MODELING ACEH: ESSAYS ON RESOURCE MANAGEMENT, INFLATION, AND SOCIAL CAPITAL

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MODELING ACEH: ESSAYS ON RESOURCE CURSE,

INFLATION, AND SOCIAL CAPITAL

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This dissertation is a collection of three papers that cover contemporary issues at centre stage in the development of Aceh, Indonesia. The first, 'Testing the resource curse hypothesis in Aceh', empirically tests the resource curse hypothesis in this oil-and-gas rich region. Using data from 1975 to 2006, the model results reject the hypothesis of a resource curse. The empirical models indicate that the boom in the mining sector in Aceh from the late 1970s until the mid-1980s did not reduce the output of the non-mining manufacturing and agriculture sectors as predicted by the resource curse theory. On the contrary, the increase in mining output actually had a positive impact on the other two sectors' output. Conflict, on the other hand, although not being significant in the model, shows a negative relationship with output in non-mining manufacturing and in agriculture. The Asian economic crisis, interestingly, is also found to have had a positive impact on the non-mining manufacturing and agricultural sector.

The second paper, 'Determinants of inflation in Aceh', examines inflation behaviour in Aceh before and after the 2004 Indian Ocean tsunami. The wild increase in inflation in post-tsunami Aceh was assumed to be influenced by two 'shocks': the tsunami and the nation-wide fuel price increase in 2005. Multivariate time series regression models are developed to describe the inflationary process. It is found that Aceh's inflation is determined mainly by inflation expectations and the exchange rate, in a way similar to Indonesia's national inflation behaviour. Productivity is also

significantly associated with inflation, but with a contradictory sign when decomposed into productivity based on oil-and-gas and non-oil-and-gas GDP. Additionally, contrary to a common assumption, a structural change test indicates that it was the oil price increase, rather than tsunami-driven factors, that changed the structure of Aceh's inflation. This paper also incorporates an analysis of the output and price relationship in Aceh's economy to examine further policy implications of inflation. Using structural vector autoregression with Blanchard-Quah restrictions, I find that shocks based on aggregate supply policy would have been more effective than aggregate demand policy in stimulating growth while maintaining moderate inflation in Aceh.

The third paper, 'Social capital as determinants to return among women IDPs of the 2004 tsunami in Aceh', investigates determinants of the decision to return to their original settlements among female internally displaced persons (IDPs) in post-tsunami Aceh. Data from the 2005 survey by the UN Development Fund for Women on the situation of women after the tsunami are used to explore the existence and use of social capital in post-disaster communities. Although the paper is based on migration literature, its approach differs in looking at the role of 'resource/origin' as a pull factor, rather than 'host/destination', as generally found in that literature. Using logistic regression analysis, the study finds that women IDPs with strong associations to friendships in temporary settlements and acquaintances from original villages are more likely to return than those with fewer or no such friendships. Indirect associations with a community through shelter type, shelter size and land ownership are also found to be significant factors in the decision to return. Understanding determinants of the decision to leave temporary shelter among women IDPs is expected to help refine post-disaster shelter management so it can be more gendered and culturally sensitive.

BIOGRAPHICAL SKETCH

Saiful Mahdi, son of late Abdullah bin Ahmad and Fatimah binti Kaoy, was born in Pidie, Aceh, Indonesia in 1968. He grew up in Banda Aceh until he finished high school. Saiful received a B.S. in Statistics from Institute Teknologi Sepuluh Nopember (ITS), Surabaya, East Java, in 1993. During his undergraduate studies, Saiful was active with several student organizations including Statistics Student Association, ITS student government, and 'Perisai Diri' Martial Art Club. Soon after his undergraduate studies, Saiful returned to Aceh and has been teaching at Syiah Kuala University as a junior lecturer since.

He is married to Dian Rubianty and they have four children; A son, Saifan Safwaturrahman Mahdi, and three daughters, Salsabila Mahdi, Samia Sakinah Mahdi, and Salwa Safira Mahdi.

With a Fulbright Scholarship, Saiful finished his M.S. in Statistics at the University of Vermont (UVM) in Burlington, VT in 2001. During his time at UVM, Saiful worked with his advisor Larry D. Haugh and the Vermont Agency of Transportation to build accident prediction models for different types of intersections and geographical settings of highways in Vermont. Saiful's inclination to apply statistical methods in various fields also developed during his graduate program at UVM, especially after being exposed to various statistical multivariate techniques by Ruth M. Mickey, who taught her students most generously.

During his graduate studies at Cornell University, Saiful worked with professors Timothy D. Mount, Iwan J. Azis, and Nancy H. Chau on economic and development issues, including mineral/energy resource management, economic policy, migration, social capital; and how to use applied econometric methods to address the issues. Saiful has published in *Indonesia, Jurnal Masyarakat Indonesia, Domain*, and *Journal of Aceh Studies.* He is also a columnist for several local media outlets in Aceh.

He co-founded The Aceh Institute, a research and policy studies institute in Banda Aceh in 2003 and served as its board member and first executive director during 2004-2007.

Saiful defended his dissertation on July 8, 2009 and passed without any conditions. He then returned to Aceh to resume his academic career as a senior lecturer at Syiah Kuala University in Banda Aceh, Indonesia. He continues to work part time with The Aceh Institute as a senior researcher and, as of June 2010, serves as the Director of International Centre for Aceh and Indian Ocean Studies (ICAIOS), an inter university research center in Banda Aceh, Indonesia.

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I owe gratitude to Prof. Iwan J. Azis and Prof. Nancy H. Chau. They both were crucial in developing my skills in policy analysis and applied econometrics. Prof. Azis was also very resourceful as Regional Science's Director of Graduate Study. Prof. Chau's pleasant and warm responses in our direct and email communications put me at ease during times of frustration and stress. As members of my committee, both of them gave helpful suggestions and comments on my research.

Last but not least, I owe eternal gratefulness to my loving wife, my mother and late father, my children, my extended family and friends for their unending support. They continue to make me feel really proud, yet humbled, of my accomplishments. They bear with me when I am not at my best. My wife and three childrenhave had to endure many ups and downs during my graduate studies. But they never lost confidence and hope in me. They are my sanctuary during hard times and my inspiration when I am baffled. Friends and volunteers helping me (and Aceh) after the 2004 Tsunami, especially those who worked through the Aceh Relief Fund (ARF), kept me strong during difficult times.

