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The Effect of Income Shocks and Credit Constraint on Child Labor Participation and Poverty: The Case of Indonesia

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THE EFFECT OF INCOME SHOCKS AND CREDIT CONSTRAINTS TO POVERTY AND CHILD'S INVOLVEMENT IN WORKING ACTIVITY: THE CASE STUDY OF INDONESIA, YEAR 2007

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Lies near the Eurasia and Indo-Australia's border plate, Indonesia is categorized as natural disaster prone areas. It is common for Indonesian to experience earthquakes that occurs due to volcanic activities or ground movement. The most frequent natural disasters hit these districts are: landslide, earthquake, and flood. The other type of natural disaster is drought, which is more common to the rest of areas and more predictable compare to the previous disasters. For those who are living in disaster prone areas, disasters do not only destroy their assets, but also damages their source of income. Moreover, it can affect the decision of household related to the activity of their child. This study aims to analyze the effect of income shocks and credit constraints on poverty and child working activity in Indonesia. We will employ logit regression to estimate the effect of income shocks and credit constraints on income. Furthermore, multinomial logit estimate will be used to capture the effect of income shocks and credit constraints on household's poverty status and household's child activity. It is hipotized that the disaster-related-income-shock and constraints to acquire credit have significant effect on poverty as well as child working activity.

1. INTRODUCTION

1.1 Background

Lies near the Eurasia and Indo-Australia's border plate, Indonesia is categorized as natural disaster prone areas. It is common for Indonesian to experience earthquakes that occurs due to volcanic activities or ground movement. Beside that fact, Indonesia is also an archipelago. Thua, the probability of this country to hit by disaster is relatively higher compared other countries. West Java Province is one of eleven provinces which is categorized as natural disaster-prone areas in Indonesia. Other provinces with similar category are West Sumatera, Bengkulu, DKI Jakarta, D.I Yogyakarta, Bali and Nusa Tenggara.

The distribution map of disaster-prone areas is uneven. As can be seen from figure 1, Central Java and West Java are the most provinces frequent hit by disaster. Regardless its effects, there were almost 1400 occurences of natural disaster in Central Java and no less than 800 natural disaster happened in West Java during the period of 1997-2009. The most common disaster is earthquake and volcanic eruptions since many active volcanos in Java. Meanwhile, Provinces in the northern part of Sumatera are also vulnerable of natural disasters as well as Nusa Tenggara and Southern parts of Sulawesi.

Figure 1. Natural Disaster Ocurrence by Province
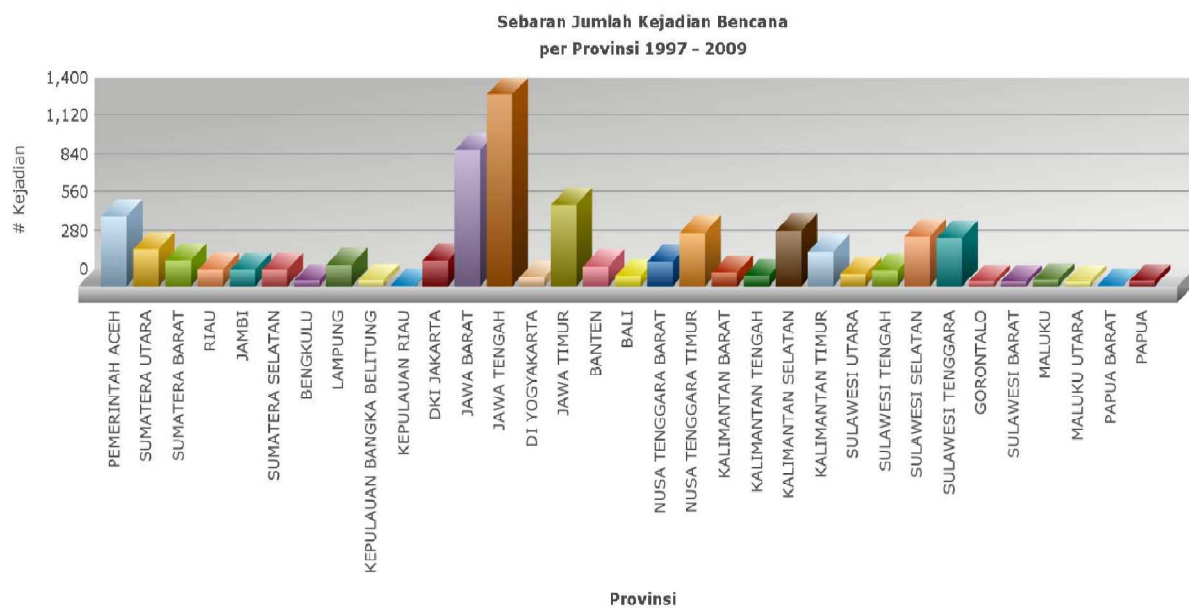
Source : Indonesia's Center of Disaster Mitigation

