京都大学防災研究所年報 第 53 号 B 平成 22 年 6 月
Annuals of Disas. Prev. Res. Inst., Kyoto Univ., No. 53 B, 2010

Long-term Economic Impact of a Disaster
- Focusing on Consequences of Financing in Reconstruction-

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Synopsis

This paper aims at pointing out that natural disasters and the associated post-disaster reconstruction efforts can give rise to negative impacts over the long term in affected economies in terms of increase in external debt. We conducted a regression analysis and found that, regardless of the level of development, countries with larger observed disaster losses tend to accumulate more external debt over the long term. We also examined how the level of development affects such longer term factors. Countries in the low income group tended to have higher levels of external debt on average than high income countries, yet these levels were relatively less affected by disasters. Finally, this research indicates that remittance inflows and international aid tend to reduce the external debt burden in disaster prone countries over the long term.

Keywords: long-term effect, reconstruction process, financial position, international aid, remittances

1. Introduction

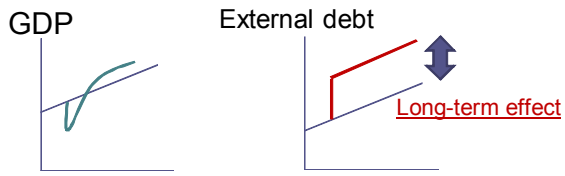
Natural disasters destroy production capital in affected-regions, which leads decreases of economic activity in the regions. It can cause the region's economy face serious setback over the long term. The majority of studies finds disasters to have a detrimental impacts on economic output in the region affected (see Murlidharan and Shah , 2003; Noy, 2009; Benson and Clay, 2004; Cuaresma et al, 2008; Mechler, 2004; Hochrainer 2006, 2009).

On the other hand, a number of empirical surveys point out that the impact is not significantly negative and even positive when the reconstruction process is taken into account (e.g. Dacy and Kunreuther 1969; Albala-Bertrand, 1993; Tol and Leek, 1999; Caselli and Malhotra, 2004; Ellson et al, 1984; Skidmore and Toya, 2002). Some papers suggest the reason for this is that a reconstruction boom postdisaster may increase economic activities in the region (e.g. Tol and Leek, 1999; Horwich, 2000) . A few papers hold that the replacement and renewal of the facilities improves the productivities in the economy leading to a kind of, "creative deconstruction", (e.g. Dacy and Kunreuther, 1969; Tol and Leek, 1999; Skidmore and Toya, 2002; Okuyama, 2003).

Most of this literature has focused on a scale of economic activity, which is indicated by GDP or GRP. What we have to look at is, however, not only GDP/GRP but also the cost of reconstruction efforts. Economic impacts of natural disasters emerge out of the combined effects of external shock on the economy itself as well as the efforts taken with respect to reconstruction in the society affected. Tatano et al.(2000) showed that, in this case, reconstruction cost should be counted as important term in economic loss.

Costs involved in the reconstruction efforts need to be financed by internal savings and capital inflows from outside the affected regions. External borrowing represents one of the most critical alternatives accessing capital inflow (IMF, 2003); yet which can also produce an increase in the amount of debt. Borrowing can affect the economy negatively over the long term even after production recovers (see Fig.1). This suggests that we

could observe the effect of costs of reconstruction as increase in debt over the long term.



(a) production (b) financial position

Fig.1 Where can long-term impact be observed?

Mechler (2004) points out that borrowing in financing reconstruction gives rise to longer-run negative economic impact in financial position in the affected region. Cochrane (1994, discussed in Benson and Clay, 2004) concludes that a disaster can lead to the lowering of a country's credit rating, increase the interest rate on external borrowing. This in turn reduces investment and affects long-term growth. Benson and Clay (2004) in a number of case studies observe that disasters increase indebtedness and thus affect the opportunity cost of future debt-servicing and repayment costs. Rasmussen (2004) finds that public debt increases dramatically during the three years following a disaster. He also suggests that reconstruction efforts could crowd out investment for productive capital and that the interest rate could be raised. Brooks et al. (1998, discussed in IMF, 2003) cited ten low-income countries to illustrate how bad weather can cause debt problems. The IMF (2003) also finds a relationship between exogenous shocks and accumulation of unsustainable external debt in many developing countries. Yang (2008) investigated cases where there had been a hurricane in the Caribbean for the period 1970-2000 and found that official development assistance (ODA), remittances from migrants, foreign lending, and foreign direct investment increased immediately after a disaster. The longer-term implications were, however, not assessed.