Financial support for my first two and a half years at Cornell was provided by the Technological and Professional Skills Development Project (TPSDP) of Syiah Kuala University, Banda Aceh. Subsequently, Department of City and Regional Planning at Cornell granted me with teaching assistantships under Yuri Mansury Ph.D. for two semesters in 2006 and one semester with Robert Schwarting in 2007. Partial funding during my study was also provided through international field research and travel grants by Cornell's Southeast Asia Program (SEAP), Mario Einaudi Center for International Studies, and the American Indonesian Cultural and Educational Foundation Scholarship.

Untuk Ummi, Hj. Fatimah, yang tuntutannya sederhana

Untuk Abu-ku, H. Abdullah, yang tak pernah menuntut

Untuk Istri-ku, Dian Rubianty, yang selalu bersama memenuhi berbagai tuntutan

Untuk anak-anakku, Saifan, Bila, Mia, dan Salwa, sumber energi dan inspirasi untuk memenuhi semua tuntutan dalam hidup ini.

Untuk Rakyat Aceh dan Nusantara, terutama yang hak-haknya belum terpenuhi….

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TESTING THE RESOURCE CURSE HYPOTHESIS IN ACEH

Abstract

This paper investigates the presence of "resource curse" syndrome in Aceh's economy, an oil and gas rich region in Indonesia to test for the resource curse hypothesis. Using a series of data from 1975-2006, a model based on OLS method was estimated. The model rejects the hypothesis of resource curse in Aceh's economy. Contrary to what the resource curse theory predicts, this paper proves that the mining sector does not have a negative impact on Aceh's non-mining manufacture and agriculture output. The findings in this paper lend support to the new development policy in Aceh that tries to revive its more diffused economic linkages such as from agriculture and fisheries while investing heavily in its human resources development using its revenue sharing fund from oil and gas.

1.1. Introduction

Aceh is one of the most resource-rich regions in Indonesia. It is the third richest province in per capita revenues after Papua and East Kalimantan (BPS, 2005).[1] Its contribution to Indonesia's exchange revenues has always been very significant. Dawood and Sjafrizal (1989), for example, note "Aceh has, since 1980, been contributing between $2 and $3 billion annually to Indonesian exports.... By 1985, Aceh was the third largest source of exports, behind only Riau and East Kalimantan…." (p. 115). Its natural gas used to supply around 30% of Indonesia's oil and gas export, and with agricultural products, it constituted 11% of foreign exchange revenues [in the 80s].[2] By the mid-90s, Aceh was contributing roughly 17% of Indonesia's total foreign exchange earnings.[3]

Despite the fact that Aceh is a very rich region, poverty and income distribution inequality has been a growing problem since, surprisingly, the 90s at the peak of industrialization following the recovery of huge natural gas reserve in North Aceh. In the 70s, "…there is substantial evidence that poverty rates were unusually low, due in part to a large surplus of rice, the staple food crop. Measured in 1980, just 1.8 percent of the rural population, and 1.7 percent of the urban population, was below the poverty line – among the lowest in [Indonesia]" (Ross, 2003). By contrast, in 1999-2000, 16.30 percent of rural and 10.15 percent urban population in Aceh "subsisted below Indonesia's already low poverty line" (Milich, 2001). According to BPS report in 1993, 40% of 5,643 villages in Aceh fall below the minimum government-set welfare standard.

[1] Based on provincial RGDP by Indonesia Office of Statistics (BPS), 2005
[2] Aceh: ecological war zone. *Down to Earth No. 47,* November 2000
[3] Husin, Z. (1998:1) as cited in Robinson (2001:221).

Many scholars and analysts see the conflict of 1989-2004 between the Free Aceh Movement (GAM) [4] and Indonesia's military as the culprit for the rampant poverty and slow economic growth (See for example Hill, Resosudarmo, and Vidyattama, 2008; Resosudarmo and Vidyattama, 2006; Tadjoedin, 2007; Tadjoedin, Sjuharyo, and Mishra, 2001). The then Governor Abdullah Puteh noted in October 2003 "The unemployment and poverty rates caused by the conflict in Aceh are alarming". The governor cited data showing that 40 percent of its 4.2 million[5] people were living below the poverty line.[6] In term of household, the situation was worse. Aceh's National Coordinating Office for Family Planning (BKKBN) reported that 476,579 (54.09%) out of 881,078 households in Aceh live in poverty with unemployment more than 300,000 in 2003.[7] By headcount, 28.4% of Aceh's population was poor in 2004, much higher than the Indonesia's national poverty level of 16.7% (BPS, 2004). Moreover, more people in rural areas have been poorer since the gas boom. Additionally, like the rest of Indonesia, Aceh was also impacted by the economic slowdown triggered by the Asian economic crisis in 1997-8.

The Indian Ocean Tsunami of 26 December 2004 worsened the outlook. Although progress has been made since (thanks to the unprecedented global solidarity in supporting Aceh's rehabilitation and reconstruction), Aceh's poverty level stands at 23.5% by October 2008, still higher than the national average of 15.4%. A comparison of poverty rates in Aceh and Indonesia from year to year is shown in Table 1.1.

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[4] GAM proclaimed Aceh as the successor state of Aceh's glorious sultanate, claiming it has nothing to do with Indonesia, on December 4, 1976. But its struggle did not get widespread support from the Acehnese until 1989 after a brutal crackdown by the Indonesian military.

[5] The population of Aceh has been unclear since the conflict intensified in 1999. Many cited 4.2 million, the highest number based on year 1990 census. According to BPS data in 2003, however, Aceh population was 3,899,367 (Serambi Indonesia, 5 February 2004). The decrease might have been caused by IDPs movement to neighboring provinces, refugees to Malaysia, and death toll during the martial law of 2003-2004. After the Tsunami, Aceh population is about 4 million (SPAN, BPS, 2006).

[6] "Alarming Poverty & Unemployment in Aceh," *Laksanama*, 29 October 2003 available at http://www.laksamana.net/vnews.cfm?ncat=35&news_id=6246 (accessed 20 May 2005)

[7] "476.579 KK Warga Aceh Masih Miskin", (476,579 households in Aceh are poord), *Serambi Inonesia*, 1 November 2003.