As well as province, the distribution map of natural disaster within province is uneven. For example, among 26 districts of West Java, districts located in the southern part of West Java are considered as the most vulnerable. This paper will focus on the 5 most natural disaster-prone areas, i.e Kabupaten Cianjur, Kabupaten Sukabumi, Kabupaten Garut, Kabupaten Tasikmalaya, and Kabupaten Ciamis. Sorrounded by volcanos and unstable land structure makes these areas become vulnerable of landslide, earthquake and volcano eruption. For the past few years, tsunami has become an increasing attention for Kabupaten Garut, Sukabumi and Ciamis as there are many heavy earthquakes occured frequently and because these districts bordered by the sea.

Table 1. Socio-economy Indicator and Characteristrics of Natural Disaster in West Java's Disaster Prone Areas, 2007.

No.	Districts	Annual real GDP per capita (million Rp)	Number of poor people (thousand)	Percentage poor people to district's population	Most frequent disasters
1	Garut	3,93	435,5	17,9	Landslide, earthquake, volcano eruption, flood
2	Sukabumi	4,93	352,3	15,6	Flood, earthquake, landslide
3	Cianjur	3,29	394,6	18,4	Flood, landslide
4	Tasikmalaya	2,58	302,4	16,9	Flood, earthquake, landslide
5	Ciamis	3,76	213,1	13,4	Food, tsunami
	West Java	6.31	5,457,9	11,2	

Sumber: BPS, 2008 dan Board of Natural Disaster Mitigation.

Natural disaster-prone areas face serious challenge in their development progress. This is because natural disaster may disturb local development's stability by creating problems such as unemployment, loss of asset and resources. The other problems potential to arise is related to psychological aspect bear by individual who are living in these areas, especially when the disaster occured regularly. As it is shown by Table 1, natural disaster-prone areas are also categorized as poor areas. In these areas, the percentage of poor people is higher than West Java at average.

As illustrated in table 1, the area south of West Java is also a poor area. With its presence as a disaster-prone area, if problems of natural disaster management in such area are not taken seriously, then the inequality of development between the southern regions of West Java, which represents the majority of disaster-prone region, with other regions will continue to happen. With a high frequency of occurrence of disasters, it will also have an impact on the socio-economic condition of the whole of West Java, such as the occurrence of poverty and urbanization, which until now has not been able to handle the solution. Other potential that may arise is the involvement of children in the job sector, either in nature or non-labor market labor market in order to increase household income.

Central and local governments have been working together to form disaster standby units as part of efforts to integrate disaster prevention and response to minimize the number of casualties and losses caused by natural disaster. Therefore, as part of the initial steps of research studies to poverty reduction in disaster-prone areas, should be investigated regarding the causes of poverty and behavior, people living in disaster prone areas, is associated with socio-economic aspects that accompany it.

From the thought above, this research will analyze the causes of poverty in Indonesia as one of disaster prone areas the world, with a focus on income shock as the main variable. Consideration of making income shock as the main variable in this study is the potential for income shock in disaster prone areas is estimated higher than the income shock that occur in areas not designated as disaster prone. In addition to income shock, other factors will also be investigated as an obstruction of access to credit by households. Barriers to credit is believed to prevent the household has a side business.

1.2 Research Objectives
The purposes of this study are as follows:
1. To determine whether there is any income shock, magnitude and causes experienced by people living in disaster prone areas in Indonesia, year 2007.

2. To determine whether there is any credit access barriers, patterns, and types of household loans received by households who live in disaster prone areas in Indonesia, year 2007.
3. To determine the effect of shock on income poverty in disaster prone areas in Indonesia, year 2007.
4. To determine the effect of income shock in the work activities of children in disaster prone areas in Indonesia, year 2007.


2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Shock to household income is a drastic change in household income. Viewed from it sources, income shock can be caused by two sources, namely the nature of individual idiosyncratic (individual) and and or collective. Individual income shock occurs for example due to job loss or death of the breadwinner. While, collective shock is the income shock that occurs simultaneously and affects people at a certain area, such as those caused by natural disasters (floods, droughts, hurricanes, tsunamis or volcanic eruptions). Macroeconomic condition and political instability are another type of collective shocks. In this study, the definition of income shock is limited into negative income shock, i.e. the household's income decline due to natural disasters.

Since income shock is associated with household loss, it also increases the household's vulnerability. According to Rubio and Soloaga (2004), household's act in response to the shocks before and after they occur. Ex ante response are actions with the purpose of reducing risks, lowering exposure and mitigating potential adverse effects. Related to natural disasters, lowering risk is very limited because natural disaster is hard to control. Lowering risk exposure and mitigation can be done such as by migrating people who live at the natural disaster prone areas (volcano eruption, tsunami and earthquake) to a relatively safe area. However, this is related to the government ability to implement the program and to the people's willingness to move. Individual or household behaviour contributes to this policy. As it can be known from most natural disaster prone areas, mostly people live there not because they love of risks, but they are reluctant to make an adaptation when they are move to the new areas of because they really have no choice at all.