Although some studies hold that natural disasters give long-term impacts of natural disasters as changes in financial position, not enough empirical evidence has been accumulated yet. This paper aims to fill this gap, and conducts empirical studies to test whether natural disasters and reconstruction efforts give rise to longer-run negative impacts on the financial position in the affected regional economy as an increase in external debt.

Moreover, this paper discusses how the development situation affects the longer-run impacts. Some studies investigate the relation between development situation and disaster impacts (Tol and Leek, 1999; Freeman et al, 2002; Horwich, 2000; Kahn, 2005; Toya and Skidmore, 2007; Kellenberg and Mobarak, 2008; Okuyama, 2009), but empirical evidence about the relationship between development situation and long-term impacts, especially focusing on financial position, is still insufficient.

The paper is organized as follows: it starts out by looking at two case studies, Japan – an OECD country, and Honduras – a low income country, to provide some insights into the effects disaster can have on key macroeconomic variables. Based on these insights, in section three, this paper defines and conducts a regression analysis in order to assess the long-term economic impacts on the financial position. Section four ends with a discussion of findings.

2. Case Studies of long-term impact of natural disasters

We conduct two case studies of longer-run impact of natural disasters. The one is the 1995 Great Hanshin Earthquake in Japan. The other is Hurricane Mitch in Honduras in 1998. These two cases represent the most severe disasters to the affected countries in decades and caused significant economic impacts to the economy. The results of the two studies are compared in order to gauge how the development situation at the time of the event affects the longer-run impacts.

2.1 High income country case: 1995 Great Hanshin Earthquake, Japan

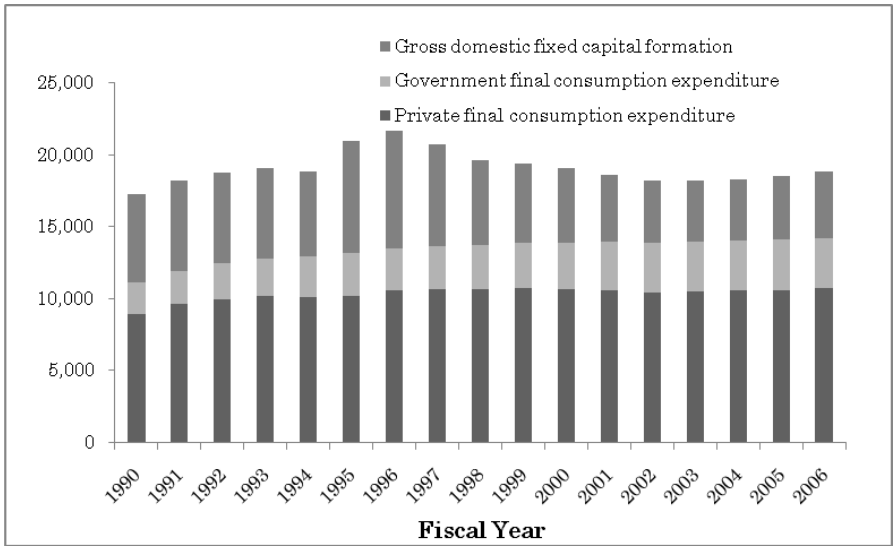


Fig.2 Expenditure Account in Hyogo prefecture (in billion JPY)
(Data Source: SNA data in Hyogo prefecture)

The Great Hanshin EQ struck the Hyogo prefecture in 1995 and represented the most severe disaster in these decades. As the relevant literature has indicated (Horwich, 2000; Nagamatsu , 2007), it was observed that gross product of the prefecture (GRP) increased immediately after the earthquake. Although the economic situation in 1995 in Japan was better than in other years since 1990, when Japan's economy was in a "lost decade" after the collapse of a "bubble", the increase in GRP in 1995 is partly explained as a result of reconstruction activity (Horwich, 2000; Nagamatsu, 2007) .