Table 1.1 Poverty Rate Comparison: Aceh vs. Indonesia[8]

Percentage	1980	1987	1999	2004	2005	2007
Aceh			16.5	28.5	28.7	26.7
Aceh-urban	11.7	9.0	13.8	17.6	19.0	18.7
Aceh-rural	11.2	8.9	17.4	32.6	32.6	29.9
Indonesia	28.6	32.2	19.1	16.7	16.0	16.6

Source: BPS as cited in Booth (1992a:348), and in World Bank (2008b)

The data indicates that while the rest of Indonesia has seen a decrease in poverty rate from year to year, Aceh has seen its own poverty rate increase. The poverty rate in Aceh was so bad in the midst of its oil and gas boom, Brown (2005) has noted that

> In 1980, Aceh was a mid-income province, ranking tenth out of 26 provinces in terms of regional GDP, with very low poverty rates – only two provinces had a lower poverty rate than Aceh. As the exploitation of its natural resources progressed, Aceh's GDP increased relatively quicker than most other provinces. In 1998, more than 40 per cent of Aceh's GDP was due to oil. But this increase in wealth generation was accompanied by a drastic increase in poverty. Poverty in Aceh increased by 239 percent from 1980 to 2002; over the same period, poverty in Indonesia as a whole fell by 47 per cent. (p.4)

Clearly, Aceh's rich natural resources, especially gas and oil, did not manifest in its people's welfare. Hill, Resosudarmo, and Vidyattama (2008) found that between 1975 and 2004 "Aceh is the only other province [beside Papua] where poverty has increased, and this is due to the effects of prolonged conflict." By 2006, Aceh is the

[8] Poverty indicators for Aceh seem to be robust across various poverty measurements. For different measurements of poverty in Indonesia, see Esmara (1975), Bidani and Ravallion (1993), Pradhan et al (2000), and Akita (2003), van Leeuwen and Földvári (2007)

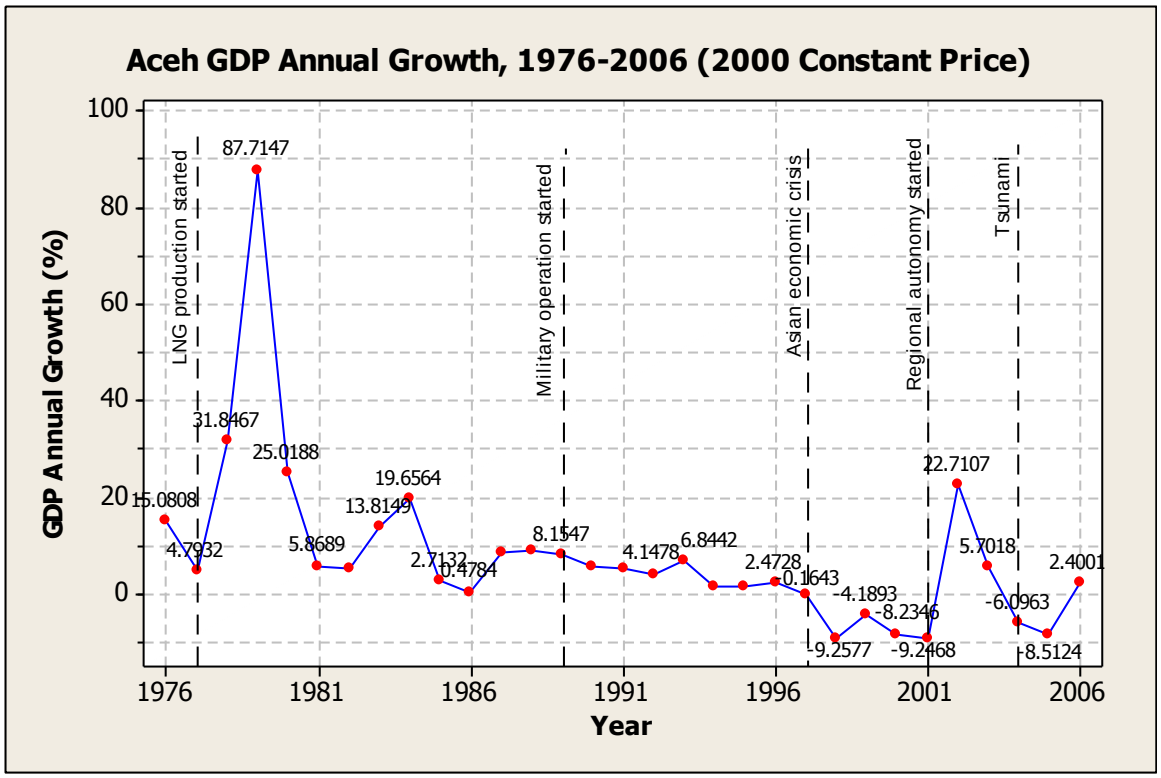
third richest province in per capita revenue among 33 provinces, after Papua and East Kalimantan. But, at the same time, Aceh ranked fourth in poverty levels under Papua, Maluku and Gorontalo. North Aceh, the district where oil and gas explorations are mostly located, is among the poorest of 21 districts in Aceh with almost a 35 per cent poverty head count before the 2004 Tsunami (World Bank, 2008:34), .

In Aceh, the massive exploitation of gas and oil have mostly benefited foreign companies and the centralized government in Jakarta, at least until 2002 when a special autonomy for the region started to be implemented.[9] Until then, it was estimated that less than 5 per cent of the benefits flowing to Jakarta from Aceh's natural resources returned to the province (Tippe, 2000). For example, when annual profits of Arun NGL Co., a joint venture natural gas refinery of Pertamina, US Mobil Oil (now ExxonMobil), and JILCO Japan, amounted to about US $2.1 billion annually in the 90s, Aceh Provincial Budget was only $82 million (Abdullah and Syahrel, 2005). This disparity is considered the main causes of discontent among Acehnese that led to Aceh's conflict as noted by Brown (2005): "The disparity between Aceh's oil-and-gas-boom wealth generation as a province and the continued impoverishment of large sections of its population is often cited as one of the root causes of the separatist struggle in the province (e.g. Kell 1995)." (p. 4)

Figure 1.1 shows the fluctuation of Aceh's GDP annual growth from 1976 to 2006. The availability of such series gives a clear picture of how Aceh's economy reacted to various shocks, i.e. the gas boom in late 70s, the protracted conflict starting in late 80s, the Asian economic crisis of 1997-8, the regional autonomy in 2001, and the Tsunami of 2004. The figure indicates that Aceh experienced a negative growth

[9] Aceh special autonomy is based on Indonesian Law No. 18/2001 furthering a decentralization process for the whole Indonesia after the 1998 "Reformasi" and the fall of Soeharto. The first two decentralization laws are Law No. 22/1999 on Regional Governance, and Law No. 25/1999 on Fiscal Balance between Center and the Regions.

twice, that is, the years following the Asian economic crisis, and two years following the Tsunami. While, the years following the Tsunami were not anymore influenced by the conflict, it is difficult to separate the impact of Asian economic crisis from that of the conflict. However, it is obvious that the trend of economic growth during the conflict of 1989 – 1998 has a downward slope. Therefore, we can assume that the Asian economic crisis has anything but worsened the economic growth in Aceh.