On the other hand, ex post action is related to household's response to manage realized loss. For those who are hit by natural disaster, this response will heavily depend on government actions, namely reconstruction and rehabilitation. This is because of limited ability of individual to take the action individually due to high costs and relatively complex management to be born. Even for government itself, collective action may involve other parties such as countries, international organization or donors when the disaster is too large. This was happened in Aceh's tsunami (2004) and Haiti's earthquake (2009). Household's degree of risks exposure and household's ability to manage risks will affect the adverse outcome of the shock.

Figure 2. Risk Chain
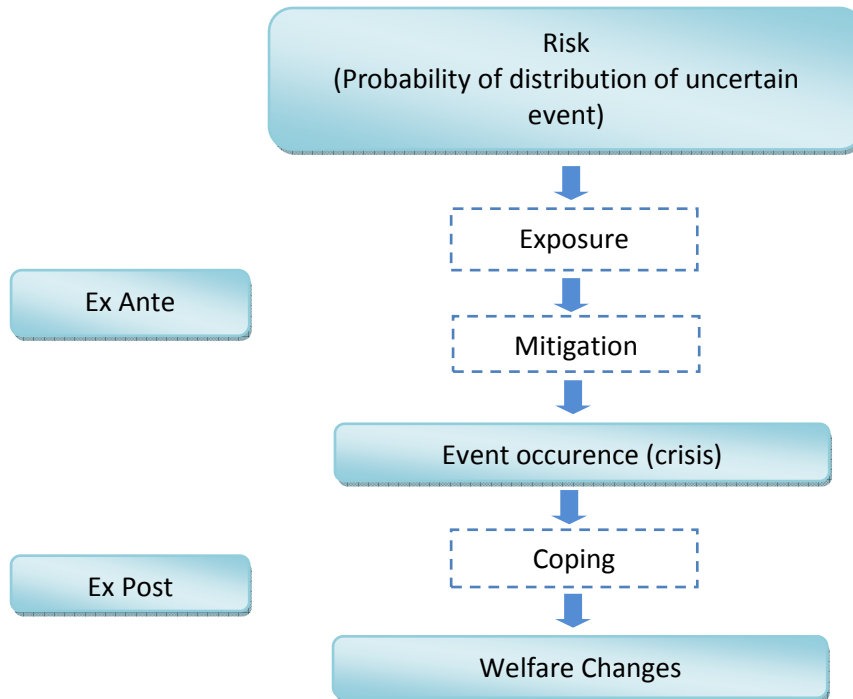
Source: Rubio and Soloaga (2004), as adapted from Heitzmann, et.al.(2002)

As seen from the frequency of occurrence, household income shock can occur in one or more times within a certain period. Income shock that occur in one period (transitory income shock) is desribed by the death of breadwinner or crop failures due to natural disaster. For people who live in the affected areas, the possibility to experience the collective shock in one year will be higher as compared with other communities who live in areas with relatively more secure from natural disasters because it can cause crop failure. Because of the high potential of income shock associated with the agricultural sector, so often in recent literature on income shock, income shock causes are categorized into two, namely: agricultural income shock and non-agricultural income shock. Included in income shock is agricultural crops failure due to pests and plant diseases.

Shock associated with income and poverty issues, poverty could actually happen in disaster prone areas or in areas not prone to disasters. It's just that, especially for the people living in disaster prone areas, the income shock not only affects Expected income households, but also can increase the income of the household variance. It is not impossible this will cause households to take risky steps in dealing with the shock and cause a fall into deeper poverty.

The studies on the income shock such as Jacoby and Skoufias (1997) who examined the effect of unanticipated income shock to the level of attendance of children in schools in India. They found that households tend to exclude their children from school when yields decline. Rubio and Soloaga (2004) found that agricultural households are relatively less sensitive than non-farm household income schock due to macro-economic crisis.

Asiimwe and Mpuga (2007) examined the implications of the rainfall shock on household income and consumption in Uganda. Natural conditions (rainfall) is quite influential on the pattern of consumption and income of households in villages in Uganda where there is virtually no credit and insurance. They confirm that shock rainfall has a significant role in household welfare in Uganda. Raddatz (2005) confirms that the disaster caused by climate change such as floods, droughts,

extreme temperatures and Typhoon have a negative effect on output growth. On the other hand, Shewmake (2008) found no significant effect of drought on farmers' income in South Africa. Possible explanation for this is that households do various adaptation efforts, such as the use of drought resistant crop varieties.