While investment for reconstruction might contribute to an increase in production in the region, it does not directly mean an improvement of economic welfare. Fig.2 gives the *Expenditure Account* for the Hyogo prefecture and shows both that the final consumption of households is not affected by the earthquake, yet investment increases following the earthquake. This increase in investment can be interpreted as resulting from the investment directed toward reconstruction, a point that was also emphasized by Nagamatsu (2007).

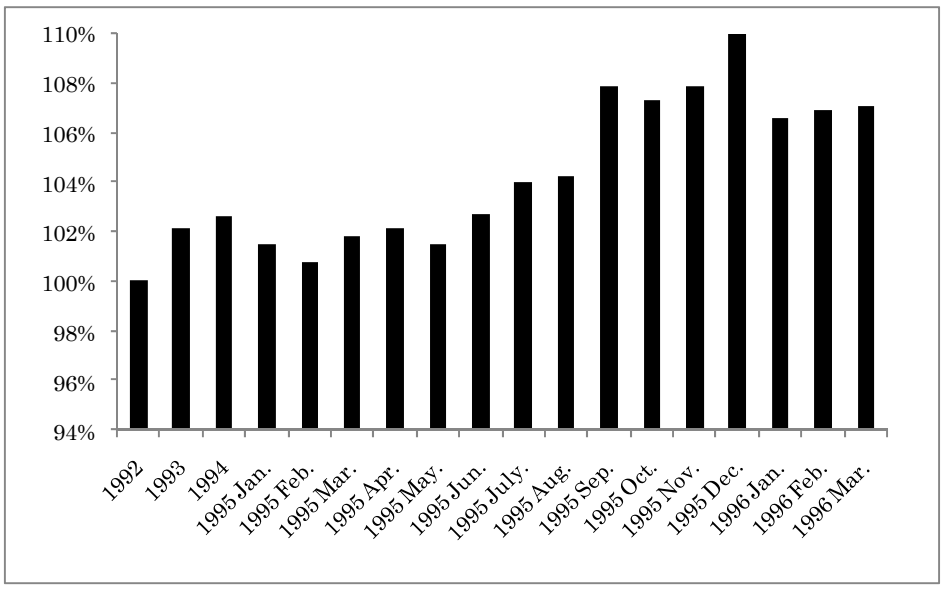


Fig.3 Amount of bank loans in the Hyogo prefecture: ratio to 1992
(Data Source: Kobe branch, Bank of Japan)

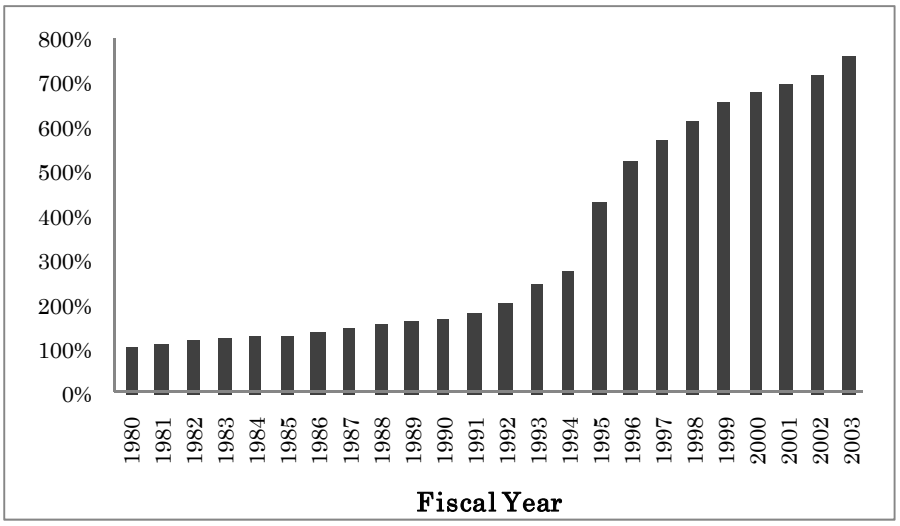


Fig.4 Amount of the public debt of Hyogo prefecture: ratio to FY 1980
(Data Source: Hyogo prefecture)

A key interest of the present paper is on how such an investment in reconstruction may represent the cause behind the increase in external debt and a decrease in monetary asset. In this respect, Nagamatsu (2007) has referred to the report produced by the Central Bank of Japan by showing that the 5 trillion JPY among total reconstruction cost was covered by a transfer from central government, while 4 trillion JPY among total reconstruction cost were derived from a private fund. In addition, Nagamatsu (2007) reports that firms affected covered there 1 trillion JPY of loss by way of existing monetary reserves and through the borrowing of 7-8 hundred million JPY.

