00443
	(0.0100)	(0.0143)	(0.0142)	(0.00736)	(0.00921)	(0.0115)
Current school grade	0.0655***	0.0537***	0.0767***	0.0842***	0.0771***	0.0912***
	(0.00778)	(0.0110)	(0.0110)	(0.00691)	(0.00969)	(0.00999)
Private	0.177***	0.197***	0.161**	0.108**	0.139**	0.0750
	(0.0478)	(0.0720)	(0.0644)	(0.0423)	(0.0586)	(0.0619)
West	0.331***	0.327***	0.338***	0.276***	0.195***	0.366***
	(0.0679)	(0.0764)	(0.115)	(0.0543)	(0.0733)	(0.0814)
Central	-0.498***	-0.473***	-0.523***	0.286***	0.245***	0.332***
	(0.0824)	(0.0982)	(0.135)	(0.0635)	(0.0875)	(0.0931)
Constant	11.83***	11.89***	11.76***	13.11***	13.16***	13.03***
	(0.0965)	(0.130)	(0.151)	(0.0570)	(0.0698)	(0.0880)

Observations	2,992	1,514	1,478	2,272	1,159	1,113
R-squared	0.218	0.210	0.227	0.222	0.221	0.225

Source: Author's compilation

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 60. Ordinary Least Squares Regressions for Urban Areas (Timor-Leste)

	2001			2006		
Dependent:	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Log Education Expenditure	**All**	**Boys**	**Girls**	**All**	**Boys**	**Girls**
Female	0.0894			0.0334		
	(0.0925)			(0.0248)		
Household Expenditure	0.00167**	0.00153	0.00172**	0.000560***	0.000347**	0.00113***
	(0.000677)	(0.00122)	(0.000778)	(0.000177)	(0.000156)	(0.000151)
Poor	-0.435**	-0.328	-0.521	-0.0692	-0.0982*	-0.00234
	(0.198)	(0.246)	(0.383)	(0.0430)	(0.0556)	(0.0554)
Birth Order	-0.147***	-0.144***	-0.155***	-0.0404***	-0.0481***	-0.0314**
	(0.0337)	(0.0465)	(0.0467)	(0.0105)	(0.0151)	(0.0144)
Household size	0.0992***	0.119***	0.0835**	0.00570	0.00763	-0.00394
	(0.0271)	(0.0400)	(0.0364)	(0.00748)	(0.00908)	(0.00989)
Current school grade	-0.00298	-0.0412	0.0317	0.109***	0.108***	0.110***
	(0.0264)	(0.0360)	(0.0401)	(0.00428)	(0.00605)	(0.00606)
Private	1.092***	1.088***	1.095***	0.688***	0.627***	0.724***
	(0.102)	(0.140)	(0.141)	(0.0375)	(0.0489)	(0.0521)
Center	0.0405	0.0234	0.0963	0.0602**	0.0797**	0.0141
	(0.132)	(0.202)	(0.175)	(0.0286)	(0.0392)	(0.0403)
East	-0.475**	0.00300	-0.940***	-0.0244	-0.00304	-0.0461
	(0.219)	(0.289)	(0.318)	(0.0338)	(0.0450)	(0.0505)
Constant	1.845***	1.777***	1.975***	1.952***	2.026***	1.893***
	(0.185)	(0.272)	(0.255)	(0.0577)	(0.0748)	(0.0800)

Observations	530	264	266	3,033	1,533	1,500
R-squared	0.279	0.293	0.297	0.364	0.337	0.400

Source: Author's compilation

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 61. Ordinary Least Squares Regressions for Urban Areas (Indonesia)