From the literature review, it appears that household characteristics and location are the variables that are often used in analyzing the causes of poverty and child labor. In this study added another variable related to social capital, namely the involvement of household activities such as: social gathering, cooperative, or other organization around the dwelling and household variables on educational expectations and children's health in the future. Those variables will represent the expected behavior and patterns of household networking. It is estimated that both variables are trending negative impact on child poverty and work activities. He added the two variables mentioned above is especially important in research related to the attitude of households to cope with disasters.

As we know that governments in disaster management has a policy of relocation alternatives. But we know that the relocation would be highly costly and not necessarily effective because the need for adaptation and self-reliance of households in the new place. Besides, we know that individuals can be risk averse or risk lover. For people who risk lover, the disaster is not a reason to switch. For such households, the policy might be developed for the government in alleviating poverty is to strengthen household assets outside agricultural assets which has been the main source of agriculture. Social capital and household credit is expected to become a factor in eliminating the effect of the income shock. The households' expectations regarding education and health conditions of children in the future is a variable that represents the character of household mentality in dealing with the surrounding conditions. Expectations of health education and positive indicating the ability of households in anticipation of changes in household conditions and an early indication that the household wants to live better.

On the other hand, for a risk-averse society, the disaster will be followed up with a migration to another area, or more precisely urbanization. This will be done with or without the voluntary relocation of government policy. The high rate of migration from disaster-prone areas can be used as an early indication that the income shock has occurred. The Government may see this as an indication of policy-making materials for disaster relief. Other indications can also be seen from the level of unemployment that occur in disaster prone areas and magnitude of losses caused by disasters. For households that risk averse and choose to migrate or to follow the policy of relocation, poor opportunities for a while there remains also to remember the transition period households have yet to find a job in the same or even better than a job before moving to a new location.

3. RESEARCH METHODOLOGY

This research will use quantitative and qualitative approaches. The quantitative approach used to analyze the factors causing poverty in disaster prone areas in West Java. The quantitative approach used to see patterns in shock and credit income households.

3.1. Empirical Model

This study is an extension of previous studies on income shock, which is more associated with child labor conditions. There are three empirical models that will be used in this study, where the regression model used is the multinomial logit. Here is a picture of the basic model, while further model development will be conducted after the literature review in more depth.

We used two models to see the effect of shock on poverty income, namely to estimate the income effect of shock on household income and the income effect of shock on the probability of households falling into poverty.

Model 1: Probability of household become poor

$$P(y = 1|x) = \beta_0 + \beta_1 X + u$$

where:

P	:	Probability of household get into a poor category
B	:	Vector parameters
X	:	Vector of independent variables: *income shock*; access to credit; household's characteristics (household size, access to primary facilities); household head's characteristics (education level, age, working status, marriage status), social capital.
U	:	Error

Model 2: The impact of income shock on child activity to work

$$P(y = 1|x) = \gamma_0 + \gamma_1 X + u$$

where:

P	:	Probability of child to involve in working activities
γ	:	Vector parameters
X	:	Vector of independent variables: *income shock*; access to credit; household's characteristics (household size, access to primary facilities); household head's characteristics (education level, age, working status, marriage status), social capital.
U	:	Error

The following is an outline of research variables associated with the model being used in this study:

Income Shock. Definition of income shock is focused on the household level, i.e. the lost of household assets due to natural disaster or economic hardship. This variable is the rupiah value of loss of assets (business and non-business) suffered by households due to natural disaster in 2007. However, income shock variable in this study is a dummy variable where 1 = ever experienced an income shock caused by natural disaster or economic hardship, 0 = no income shock ever experienced. To anticipate the multiple occurence of natural disasters type experienced by a household, we rank income loss by its value to determine the most effect of disaster to a household.

Poverty. Poverty variable in this study is described by the economic conditions of households in the year 2007. The poverty line is calculated using the World Bank criteria, where it is classified as poor when the household per capita expenditure is less than US$ 2.

Children involved in work activities. Children is categorized into three main activities, i.e. studying, involving in work activities, or having no activity. The definition of involving in work activities cound be in or out of labor market. However, because there is a possibility of children to do both study and work, we consider to categorize children who are doing both activities into "working" category rather than "studying".

3.2 Data

This study uses secondary data, namely IFLS (Indonesia Family Life Survey) in 2007. IFLS is a comprehensive household survey data, especially on the information about household characteristics from the aspect of demographic and socio-economic. IFLS data was taken once every three years, where year 2007 is the latest IFLS data.

The consideration of choosing IFLS is because the data has detailed information of the variables being used in this study. The information contained in IFLS includes, but not limited to: individual characteristics (age, gender, education, marital status, education, etc.), asset ownership by households (farm/non-agricultural, agricultural capital, valuables, etc.), health status, type of household consumption, etc.