Thus, focusing on the indicator representing production alone is unable to capture the long-term effects arising out of an earthquake event. In contrast, we suggest that the long-term impact can be observed by considering the financial position, i.e., by an increase in debt.

Fig.3 illustrates the amount of the loan provided by banks in the Hyogo prefecture (Bank of Japan, 1997). Fig.3 shows that the loan amount increased after September, 1995 onwards. This increase came to 10% in December 1995 compared to 1994. In absolute terms, this amount is significant adding up to an increase of about 1 trillion JPY as compared to the month the year before the earthquake. Fig.4 sets out the amount of public debt of the Hyogo prefecture. Fig.4 implies that the amount of public debt increased in 1995 and kept increasing afterwards. Clearly, there are factors impacting on debt such as raising bond for investment to new public project, yet we may hypothesize that debt increased as a consequence of the event and remained in the economy over the longer-run.

2.2 Low income country case: Honduras

In October 1998, Hurricane Mitch struck Central America and affected Honduras with widespread flooding. Mitch was an event with a return period of less than once in 100 years. 14000 people were killed and economic loss was around US$ 4 billion (EM-DAT, 2008). Fig.5 sets out the trajectory with respect to key economic variables for Honduras: GDP per capita, Gross fixed capital formation (GFCF), and external debt. In 1999, the economy of Honduras faced a serious recession, which can be observed in Fig.5 as a decrease in GDP per capita. Fig.5 also shows that GFCF increased in 1999, which can be explained with the reconstruction efforts leading to heightened demand and this GDP. In this regard, major reconstruction work had taken place in the following month and years (Telford et al., 2004).

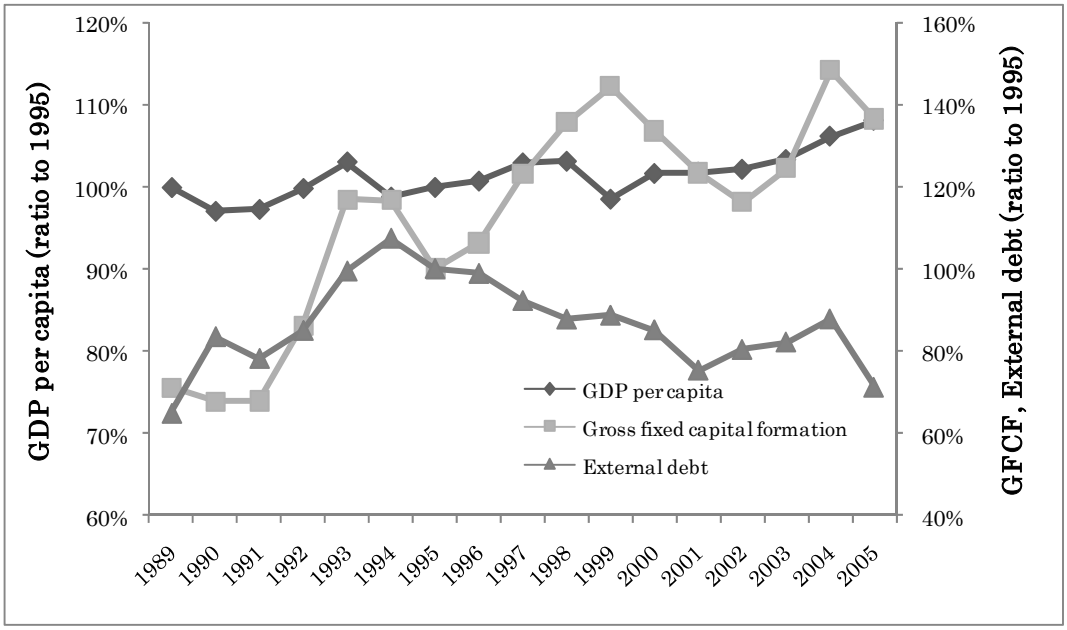


Fig.5 Trajectory of GDP per capita, Gross Fixed Capital Formation and External debt for Honduras
(Data Source: World Development Indicator, 2008)

Honduras had previous been in much debt over a considerable period, however since the early 1990s onwards, the country had made significant progress in improving its financial position by implementing structural reforms and strengthening social policies. This progress temporarily came to a halt in October 1998 as a result of Hurricane Mitch (IMF, 1999). Following the hurricane, external public debt increased by US$ 1.5-5.5 billion (Telford et al., 2004).