Source: Author calculation based on BPS and CEIC data

Figure 1.1
Aceh's GDP Annual Growth, 1976-2006 (2000 Constant Price)

As shown in Section 1.3, resource curse literature theorizes that there is usually a tradeoff between mining growth and manufacturing and agriculture growth in a mining-rich region. General findings of such literature in Indonesia, however, are conflicting. Although most claim that Indonesia did not experience a "resource curse"

during the oil boom of early 70s, there are several more recent papers that challenge those claims. This paper investigates the resource curse phenomena in Aceh, an oil and gas rich region in the western part of Indonesia. This is a different account of the issue on Indonesia as it investigates the phenomena at a sub-national level rather than that of a whole country.

In Aceh case, while the conflict has been a ubiquitous explanation for slow economic growth, there have been only a few attempts to look for alternative accounts. This paper is an attempt to explore another strain of explanation; that is, to test the hypothesis of natural resource curse in Aceh by looking at how Aceh's mining boom, in addition to the conflict, has influenced its agriculture and non-mining manufacture sectors. In other words, this paper investigates the existence of "Dutch disease" syndrome in Aceh's economy, that is, to investigate whether the mining sector, especially oil and gas, has become a primary sector in Aceh's economy at the expense of the agriculture and manufacturing sectors. In addition, this paper also examines the impact of the other shocks on Aceh economic structure.

The rest of the paper is organized as follows. Section 1.2 gives a brief historical descriptive on Aceh to provide context for the overall analysis. Section 1.3 reviews current literature on "resource curse", from international, national, and local experience. Section 1.4 discusses data and methodology used in this study. Section 1.5 shows and discusses the results of descriptive and empirical data analysis, and Section 1.6 offers conclusions.

1.2. Aceh: A Brief Historical Descriptive Account

Aceh is located at the northern tip of Sumatra, one of the five bigger islands in *the archipelago*, known as Indonesia since 1945. Surrounded by the Malacca Strait at its northern and eastern parts and the Indian Ocean to its west, Aceh is situated at an

important world trade route. Besides its rich sea resources and potential, Aceh is also blessed with a fertile land and rich mineral resources, especially in oil and natural gas.

Aceh's history is distinctive compared to other regions in Indonesia. In fact, its history is one of the attributes that sets Aceh apart from the rest of the country (Schulze, 2007). Schulze notes "It was the only part of Indonesia that had existed as an internationally recognized independent state, a Muslim sultanate, before the republic's establishment…" (p.183). In addition, Aceh has been referred to by historians for "its commercial and cultural significance in past eras, and to its independence from Jakarta governments both before and after independence." (Dawood and Sjafrizal, 1989: 108)

Before becoming part of Indonesia, Aceh was under one of the first known kingdoms in the archipelago. Marco Polo visited one of the kingdoms, Perlak, in 1292, "giving us the first evidence of Islamic sultanate in Southeast Asia" (Siegel, 1969:4). Pasai, another early kingdom, has been illustrated as "an important center for the diffusion of Islam in the Indian Archipelago" until the fifteenth century (Th. W. Juynboll–[P. Voorhoeve], 1960 in Siegel, 1969:4). Sultan Ali Mughayat Shah unified the various kingdoms under the Sultanate of Aceh in the early sixteenth century.

The golden era of this sultanate, however, was not achieved until the early seventeenth century, during the reign of Sultan Iskandar Muda (1607-1636). During his reign, Aceh had political influence in both sides of the Malacca Strait and, in fact, almost succeeded in taking Malacca from the Portuguese (Siegel, 1969; Newitt, 2005).[10] He was also successful in developing his regions to be one of the most important military and trading powers in the archipelago. Under his leadership, Aceh became a famous port in Malacca Strait and supplying half of pepper for the world consumption. In addition, Sultan Iskandar Muda was also good in managing

[10] Malacca is now one of the Strait States in Malaysia.

diplomatic relationships with the Ottoman Empire, France, Great Britain and the United States (World Bank, 2006).

Aceh's political influence started to decline after the death of Sultan Iskandar Muda and following the destruction of most of the Acehnese fleet during the final raid on Malacca (Siegel, 1969). Although Aceh's earlier rivalry was mostly with the Portuguese in the Malacca Strait, it was the Dutch that wanted to control Aceh for its colonial interest in the archipelago in the nineteenth century. But the Dutch could not do anything until 1871 when they were released from The London Treaty (1824) in which "the Dutch had pledged to the English not to extend their control of societies of Sumatra to Aceh" (Siegel, 1969:5). After negotiations with the Acehnese to gain control over waters surrounding the kingdom failed, the Dutch declared war in 1873. The war has never officially concluded, but "the Dutch had to maintain their military government in Aceh until 1918" (Siegel, 1969:5).

The Netherlands' rule, nevertheless, was continuously distracted by waves of guerilla wars, especially those led by religious leaders who were sidelined by the colonial administration that favored local chieftains (*uleebalang*). One of the famous such leader is Teungku Chik Di Tiro (1836-1891) whose legacy extended to contemporary Aceh's history. Although the Acehnese aristocrats decided to collaborate and signed an agreement with the Dutch in 1903, the Aceh War, according to the Dutch higher officers, was already the most expensive war during Dutch 350 years of colonial era in the archipelago (Robinson, 2001). Because the war was never concluded and the opposition to the Dutch's power never ceased, Acehnese believe that they had never surrendered to the Dutch, thus Aceh had never been part of the Dutch colony. Some scholars attest to the fact, such as Schulze (2007) who notes that Aceh "was…the only part of the archipelago never to have been totally conquered and subdued by the Dutch" (p. 183). Later in the 70's, this fact was used by the nationalists

of the Free Aceh Movement (GAM), led by Hasan Di Tiro, to argue that Aceh should have never been part of Indonesia as the de-colonization should have never included Aceh as part of the Dutch's colony that became Indonesia. Hasan Tiro is a descendant of Teungku Chik Di Tiro.