4. RESULTS AND ANALYSIS

This section contains the results we found in this study. The section is started with the tabulation of statistics on income shocks due to economic hardship and natural disaster, credit access and child activities. Next, the results on the two regressions model will be elaborated. The section will be ended with some conclusions.

4.1. Disaster Effect to Household's Business and Non-Business Assets

Table 2. Income shocks due to economic hardship (crop loss)

Type of Economic Hardship	Incidence			Average Cost (Thousand Rupiahs)		
	Urban	Rural	Total	Urban	Rural	Total
Drought/ lack of water	91	698	789	1,909	1,829	1,838
	(29%)	(48%)	(45%)			
Flood	40	76	116	526	2,203	1,592
	(13%)	(5%)	(7%)			
Pestilence/rodents	85	415	500	780	1,990	1,797
	(27%)	(29%)	(29%)			
Disease	19	115	134	364	2,036	1,780
	(6%)	(8%)	(8%)			
Other	76	139	215	4,754	1,156	2,423
	(24%)	(10%)	(12%)			
Total	311	1,443	1,754	2,056	1,843	1,880
	(100%)	(100%)	(100%)			

Source: Author's calculation

Based on the table above there is evidence of income shock due to economic hardship, i.e. crop loss. The average cost or crop loss is ranging from 360,000 to 4.7 million rupiah. Most of the incidence was happen in the rural areas, especially for drought and rodent. This is obvious because most of agricultural lands are located in rural. Thus, the average cost of flood, rodent and disease are higher in rural. This could reflect the severities of hardship in rural areas are much worse than in urban where better mitigation and adaptation infrastructure available.

However, the average cost born by household due to crop loss based on above figures need to be further analyzed. It is because the figure shows only the total costs of crop loss. It seems to create problem when the crop loss is due to seasonal change. When the crop loss happened   partially, for example due to rodent or epidemic disease, then the above figures do not allow us to know the cost per square meter of crop loss born by farmers. Thus, it is possible that the figures tend to be misleading. The other problem arises from the above statistics is that the IFLS questionnaires do not specifically figure out type of crop loss caused by "other" category. Nevertheless, we can not neglect the cost born by urban household, which is accounted for almost twice of total average cost.

Table 3. Income shocks due to natural disaster

Type of Natural disaster	Incidence			Business Assets Lost (Thousand Rupiah)			Non-Business Assets Lost (Thousand Rupiah)		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Flood	1,573	455	2,028	657	4,822	1,881	1,100	952	1,067
	(25%)	(16.5%)	(22.5%)						
Landslide/ Mudslide	9	36	45	3,500	3,083	3,159	556	4,000	3,311
	(0.1%)	(1.3%)	(0.5%)						
Earthquake	3,933	1,853	5,786	4,124	1,790	3,524	16,887	10,517	14,836
	(62.6%)	(67.4%)	(64.1%)						
Tsunami	23	64	87	4,000	682	1,719	348	12	115
	(0.4%)	(2.3%)	(1%)						
Windstorm	170	251	421	538	1,881	1,478	2,488	739	1,445
	(2.7%)	(9.1%)	(4.7%)						
Forest fire	-	12	12	-	-	-	-	7,000	7,000
	(0%)	(0.4%)	(0.1%)						
Fire	573	80	653	12,808	4,675	11,321	21,204	29,153	22,074
	(9.1%)	(2.9%)	(7.2%)						
Total	6,281	2,751	9,032	3,460	2,765	3,251	12,716	8,126	11,321
	(100%)	(100%)	(100%)						

Source: Author's calculation

The table above shows another evidence of income shocks due to natural disaster. In total there are more than nine thousand households suffered from natural disaster in Indonesia in the period of 2002 - 2007. During that period, earthquake and flood dominating the incidence of natural disaster both in urban and rural areas. The lost of business assets hold by the household is around three million rupiahs on average. This number is far smaller that the losses on non-business assets, that is eleven million rupiah on average.

In general urban households bear higher cost of natural disaster compared to rural households. However, looking into the lost of business assets by location, we can see that there is a variation in the amount lost based on its causes. For example, the average lost of business assets born by household who are living in rural and urban tend to be similar, as much as 3 millions rupiahs. While, flood and windstorm tends to harm business asset more in rural areas, compared to business assets in urban areas. It might be occur because most of rural business assets are agricultural plantations.

Tsunami disaster, hit Indonesia in 2004, is expected to have significant loss to business assets. However, IFLS sampling areas included only one household for Aceh, the most suffered area from 2004 Tsunami. Moreover, data record on business asset lost is only matter for households who are living in Kabupaten Tapanuli Tengah (North Sumatera), Kabupaten Ciamis (West Java), and Kabupaten Cilacap (Central Java). Among these three areas, only Kabupaten Ciamis were seriously suffered by Tsunami. That is why average lost of business assets born by households seems to be underestimated. However, it can be drawn from the figures that the cost of business assets in urban areas is higher relative to rural areas.