Also in Fig.5, it can be observed that the amount of external debt decreased after 1994, while it increased in 1999, which can be explained as the result of structural reforms and reconstruction efforts. In 2000, Honduras was granted debt relief under the Highly Indebted Poor Countries Initiative (HIPC) framework (Mechler, 2004), which led a decrease in the amount of external debt.

Conversely, Fig.5 implies that the change in the amount of external debt after 1998 was not significant part of the decreasing trend. We may hypothesize that the reconstruction financed by external debt remained insufficient, and infrastructure and housing reconstruction remaining incomplete (Telford et al., 2004). Also in Fig.5, it can be observed that GFCF did not increase further beyond 2000. Overall, considering the indebtedness before the disaster, it is suggested that Honduras faced some debt constraint in financing the reconstruction.

2.3 Findings

There is indication that, regardless of level of development, affected regions tend to accumulate external debt during the reconstruction process. This could be explained by the fact that external borrowing provides an important alternative in financing reconstruction. On the other hand, there is indication that increases in debt could be significant in the Japan case, while the amount of external debt did not increase significantly in Honduras after Hurricane Mitch. We could hypothesize the reconstruction was not being financed sufficiently by external borrowing. This might suggest that low income countries tend to be less able to finance reconstruction following a disaster, which could lead to reconstruction not being completed to an acceptable level.

Table 1 Summary of the case studies

	Great Hanshin Awaji EQ, 1995	Hurricane Mitch, 1998
Disaster	Earthquake	Hurricane
Used data	Regional level	Country level
Production	Increased immediately after the disaster	Increased after recession
Capital Formation	Increase	Increase
Increase in debt after disaster	Observed (Significant)	Observed (Insignificant)
Long-term impact	Change in financial position	Inadequate repair

It cannot, however, be concluded that these factors are directly caused by a natural disaster. Many other economic conditions in the countries concerned could also be involved. In the next section, these findings will be further investigated by employing regression analysis.

3. Empirical analysis of the long-term impact on the financial position

3.1 Regression analysis: Increase in external debt

(1) Question and Hypothesis

The studies suggested an increase in debt post disaster in the longer-run. We now investigate this case study finding more rigorously with regression analysis employing data of economic losses of disaster cases. The main issues that will be addressed are: can the long-term impacts in terms of an increase in external debt be observed statistically by using data collected from past disasters, and; can the situation with respect to development have any long-term impact?

The hypothesis can thus be formulated as follows; affected countries experiencing greater losses through disaster will potentially accumulate more external debt as a result of the reconstruction activities and this will continue in the countries affected over the long-term. The hypothesis is therefore, : The amount of external debt over the long-term will be affected by the amount of damage a country has experienced during the past.

(2) Model and data

We developed a regression model as shown in equation (1), in which the dependent variable of country i is referred to as $External\ Debt_i$, independent variable of country i is referred to as $TotalDamage_i$, and residual ε_i. $External\ Debt_i$ represents the amount of External debt in 2004 as evaluated according to current USD[1].

$$\ln(External\,Debt_i) = \alpha + \beta \ln(Total\,Damage_i) + \varepsilon_i \quad (1)$$

The WDI, however, did not posses sufficient data with regard to the external debt of high income countries. For the high income countries, therefore, an alternative dataset from the *Join External Debt Hub* (JEDH) was used. The data for gross external debt from the JEDH database appears on a quarterly basis and the 4th quarter of 2004 was chosen as the data for that year.

We used data of disaster losses from EM-DAT. The EM-DAT disaster database (CRED, 2008) is maintained by the Centre for Research on the Epidemiology of Disasters (CRED) at the Université Catholique de Louvain. EM-DAT currently provides information on those killed, made homeless and affected as well as financial loss experienced for more than 16,000 sudden-onset (such as floods, storms, earthquakes) and slow-onset (drought) events from 1900 to the present. *Total Damage* was calculated as the sum of the economic loss from natural disasters for the period 1970-2003 with deflated to constant 2005 USD. The economic loss for past disaster cases were summed because debt can accumulate following a past disaster.