Dutch colonial rule in the archipelago, including Aceh, was replaced by Japan's in 1942. Japan colonialized Indonesia until it was defeated by other Allied forces, the US and the Britain, in 1945. As Japan left Indonesia and the Allies had not arrived, independent movement leaders seized "the vacuum of power" to proclaim Indonesia's independence on 17 August 1945 (Bevan, Collier, and Gunning, 1999). When the Dutch returned on September 1945, embedded to the Allied forces, it could not accept the fact that Indonesia had declared its independence. Assisted by the Allies, the Dutch tried to get their colony back, which led to the Indonesian revolutionary war from 1945 to 1949 (Robinson, 2001; Bevan, Collier, and Gunning, 1999). Dutch attempts succeeded in conquering Java, Borneo and some other parts of Indonesia. However, it failed to conquer Aceh. The new government of Indonesia then formed an emergency government in Aceh, to show the world that Indonesia still existed. Aceh subsequently played a critical role during the revolution times, until the Dutch agreed to acknowledge Indonesia's independence and left its territory in 1949.

As the Dutch did not return to Aceh, the Acehnese aristocrats (chieftains, *uleebalang*) who had been siding with the Dutch were overthrown from power by their rival groups led by members of modernist Islamic youth groups which had emerged in the 1930s. From 1945 to 1949, Aceh was governed chiefly by Teungku Daud Beureuèh, the leader of Islamic modernist movement (Siegel, 1969).

Besides its critical role for the new independent Indonesia, the Acehnese also gave another significant contribution to the new country during the revolutionary war. The people of Aceh collected money and gold throughout the region that was then

enough to buy two airplanes donated to the government of Indonesia for its international diplomacy, trade and military operations. The airplanes were named after the highest mountain in Aceh, "Seulawah", and later became Indonesia's first flag carrier. Seulawah 001 and 002 are two Douglas DC-3 Dakota airplanes that started Garuda Indonesia Airways on 26 January 1949.[11]

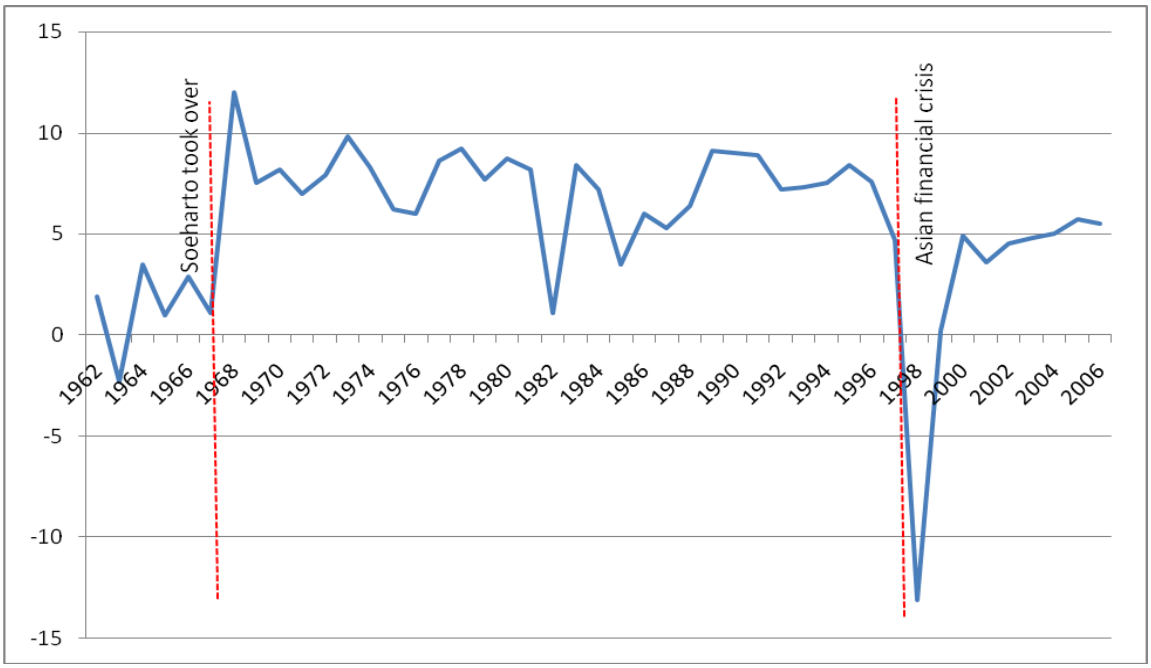
Soekarno, the first president of Indonesia and other leaders in Jakarta failed to recognize this significant role of the Acehnese people in Indonesia's history. In 1949, Aceh was put under North Sumatra province, causing discontent among the Acehnese. "The replacement of Acehnese in governmental positions by other Indonesians, coupled with Acehnese dissatisfaction with the kind of nation Indonesia was becoming, precipitated a rebellion which began in 1953" (Siegel, 1969:6).

The central government tried to solve the problem by persuading the rebel leader, Teungku Daud Beureuèh, the reformist Muslim leader who was once an Indonesian nationalist himself, promising him that the central government would grant Aceh a special status and more autonomy in religious, educational and cultural matters (Robinson, 2001). Aceh then became a special region in Indonesia, named "Daerah Istimewa Aceh" or Special Region of Aceh in 1959. Although Beureuèh's movement was largely settled by 1957, followed by a special region status for Aceh in 1959, the rebellion continued until 1961 (Siegel, 1969).

The new autonomy status, however, did not really mean anything. The province remained at the *periphery* of Indonesia's centralized system, neglected by the central government (World Bank, 2006). Later, when Indonesia adopted a regional development system, Aceh even became a *sub-periphery* when North Sumatra was considered the center of the western regional development. In addition, Aceh also

[11] Source: the Garuda Indonesia airlines: http://www.garuda-indonesia.com/about-us (accessed 12 May 2009)

experienced Indonesia's bad economic conditions like other regions in the new country. Busy with his political maneuver at the height of the Cold War, Soekarno, the Indonesian nationalist leader, failed to jump-start Indonesia's economic growth. As shown in Figure 1.2, the annual growth of Indonesia's GDP in percentage during Soekarno administration, from 1962 to 1966, was in general very low, with a negative growth in 1963.