For non-business assets, average costs borne by households in urban areas tend to be higher compared to the costs borne by households in rural areas. One of possible explanation is because of earthquake damages many buildings. In urban areas, most of non-asset buildings such as house, are permanent. Moreover, earthquake damages not only housing, but also other non-assets materials such as vehicles. This is believed to contribute significantly in amount to the cost of disaster in urban areas.

4.2. Household's Credit Constraints Profile

There are a total of 24 thousand household member accessing credits. About 60% of them reside in urban areas with average monthly per capita expenditure 655,000 rupiahs. The other ten thousand are living in the rural area with monthly per capita expenditure 482,000 rupiahs on average. It can be seen from the following table that household's accessibility to credit is relatively high, as there are only 5 percent of credit application turned down. Rural and urban area has similar portion of the success or turn down of the credit application.

However, it seems that for urban households, credit constraint is associated with per capita income. Table 4 shows that most of them who have succeeded accessing credit are among the non-poor households. More or less, it tells us that credit application process in urban area is more stricter than rural, especially related to collateral requirements. While, loan process in rural area tends to be loose, since social behavior in rural enable people to get a loan with familiarity mechanism.

Table 4. Profile of Household Member Accessing Credit

Credit Status	Number of HHM accessing Credit			Average Per Capita Expenditure (Thousand Rupiah/Month)		
	Urban	Rural	Total	Urban	Rural	Total
Turn Down	695 (5%)	479 (5%)	1,174 (5%)	539	404	481
Success	13,677 (95%)	9,704 (95%)	23,381 (95%)	661	486	588
Total	14,372 (100%)	10,183 (100%)	24,555 (100%)	655	482	583

Source: Author's calculation

Figure 3. Households' credit constraints by creditor type and location
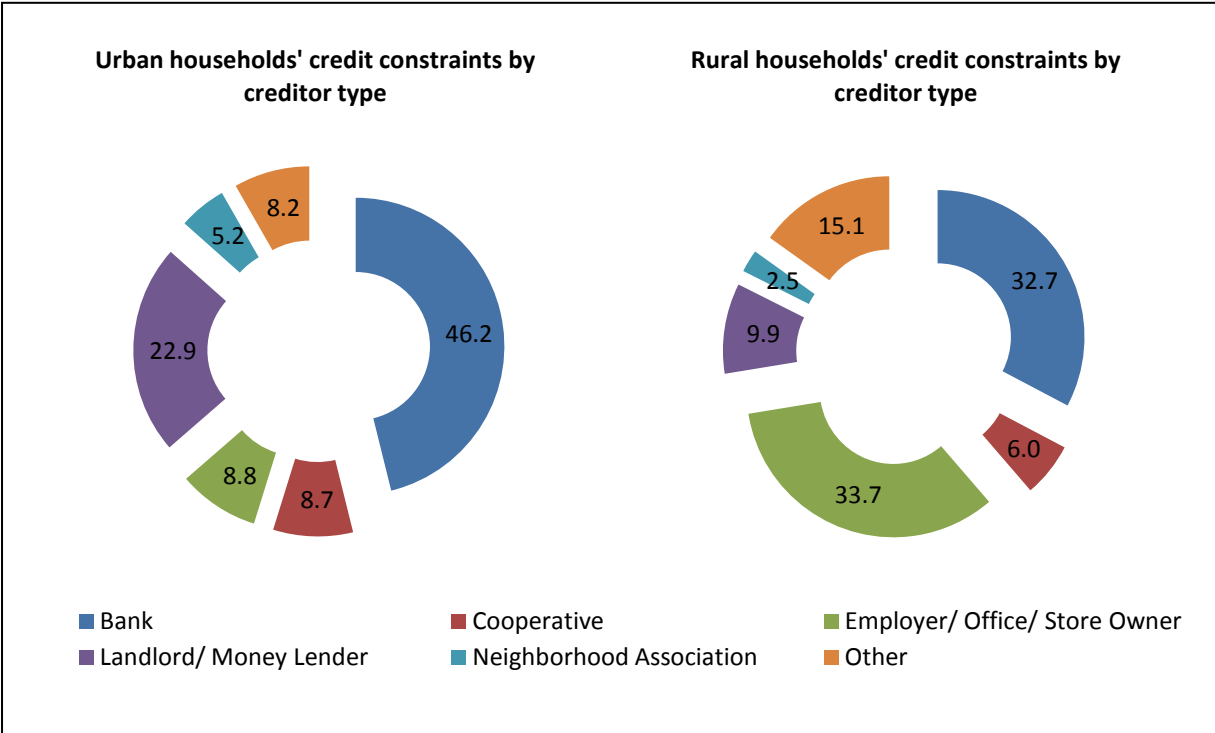
Source: Author's calculation

In total there are about 5% of the credits application are turned down. Focusing on the turned down credit by creditor type, there a slight difference between urban and rural credit behavior. In majority, urban household credit constraints is happened for households who apply to formal credit institution, i.e. private and government bank. Even turned down, landlord is still preferable as a creditor compared to other informal institutions such as neighborhood association and employer. On the other hand, employer and bank is the most difficult source to be accessed in urban areas. Both of them accounted for around two third of credit constraints.