[1] In the World Development Indicators database, external debt is defined as the "debt owed to nonresidents repayable in foreign currency, goods, or services. Total external debt is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt. Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt. Data are in current U.S. dollars."(World Bank, 2008)

Thus, the total amount of economic loss is able to be correlated with the amount of debt.

Table 2 Overview of data used

Variable	Data source	Time horizon
Damage	EM-DAT	1960-2003
External debt	WDI, 2008;	2004
External debt (HI countries)	JEDH	2004, quarterly 4th
GNI per capita (calculated using the World Bank Atlas method.)	WDI, 2008	2004

The World Bank's criterion for classifying income level of economies was also used, which gives the gross national income (GNI) per capita. In this respect, the World Bank classifies every economy into low income (LI), middle income (MI) or high income (HI). Economies are also divided according to GNI per capita, as calculated using the World Bank Atlas method. These groups consist of: low income, $935 or less; middle income, $936 - $11,455; and high income, $11,456 or more (see Table.4). Moreover, because there are only 23 valid data sets for countries in the HI group, Seychelles, Trinidad and Tobago, Oman, Czech Republic, and Hungary, which represent countries with the highest GNI per capita in the MI group, were added to the HI group for the purpose of regression analysis.

Table 3 World Bank's criterion for income level

countries	Criterion : GNI per capita
Low income (LI)	$935 or less
Middle income (MI)	$936 - $11,455
High income (HI)	$11,456 or more (Seychelles, Trinidad and Tobago, Oman, Czech Republic, and Hungary are added from MI group)

(3) Results of the regression

Table 5 gives the result of the regression analysis. Regardless of the income level, the variable *ln (Total Damage)* is statistically significant with the sign indicating a plus, which means that, countries with larger observed disaster losses tend to accumulate more external debt over the long-term.

The constant for the low income countries is 19.932, which is the largest of the three groups, whereas this is 15.194 for the MI group, and 18.904 for the HI group. The coefficient for the logged Total Damage is 0.166 for the LI group, 0.555 for the MI group, and 0.520 for the HI group. We found that countries in the lower income group tend to have higher levels of external debt on average than high income countries, yet these levels, relatively speaking, were not affected as much by disaster. Furthermore, the value of the R-square is small in low income countries. These results can be explained as arising out of two possible criteria. First, external debt plays a less important role in the financing of the reconstruction in lower income countries, where alternative capital inflows play a more important role in

Table4 Results of the regression

Independent Variables	All samples (N=146)	LI group (N=46)	MI group (N=67)	HI group (N=28)
Constant	16.290***	19.932***	15.194***	18.904***
	(20.223)	(26.015)	(13.171)	(12.511)
ln (Total Damages)	0.520***	0.166**	0.555***	0.520***
	(8.680)	(2.673)	(6.597)	(5.100)
R-Square	0.344	0.140	0.401	0.500

*significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

reconstruction. Second, low income countries tend to face some borrowing constraints, which can be seen and is implied in the case of Honduras case.

3.2 How do international aid and remittances contribute to reducing the long-term impact?

(1) Questions and Hypothesis

As previous research has indicated, (Charveriat, 2000; Mechler, 2004), ex-post international aid is often insufficient and unreliable for the purpose of reconstruction, and ex-post borrowing may give rise to a long-term negative economic impact on the financial position of a country. As Linnerooth-Bayer and Mechler (2007) have demonstrated, different kinds of alternatives need to be given greater consideration in relation to ex-ante risk financing measures.

In this section, we therefore investigate the role of daily remittances and international aid, which are not related to disaster event but daily economic activities. Such daily remittances and international aid may help those affected save money for the purpose of responding to disasters as well help as finance reconstruction during the aftermath, which implies that less borrowing for financing reconstruction will be required.