Source: Author's calculation based on the World Bank's data

Figure 1.2
Indonesia's GDP Annual Growth, 1962-2006

Soekarno's regime became unpopular due to economic hardship and unfavorable world political situation in the late 60s. His regime was toppled by then a not-very well-known army officer, Soeharto, in 1966 following a bloody coup in 1965. Soeharto became the second president of Indonesia in 1967 with the support from western countries, especially the US. Under Soeharto's regime, known as "the New

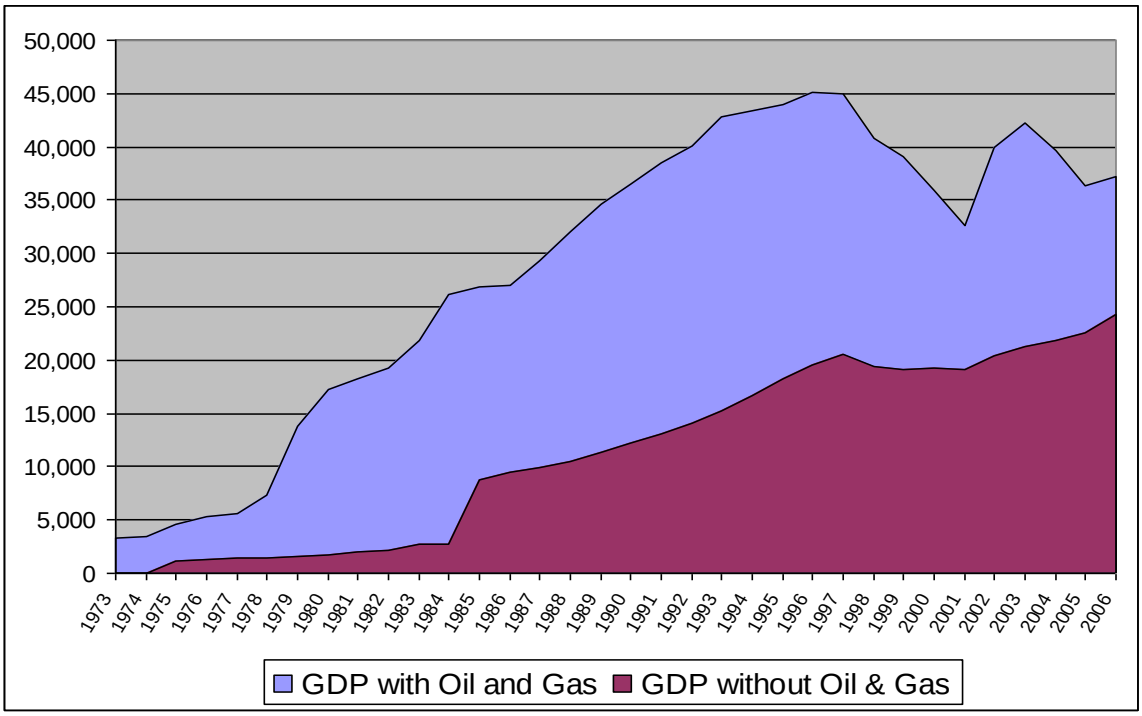
Order", Indonesia reformed its economy by opening its door to industrialization and trade liberalization in return for generous "developmental aid" from industrial countries that wanted to stop Indonesia from falling into the Communist bloc.

The economic reform during the Soeharto era attracted a large number of foreign investments and generated enormous capital inflows to the country, which enabled the country to expand its economy (Azis, 2000). Accordingly, economic expansion opened more opportunities and more jobs, increased productivity and income per capita. In the end, it reduced poverty and enhanced the economic growth of Indonesia. As also shown in Figure 1.2, the annual growth of Indonesia's GDP soared from one percent in 1965 to 12 percent in 1968, after Soeharto took office (Bevan, Collier, and Gunning, 1999).

In early 1970s, Indonesia economic growth was even better as the country began the explorations of its rich mineral resources. Oil and natural gas started to generate enormous revenues for the country in mid 70s and early 80s, with one of the biggest exploitations being in Aceh. The mining boom in Aceh started in 1971, after a massive natural gas reserve was discovered in Lhok Sukon, North Aceh by then Mobil Oil Indonesia (MOI), a subsidiary of US Mobil Oil. A joint venture company, PT. Arun, was founded to refine the natural gas into liquefied natural gas (LNG) in 1977. The operation of PT. Arun then led to other petrochemical industries, such as the Kraft Paper Factory established in 1982, the Iskandar Muda Fertilizer Company in 1982, and the ASEAN Aceh Fertilizer in1983 (Dawood and Sjafrizal, 1989).

The industrialization in Aceh from mid 70s through the 1980s had transformed the region from a remote place of little significance into an industrial center, significantly contributing revenues to the central government. As the LNG boom boosted its economy, the province became "the fastest-growing provincial economy"

in Indonesia (Robinson, 2001, p.221). Figure 1.3 shows the significance of oil and gas production in Aceh's GDP.

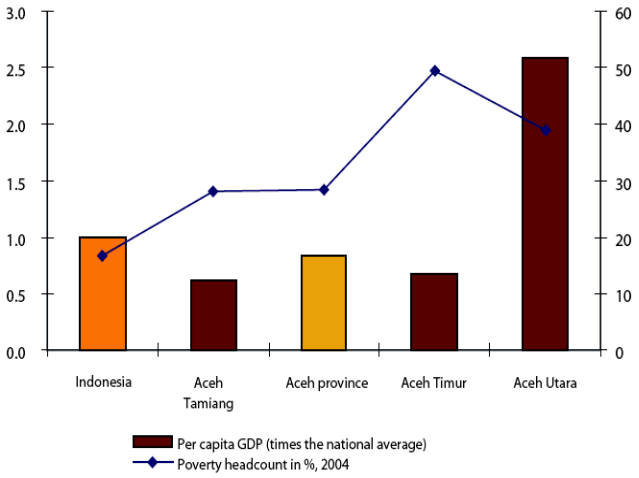


Source: author calculation with data from BPS

Figure 1.3
The role of Oil and Gas in Aceh's GDP 1973-2006,
Based on Year 2000 Constant Price (in billions IDR)

Although industrialization in Aceh had significantly increased its GDP by the late 70s, it had not brought prosperity to the people in the region, including those of the immediate districts where the industrialization centered. In fact, as indicated in Figure 1.4, North Aceh (Aceh Utara) District, where PT. Arun and now Exxon-Mobil Indonesia (EMOI) operate, and East Aceh, where the oil refineries located, have among the worse poverty rate compared to other districts in the province while its per capita GDP has been among the highest (World Bank, 2008). Aceh in general did not get much from the oil and gas revenues as most of them were accrued to the central

government, supposedly to be redistributed to the rest of the country (Booth, 1992; Dawood and Sjafrizal, 1989).