4.3. Household's Child Activities

The child activities are classified into three categories; study, work and other activities (neither study nor work). In general, more than 40 percent of these children are involved in work activities. Furthermore, the disaggregation of urban-rural category shows another important finding. In rural area there are more children who decide to work than the one live in urban area. This is because of many unpaid job are available in rural compared to urban areas. It is common for children in rural areas to help their parents, working in family agricultural sector. More than 60% of children living in urban area are studying, while there are about 52 percent of them in rural area.

In addition, there are more than seven thousand children or 13 percent suffered from the economic hardship and natural disaster. Within this number of children, about 45 percent the one involve in work activities. Based on these facts it is worth to go deeper to analyse the impact of these disaster into the probability of children involves in work activities.

Table 5. Summary of child activities

Child Activities	Number of Child			Average Age	Suffered from Economic Hardship	Suffered from Natural Disaster
	Urban	Rural	Total			
Work	10,083	13,004	23,087	10.68	1,670	1,673
	(38.1%)	(44.2%)	(41.3%)		(48.2%)	(43.4%)
Study	15,911	15,533	31,464	9.36	1,709	2,096
	(60.1)	(52.7)	(56.2%)		(49.4%)	(54.4%)
Neither Study nor Work	464	918	1,382	9.98	82	86
	(1.8%)	(3.1%)	(2.5%)		(2.4%)	(2.2%)
Total	**26,458**	**29,455**	**55,933**		**3,461**	**3,855**
	(100%)	**(100%)**	**(100%)**	**9.92**	**(100%)**	**(100%)**

Source: Author's calculation

4.4. The Effect of Disaster and Credit Constraints to Poverty

From the logit regression on Table 6, it can be shown that disaster significantly increases household poverty. However, the contribution is small. Every disaster incidence increases poverty by less than half percentage of household to being poor. Beside disaster incidence, household's poverty is driven by other factors such as household location, household size, household's access to basic facility, and household's ownership of non-farm assets. On the other hand, credit constraints seem to have no effect on poverty.

Table 6. Logit regression of poverty line vs disaster incidence & credit constraint

				Number of obs		677
				LR chi2 (30)		143.180
				Prob > chi2		0.000
Log likelihood		-364.878		Pseudo R2		0.164
povline2d	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95%Conf.Interval]**	
Disaster incidence	0.457	0.214	2.14	0.03	0.037	0.876
Credit constraint	0.603	0.685	0.88	0.38	-0.739	1.945
Urban	-0.779	0.198	-3.92	0.00	-1.167	-0.390
Household size	0.414	0.065	6.34	0.00	0.286	0.542
HH head work	0.153	0.346	0.44	0.66	-0.526	0.832
Rotating credit	-0.063	0.200	-0.31	0.75	-0.454	0.328
Non-farm assets	-0.860	0.200	-4.30	0.00	-1.252	-0.468
HHH education level						
Not finished primary	-1.272	0.508	-2.50	0.01	-2.267	-0.276
Finished primary	-1.267	0.490	-2.59	0.01	-2.227	-0.308
Finished secondary	-1.808	0.496	-3.64	0.00	-2.781	-0.836
Tertiary	-2.760	0.539	-5.12	0.00	-3.816	-1.704
Constant	1.013	0.629	1.61	0.11	-0.220	2.246

Source: Author's calculation

Households who are living in urban area are found to have greater probability of being non-poor compared to households who are living in rural area. Since we use World Bank's definition of poverty, it is obvious that the rationale behind location factor is due to the difference in salary received and expenses spent by households. Urban households tend to have greater salary as well as higher expenditure level compared to those in the rural areas.

Similar to urban area, ownership of non-farm assets gives significant effect to household to be non-poor. As it can be seen from the above table, an increase in 1 percentage of non-farm asset ownership tends to reduce the probability of household to being poor by 0.8 percent. In addition, head of household's education at every level become the significant factor reducing poverty among households. On the contrary, household size is a factor contributes positively to household poverty. Larger number of household member is associated with higher probability of household to being poor. It is not unexpectable since an addition in household member means greater burden for household. However, it might be not true when majority of household member is adult and has salary.