Recently, role of remittances has attracted attention as disaster risk financing. The World Bank (2006) has pointed out that remittances from abroad increase subsequent to natural disasters, which play a role as a safety net for those households affected. Similarly, Mohapatra et al.(2009) has suggested that international remittances-receiving households are better prepared to cope with a disaster. Yang and Choi (2006) have found in the case of Philippines, that remittances help compensate for the loss in income due to heavy rainfall. It has also suggested that migrant remittances play an important role for reconstruction of the regions (Suleri and Savage, 2006). Correspondingly, Telford et al.(2004) showed how remittances from abroad in the case of successful reconstruction were one of the main contributors toward reconstruction after Hurricane Mitch.

Contrast to these previous studies, in the present paper, the role of daily remittances for reducing the effects of disasters is assessed from the perspective of a change in the financial position of a country. Thus, the hypothesis is put forward in the current paper that remittances reduce the impact over the long-term of an increase to external debt. In other words, in those countries that receive more daily remittances, the effect of natural disaster on the financial position is less.

Next, the role of daily international aid for reducing long-term impacts will be discussed. If affected countries have been successful in receiving enough daily international aid, population could potentially then save more that could be used to prepare for disasters in that the finance for reconstruction could be obtained through a reallocation of this aid. This would, in turn, serve to reduce an increase in debt. For example, Benson and Clay (2004) have shown that many donors respond to disaster by reallocating resources.

The hypothesis put forward in the present context is therefore as follows: the more the average of annual international aid in a country is, the less the accumulated external debt as a consequence of a natural disaster is. We assume that average of annual international aid can successfully represent the scale of daily international aid in a country. Disasters can be assumed to have little impact on longer-term trends with regards to the total aid flows, as Benson and Clay (2004) pointed out.

(2) Model and data

A regression model is devised as in equation (2). In equation (2), $External\ Debt_i$ represents the same value in (1). $DmmHR_i$ represents the dummy variable and refers to those countries receiving a high level of average annual remittance. Such countries will hereafter be referred to as “high remittance country”. $DmmHA_i$ represents the dummy variable and refers to those countries that receive a high level of average annual international, which is hereafter referred to as a “high aid country”. The variable of $Total\ Damage_i$ in equation (2) is the same value as in (1) .

Table 5 Definition of the variables in WDI
(Source: World Development Indicator, 2008)

Workers' remittances and compensation of employees, received (% of GDP)	Workers' remittances and compensation of employees comprise current transfers by migrant workers and wages and salaries earned by nonresident workers. Workers' remittances are classified as current private transfers from migrant workers who are residents of the host country to recipients in their country of origin. They include only transfers made by workers who have been living in the host country for more than a year, irrespective of their immigration status. Compensation of employees is the income of migrants who have lived in the host country for less than a year. Migrants' transfers are defined as the net worth of migrants who are expected to remain in the host country for more than one year that is transferred from one country to another at the time of migration.
Aid (% of GNI)	Aid includes both official development assistance (ODA) and official aid. Ratios are computed using values in U.S. dollars converted at official exchange rates.

$$\ln(ExtenalDebt_i) = \alpha + \beta_1 \ln(TotalDamage_i) + \beta_2 DmmHR_i * \ln(TotalDamage_i) + \beta_3 DmmHA_i * \ln(TotalDamage_i) + \varepsilon_i \quad (2)$$

The figures for the remittances and international aid are available from the WDI. Table.6 gives the definition for the variables as employed here, which is defined by WDI. We calculated the average value of Remittances and aid. The criterion for a high remittance country was set depending on whether the average remittances (% of GDP) for that country exceed 1%. The criterion for a high aid country was set depending on whether the average of the aid (% of GNI) in the country exceeds 1%).

(3) Results of the regression

Table 8 gives the result of the regression. *DmmHR*ln (Total Damage)* is statistically significant and the sign is negative, which means the hypothesis put forward is validated. Thus, the higher level of remittances countries receive, the less the amount of external debt they tend to accumulate due to disaster loss, which means that remittances contributes to reducing the impact of a natural disaster over the long-term with respect to an increase in debt. *DmmHA*ln (Total Damage)* is statistically significant with the sign indicating negative, which means that high aid countries tend to accumulate less external debt as a result of a natural disaster. This shows that receiving a higher level of daily international aid contributes to reducing the long-term impact of disaster.