	2000			2007		
Dependent: (Indonesia Urban) Log Education Expenditure	**(1) All**	**(2) Boys**	**(3) Girls**	**(1) All**	**(2) Boys**	**(3) Girls**
Female	-0.0194			0.0123		
	(0.0331)			(0.0305)		
Household Expenditure	1.73e-07***	1.83e-07***	1.66e-07***	1.16e-07***	1.14e-07***	1.19e-07***
	(2.12e-08)	(3.11e-08)	(2.84e-08)	(8.92e-09)	(1.26e-08)	(1.26e-08)
Poor	-0.415***	-0.490***	-0.337***	-0.342***	-0.326***	-0.352***
	(0.0684)	(0.0953)	(0.0980)	(0.0620)	(0.0871)	(0.0891)
Birth Order	-0.0729***	-0.0394**	-0.107***	-0.109***	-0.129***	-0.0871***
	(0.0142)	(0.0190)	(0.0210)	(0.0156)	(0.0211)	(0.0235)
Household size	-0.0105	-0.0327***	0.0105	-0.00383	-0.000107	-0.00789
	(0.00792)	(0.0105)	(0.0117)	(0.00594)	(0.00780)	(0.00925)
Current school grade	0.0944***	0.0878***	0.101***	0.0716***	0.0626***	0.0812***
	(0.00685)	(0.00955)	(0.00969)	(0.00705)	(0.00994)	(0.0100)
Private	0.297***	0.261***	0.322***	0.361***	0.373***	0.342***
	(0.0433)	(0.0605)	(0.0610)	(0.0416)	(0.0558)	(0.0628)
West	0.338***	0.407***	0.270***	0.254***	0.197***	0.305***
	(0.0592)	(0.0858)	(0.0809)	(0.0519)	(0.0716)	(0.0746)
Central	0.0117	0.0656	-0.0373	0.146**	0.0902	0.196**
	(0.0833)	(0.121)	(0.113)	(0.0706)	(0.101)	(0.0989)
Constant	11.98***	12.01***	11.94***	13.24***	13.34***	13.14***
	(0.0773)	(0.107)	(0.109)	(0.0732)	(0.0972)	(0.108)

Observations	2,378	1,208	1,170	2,124	1,103	1,021
R-squared	0.245	0.234	0.263	0.291	0.295	0.290

Source: Author's compilation

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Conflict as Additional Variable

In this section, we will discuss adding conflict variables to the model. Conflict variable added from CAVR (2013) summarized by Utsumi (2021).

Table 62. Number of deaths by district due to conflict in Timor-Leste in 1999

No	District	Deaths	Region	Conflict
1	Bobonaro	229	Western	Yes
2	Dili	192	Central	
3	Cova Lima	190	Western	
4	Liquiçá	183	Central	
5	Oecussi	170	Western	
National average deaths	***97.77***			
6	Ermera	82	Western	No
7	Lautem	53	Eastern	
8	Baucau	43	Eastern	
9	Ainaro	34	Western	
10	Manatuto	32	Eastern	
11	Aileu	28	Central	
12	Manufahi	27	Central	
13	Viqueque	8	Eastern	
Total	**1,271**			

Source: CAVR (2013) in Utsumi (2021)

From the table, we derived two variables: dummy conflict and the number of death in 1999 at the district level. Then, we run similar regression as shown in the main text.

Table 63. Ordinary Least Squares Regressions for the Population Cohorts Year 2006 (Timor-Leste)

VARIABLES	(1)	(2)	(3)
Female	0.0268	0.0263	0.0271
	(0.0173)	(0.0172)	(0.0172)
Household Expenditure	0.000406***	0.000401***	0.000405***
	(0.000134)	(0.000129)	(0.000130)
Poor	-0.172***	-0.143***	-0.133***
	(0.0272)	(0.0268)	(0.0270)
Birth Order	-0.0464***	-0.0474***	-0.0471***
	(0.00786)	(0.00783)	(0.00782)
Household size	0.0110*	0.00787	0.00640
	(0.00565)	(0.00555)	(0.00559)
Current school grade	0.113***	0.113***	0.113***
	(0.00318)	(0.00317)	(0.00317)
Private	0.547***	0.553***	0.557***
	(0.0257)	(0.0256)	(0.0256)

VARIABLES	(1)	(2)	(3)
Rural	-0.0389**	-0.0379**	-0.0497**
	(0.0196)	(0.0192)	(0.0195)
Center	0.301***	0.337***	0.324***
	(0.0287)	(0.0279)	(0.0283)
East	0.322***	0.394***	0.379***
	(0.0377)	(0.0371)	(0.0374)
Conflict	0.224***		
	(0.0291)		
Number of Death		0.00189***	
		(0.000184)	
Number of Death*Conflict (=0)			0.00389***
			(0.000570)
Number of Death*Conflict (=1)			0.00221***
			(0.000200)
Constant	1.679***	1.548***	1.495***
	(0.0497)	(0.0528)	(0.0542)
Observations	5,714	5,714	5,714
R-squared	0.369	0.374	0.376

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The existence of conflict positively significant affecting the school expenditure. However, based on the interaction of dummy conflict and the number of deaths, the result shows that districts without conflict have higher expenditure compared to districts with conflict.

Table 64. Results from Blinder-Oaxaca Decomposition (adding conflict)

VARIABLES	All
Prediction for Boys	2.762***
	(0.0146)
Prediction for Girls	2.816***
	(0.0162)
Difference	-0.0537**
	(0.0218)
Explained	-0.0271**
	(0.0134)
Unexplained	-0.0266
	(0.0172)

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Results from Blinder-Oaxaca decomposition show a now statistically insignificant differences in unexplained variation for spending on boys versus on girls after the inclusion of these additional variables. We therefore interpret conflict characteristics (such as boys dropping out of school) as potentially related to the gaps identified earlier in this paper.