Source: World Bank, 2008, p. 34

Figure 1.4

Per capita GDP and poverty in oil/gas producing districts, 2004

The poverty level increased as the industrialization did not bring new sizeable opportunity and employment to the area. The jobs in PT. Arun and other industries were filled in by either foreigners or Indonesian from other places. The industries centered around LNG facilities in North Aceh itself are "point" instead of "diffused" linkage industries (Booth, 1992). That is, they are capital intensive with few direct beneficiaries compared to, for example, manufacturing and agricultural industries. As many local people remained jobless and lived under poverty line, it subsequently led to dissatisfaction toward the government. In the end, the (failed) industrialization in the province had become one of significant factors that created a fertile ground for the emergence (and re-emergence) of the Aceh Freedom Movement or GAM (Kell, 1995; Sulaiman, 2000; Robinson, 2001; Schulze, 2007).

The Free Aceh Movement or Gerakan Aceh Merdeka (GAM) was established by Hasan Di Tiro on 4 December 1976 in the interior of Pidie district.[12] Like the first rebellion led by Daud Beureuèh in the 50s, this movement was also "triggerred by unsatisfactory center-pheripery relations, namely the removal of special status in all but name" (Schulze, 2007:183). But, unlike Beureuèh's rebellion, the GAM insurgency "had a distinct economic dimension" which was "directly, but not solely, linked to the discovery and extraction of natural gas" (Schulze, 2007:184). At the beginning, GAM had only a limited support from the population. The core group was less than a hundred persons in Pidie and North Aceh, with a few old weapons. But a brutal crackdown by the military forces sent by Jakarta garnered sympathy for the GAM and then wider support from the Acehnese, especially those in disadvantaged rural areas.

GAM was founded on the basis of Acehnese nationalistic ideology. The founder, Hasan Di Tiro, believed in the strength of the glorious past of Aceh as the source of spirit to fight for an independent state. Additionally, as he writes in his book '*Demokrasi untuk Indonesia*' or 'Democracy for Indonesia,' Hasan Di Tiro argues that the form of a unitary state does not fit a diversed archipelago like Indonesia.

The level of insurgency by GAM was up and down. After its declaration, it was directly suppressed by a limited military operation sent by the central governmnent that wanted to make sure its "vital projects"[13] in North Aceh were safe and secure. Due to this operation, Hasan Di Tiro had to flee Aceh on 28 March 1979 (Sulaiman, 2000). He then lived in Malaysia and several other countries before settling in Sweden, where he was granted asylum and has been living until now. The decline

[12] This date was when Maat Di Tiro died. He is the cousin of Hasan Di Tiro's mother, who the later claimed to be the last successor of The Sultanate of Aceh (Sulaiman, 2000:26).
[13] The industrial complex that centered around the Arun natural gas refinery near Lhokseumawe is commonly called "provit" or "proyek vital" by government officials, indicating its significance to Indonesia's economy.

of GAM activities continued until the 80s. At the end of the 80s, however, GAM re-emerged with a more open armed insurgency. Some of its members were reported to have returned from a military training in Libya.[14] To quell the ever stronger GAM, Jakarta put Aceh under a military operation zone known as '*Daerah Operasi Militer (DOM)*' in 1989. The period following 1989 is later known as a dark period of gross human rights violations in Aceh. Due to intensified and repressive military operations, GAM activities declined once again, but never totally stopped. Many of its members and sympathizers fled Aceh to neighbouring provinces and countries, especially to Malaysia.

The Asian economic crisis that started in 1997 struck Indonesian economy badly. As the economy worsened, students and pro-democracy movement brought down Soeharto's regime in May 1998. This marked the beginning of 'reformasi' in Indonesia allowing more free press, freedom of expression, and public scrutiny on the government and the military. The 'reformasi' euphoria made national and local media possible to report military brutality during DOM era in Aceh. At this time, GAM re-emerged again. This time, it received a popular support as the population had found out more about the widespread brutal treatment on their fellow Acehnese by the Indonesian military. At this period, many of GAM's member and sympathizers returned from Malaysia. GAM was also advantaged by, if not itself orchestered, a civil society call for a referendum for Acehnese to decide whether to stay within or seceede away from the republic.[15]

Then, the new president who replaced Soeharto, B.J. Habibie, terminated DOM status on Aceh and withdrew non-organic troops from Aceh followed by a

[14] *Majalah Aceh Kita* (Aceh Kita Magazine), August 2005, p. 28

[15] A demand for referendum in Aceh was spearheaded by SIRA (Sentral Informasi Referendum Aceh) a group formed at an Aceh's student and youth diaspora congress on 31 January – 4 February 1999. With the support of GAM, SIRA brought together a rally of more than a million people in Banda Aceh on 8 November 1999 to demand for a referendum.