Table 6 Role of remittances and international aid for long-term impact

Independent Variables	Coefficient (t-value)
Constant	18.348***
	(26.625)
ln(Total Damage)	0.505***
	(10.359)
*DmmHR*ln(Total Damage)*	-0.067***
	(-2.964)
*DmmHA*ln(Total Damage)*	-0.162***
	(-6.700)
R-Square: 0.590	
(N=144)	

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level

4. Discussion and implications of research findings

4.1 Long-term impact and economic loss measuring

This paper aimed to show that natural disasters and the associated reconstruction efforts post disaster can give rise to long-term negative impacts in affected economies in terms of increase in external debt. Two

case studies were carried out with regard to different development situations. In each case, it was observed that the external debt tends to accumulate following a disaster. Furthermore, a regression analysis was also carried out and found that regardless of the development situation, countries with larger observed disaster losses tend to accumulate more external debt over the long-term.

The results of this paper suggest that focusing on production is not sufficient to understand the long-term economic impacts a disaster may have on a region. Natural disaster can have a long-term negative effect on the financial position of country even after production recovers as a result of the reconstruction efforts.

Given that disasters could give positive effect in production and negative effect in financial position, it is not obvious whether the economy was affected negatively or positively in total. In this regard, we need to answer the question "how can the losses caused by a disaster be measured appropriately taking into account change in financial position?" . One possible answer would suggest that economic losses should be measured in terms of economic welfare. GDP, for example, is an indicator for economic activity, not welfare (Tol and Leek, 2000). In this respect, we previously initiated discussion on how to measure economic loss that is consistent with considering economic welfare but involve double counting (Tatano and Nakano, 2008).

4.2 How development situation affects the long-term impact?

We examined how development situation affects the longer-run impact and found that countries in the low income group tend to have higher levels of external debt on average than high income countries, yet these levels are, in relative terms, not affected as much by disasters.

This second point can be explained by two possible facts. First, external debt plays a less important role with regard to financing the reconstruction of lower income countries, whereas, in contrast, alternative capital inflows play a more important role in reconstruction. Second, low income countries tend to face certain borrowing constraints, which could be observed in the case of Honduras.

4.3 Role of international aid and remittances

In the present paper, we found that countries in the group of high remittance countries and high aid countries tend to accumulate less external debt as a result of a natural disaster. This indicates that receiving a higher level of daily remittances and international aid contributes to reducing long-term impact of disaster. This can be explained by the fact that reallocation of remittances and international aid could play an important role in financing reconstruction, which is close to a finding of Benson and Clay (2004).

It can suggest that supporting of the paying remittances over the average period could potentially provide an important alternative with regard to ex-ante risk financing measures. World Economic Social Survey (UN, 2008) suggests that governments should lessen costs for sending remittances and adopt policies to make sure that remittances can be received through official channels.

This paper contributes to starting discussion of long-term impact of natural disaster taking into account the financial position. This, however, needs to be improved more. As discussed in Okuyama (2008) and Skidmore and Toya (2002), what needs to be acknowledged is that data of economic loss of disaster is sometimes low quality. Definition of the economic loss tends to be ambiguous and the process of collecting data of economic losses has not been well developed. Progress in methodology for economic loss measurement will help us improve the result. Moreover, quality of economic data like remittances is also inadequate. The collection of more reliable data on remittances is thus necessary in order that the role of remittances can be investigated in greater detail.

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災害が及ぼす経済への長期的影響に関する一考察
―再建時の資金調達に着目して―

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要　旨

本研究は，災害後の再建活動にかかる資金調達に着目し，災害が負債の増加という形で被災地域に長期的な影響をもたらす可能性を指摘する。そのために近年の災害のケーススタディを行うとともに，過去に受けた災害の被害の大きさと現在抱える負債の大きさの関係について回帰分析を行う。また経済発展の状況の違いによる長期的効果の現れ方の違いについても明らかにする。本研究から，先進国・途上国ともに，過去に大きな災害を受けた地域が長期的に大きな負債を抱える傾向にあることが示唆された。また低所得国のグループでは平均的に大きな負債を有する一方で，それが災害によって増加する効果は高所得国に比べ比較的大きくないことが示唆された。またその影響を軽減するのに国際援助や海外からの送金が貢献する可能性が示された。

キーワード：長期的影響，経済再建過程，資金調達，国際援助，海外からの送金