However, an unexpected direction is given by social capital variable, i.e. rotating credit association (*arisan*). As mentioned earlier, rotating credit association is a proxy of social capital. In many literatures, social capital is expected to act as a social insurance for households. Thus, we expect that *arisan* has a negative and significance direction in to household poverty. However, it might be the case that funds come from *arisan* are in majority used to finance consumption. Furthermore, the sustainability of arisan is still questionable. Some research in Latin America shows that the sustainability of rotating credit association is questionable because of member's behavior. There is a tendency that member's reluctant to pay as she or he win the pot of *arisan*. This is, much or less, related to the absence of written sanction to the untrusted member.

4.5. The Effect of of Disaster to Children Activities
We employ a multinomial logit regression to know the effect of disaster and credit constraints on child activities. We take into account children aged 6-15 years old and divided their activities into three types, i.e. (1) work; (2) study; and (3) neither work nor study. Similar to the previous regression on proverty, we employ disaster incidence and household characteristics variables. Beside that, we

add up other variables, i.e. child age, household's per capita expenditure and household head's age and education. Nevertheless, we exclude credit constraints variable as it creates colinearity problem to the regression.

Table 7. Regression on child activities vs disaster incidence

					Number of obs		2510
					LR chi2(30)		286.69
					Prob > chi2		0.000
	Log likelihood		-1866.454		Pseudo R2		0.071
	Cactiv	Coef.	Std.Err.	Z	P>|z|	[95% Conf. Interval]	
1	Disaster incidence	0.050	0.305	0.160	0.871	-0.548	0.647
	Child age	0.123	0.055	2.230	0.026	0.015	0.232
	Household age	-0.179	0.067	-2.680	0.007	-0.310	-0.048
	HH Expenditure	0.000	0.000	1.790	0.074	0.000	0.000
	Urban	-0.062	0.344	-0.180	0.856	-0.736	0.611
	Electricity	0.425	0.356	1.200	0.232	-0.272	1.122
	HHH education						
	Not finished primary	0.384	0.376	1.020	0.307	-0.353	1.121
	Finished primary	0.708	0.404	1.750	0.080	-0.084	1.501
	Finished secondary	1.102	0.500	2.200	0.027	0.122	2.081
	Tertiary	1.468	1.090	1.350	0.178	-0.668	3.605
	HHH age	-0.073	0.085	-0.850	0.393	-0.239	0.094
	HHH age squared	0.001	0.001	1.010	0.313	-0.001	0.002
	HHH work	0.123	0.617	0.200	0.841	-1.086	1.333
	Rotating credit	-0.042	0.283	-0.150	0.882	-0.596	0.513
	Non-farm asset	0.678	0.313	2.170	0.030	0.065	1.291
	Constant	2.280	2.100	1.090	0.278	-1.836	6.396
2	Disaster incidence	0.065	0.306	0.210	0.832	-0.535	0.665
	Child age	-0.148	0.056	-2.670	0.008	-0.257	-0.040
	Household age	-0.133	0.067	-2.000	0.046	-0.264	-0.003
	HH Expenditure	0.000	0.000	1.920	0.054	0.000	0.000
	Urban	0.005	0.344	0.010	0.988	-0.669	0.679
	Electricity	0.815	0.363	2.240	0.025	0.103	1.527
	HHH education						
	Not finished primary	0.548	0.380	1.440	0.149	-0.197	1.294
	Finished primary	0.724	0.408	1.770	0.076	-0.077	1.524
	Finished secondary	0.969	0.503	1.930	0.054	-0.017	1.956
	Tertiary	1.831	1.089	1.680	0.093	-0.303	3.964
	HHH age	-0.050	0.085	-0.580	0.559	-0.216	0.117
	HHH age squared	0.001	0.001	0.770	0.442	-0.001	0.002
	HHH work	-0.120	0.617	-0.190	0.846	-1.329	1.089
	Rotating credit	0.188	0.283	0.660	0.507	-0.367	0.743
	Non-farm asset	0.527	0.313	1.680	0.092	-0.087	1.141
	Constant	3.908	2.099	1.860	0.063	-0.206	8.021

Source: Author's calculation

By taking "neither work or study" as base category, the regression result shows that the household's decision to send or not to send their child to school or to work is not affected by disaster incidence. Child age reduces the full time school attendance but increases the probability of children to involve in in working activity. This is make sense for the point of view of lower income households, that

when a child grows up then the household member thinks that the child is able to support their financial condition, even small part. For example by helping parent in a non-market activity.

5. CONCLUSIONS AND POLICY IMPLICATION

As a natural disaster prone area with large population size, Indonesia faces serious challenges in continuing its developments. Our study find that disasters contribute significanty to increase the poverty among households. This is an indication that the GoI must have the most appropriate strategy to help people who are living in the most vulnerable area from being poor. Sending people to higher school is one of the solution because it is a possibility for them to have a different type of occupation rather than become a farmer. Asset diversification is also a way to reduce poverty. Thus, in this case, the support of infrastructure in disaster prone areas is important to develop non-farm activities.

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