With these new conflict variables and for the case of Timor-Leste in 2006, the hurdle model results are presented in the table below.

Table 65. Results from Hurdle Models with Conflict Variable Year 2006 (Timor Leste)

Dependent: Log Education Expenditure	**1**	**2**	**3**	**4**	**5**	**6**
Female	0.0323*	0.0323*	0.0311*	0.0304*	0.0323*	0.0308*
	(0.0167)	(0.0167)	(0.0167)	(0.0167)	(0.0167)	(0.0166)
Household Expenditure	0.000535***	0.000535***	0.000491***	0.000471***	0.000535***	0.000505***
	(5.69e-05)	(5.69e-05)	(5.80e-05)	(5.77e-05)	(5.69e-05)	(5.76e-05)
Poor	-0.200***	-0.200***	-0.193***	-0.185***	-0.200***	-0.163***
	(0.0202)	(0.0202)	(0.0202)	(0.0203)	(0.0202)	(0.0204)
Birth Order	-0.0327***	-0.0327***	-0.0328***	-0.0327***	-0.0327***	-0.0323***
	(0.00702)	(0.00702)	(0.00701)	(0.00700)	(0.00702)	(0.00697)
Household Size	0.0173***	0.0173***	0.0177***	0.0173***	0.0173***	0.0137***
	(0.00424)	(0.00424)	(0.00424)	(0.00423)	(0.00424)	(0.00423)
Current grade	0.109***	0.109***	0.109***	0.110***	0.109***	0.111***
	(0.00290)	(0.00290)	(0.00289)	(0.00289)	(0.00290)	(0.00288)
Private	0.553***	0.553***	0.558***	0.563***	0.553***	0.576***
	(0.0226)	(0.0226)	(0.0226)	(0.0225)	(0.0226)	(0.0225)
Conflict			0.0671***			-0.533***
			(0.0173)			(0.0688)
Number of Death				0.000673***		0.00401***
				(0.000112)		(0.000446)
Constant	1.935***	1.935***	1.906***	1.864***	1.935***	1.743***
	(0.0335)	(0.0335)	(0.0343)	(0.0355)	(0.0335)	(0.0386)
Dependent: Schooling Decision						
Female	-0.0844	-0.0846	-0.0844	-0.0846	-0.0831	-0.0831
	(0.124)	(0.124)	(0.124)	(0.124)	(0.125)	(0.125)
Household Size	-0.0276	-0.0218	-0.0276	-0.0218	-0.0166	-0.0166
	(0.0263)	(0.0265)	(0.0263)	(0.0265)	(0.0271)	(0.0271)
Rural	-0.300**	-0.326**	-0.300**	-0.326**	-0.259*	-0.259*
	(0.132)	(0.131)	(0.132)	(0.131)	(0.135)	(0.135)
Center	0.580***	0.405**	0.580***	0.405**	0.499**	0.499**

	(0.214)	(0.190)	(0.214)	(0.190)	(0.219)	(0.219)
East (Timor-Leste)/West (Indonesia)	0.353	0.0500	0.353	0.0500	0.218	0.218
	(0.292)	(0.279)	(0.292)	(0.279)	(0.303)	(0.303)
Conflict	-0.00902		-0.00902		1.081**	1.081**
	(0.242)		(0.242)		(0.466)	(0.466)
Number of Death		-0.00195		-0.00195	-0.00764***	-0.00764***
		(0.00142)		(0.00142)	(0.00287)	(0.00287)
Constant	2.617***	2.971***	2.617***	2.971***	2.955***	2.955***
	(0.339)	(0.357)	(0.339)	(0.357)	(0.378)	(0.378)
Ln Sigma						
Constant	-0.464***	-0.464***	-0.465***	-0.467***	-0.464***	-0.472***
	(0.00941)	(0.00941)	(0.00941)	(0.00941)	(0.00941)	(0.00941)
Observations	5,714	5,714	5,714	5,714	5,714	5,714
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Results from the hurdle model show that conflict dummy variable and the number of deaths are not statistically significant at conventional levels in the selection (hurdle) stage. However, when added to both the selection and outcome equations, the estimated sign of the conflict dummy flips suggesting that households spend more on females not necessarily because of discrimination but instead because conflict can reduce male education participation and increase the cost of participation for girls (when private Catholic schools are more expensive than public schools). However, due to data availability limitations we are not able to extend this analysis to the other cases as presented in the main paper.