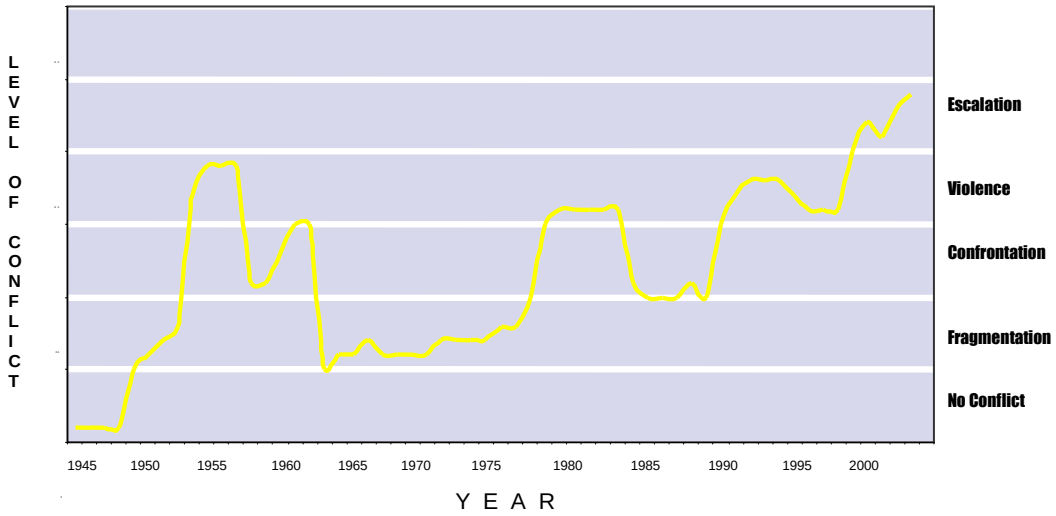
public apology for the atrocities the military had perpetrated in the region by the Indonesian military highest commander, General Wiranto, in August 1998 (Schulze, 2007). President Abdurrahman Wahid who replaced Habibie after a power dispute in Jakarta increased the efforts to resolve Aceh conflict by starting a dialog with GAM on January 2000. This dialog was facilitated by the Henry Dunant Centre (HDC), a Geneva based non-governmental organization which subsequently opened its office in Banda Aceh, the capital of Aceh.

Humanitarian Dialog facilitated by the HDC produced a 'Humanitarian Pause', a ceasefire agreement between TNI, the Indonesian military, and GAM on 12 May 2000. However, violence continued in Aceh, and the agreement was hardly in effect until 15 January 2001 when a new deal was reached under the name of 'Violence Moratorium'. When the violence did not stop, HDC tried to save the agreement once again under the 'Peace through Dialog' agreement until July 2001 when Indonesia government unilaterally left the dialog and detained GAM's negotiators in Banda Aceh. Another attempt to stop the conflict was made in February 2002. Indonesia was then under President Megawati Soekarnoputri, the daughter of the first Indonesia's president, Soekarno, who ascended to power with the support of a nationalist base. HDC brought in the 'wise men', some prominent figures like retired US Marine General Anthony Zinni and former Thai Prime Minister Surin Pitsuan, to strengthen the dialog. With a pledge of economic aid from Japan, the European Community and the World Bank if Aceh conflict can be resolved, Indonesia and GAM once again agreed on a *Cessation of Hostilities Agreement* (CoHA) on 9 December 2002. Under this agreement, a *Joint Security Committee* (JSC) consisting of 50 Thai and Filipino soldiers, 50 members of the TNI, and 50 members of GAM was formed to monitor the agreement implementation on the ground (Schulze, 2007).

But after "TNI-inspired systematic attacks" on all Joint Security Committee (JSC) offices outside Banda Aceh, the CoHA "was dead in all but name" by April 2003 (Schulze, 2007:212). Efforts by the HDC and international community to save the agreement through a meeting in Tokyo on 18 May 2003 failed. The following day, Megawati placed Aceh under martial law, initially for a six month period. This failed to stop the insurgency and the martial law was extended for another six month from 19 November 2003 to 18 May 2004. The martial law was then reduced to "civil emergency" on 19 May 2004 for another six month. With this status Aceh was still closed to foreigners and mobility was still limited. Aceh was still under these restrictions when it was struck by the 26 December 2004 Indian Ocean Tsunami. Although the new administration under President Susilo Bambang Yudhoyono and Vice President Jusuf Kalla had started a new approach on the Aceh conflict before the Tsunami, it was the disaster that gave momentum for the two sides to come to an agreement faster. A new dialog was started in January 2005, facilitated by Crisis Management Initiative (CMI), a Helsinki based organization led by Finland's former president, Martti Ahtisaari. After several rounds of negotiation, a peace agreement under Helsinki Memorandum of Understanding (MoU) was signed by Indonesia and GAM on 15 August 2005, eight months after the Tsunami.

In summary, Aceh has been in conflict with the central government in Jakarta during most of the time it has been part of Indonesia. Figure 1.5 shows the fluctuation of manifest conflict intensity in Aceh between 1945 and 2004 as suggested by Age (2007).

Level of Manifest Conflict between Aceh and Indonesia, 1945-2004



Source: Age (2007), used with permission

Figure 1.5
Level of manifest conflict between Indonesia and Aceh, 1945-2004

1.3. Resource Curse: A Literature Review

The notion that natural resources can be a curse rather than a blessing emerged in the 1980s, following the oil boom. "Resource curse" is a term used to describe the failure of a country or region to benefit from its natural wealth (Humphreys, Sachs and Stiglitz, 2007). The term originates from Auty (1993) as "resource curse theory" in which he describes how countries rich in natural resources were unable to capture that wealth to boost their economic performance and that their economic growth was lower than those with limited natural resources. The term is sometimes also referred to as the "paradox of plenty" (Karl, 1997). But it should not be confused with the term "Dutch disease" (Corden and Neary, 1982) which can be thought as one of the syndromes or causes of resource curse (Humphreys, Sachs and Stiglitz, 2007).

Sachs and Warner (2001) assert that numerous studies have shown a link between natural resource abundance and poor economic growth. Gylfason (2000), for example, points out that from 1965-1998, gross national product per capita growth

decreased on average by 1.3% in the OPEC countries, while in the rest of the developing world per capita growth was on average 2.2%. In addition, Auty (2001) observes that resource-abundant developing countries have under-performed when compared with the resource-deficient developing countries in recent decades. Similar conclusions have been put forward before by Ranis (1991), Lal and Myint (1996), Sachs and Warner (1995, 1999). Resource curse phenomena can be caused by various reasons. Humphreys, Sachs and Stiglitz (2007) summarize them into five sources:

(1) *Unequal expertise*, that is, asymmetry between governments acting as an "agent" for the people who own mineral resources and international corporations which have great interest and expertise in mineral sectors and extensive resources to draw on;

(2) *"Dutch disease"*, in which extraction of mineral resources gives primacy to two domestic sectors—mineral sectors and the non-tradable sectors, such as the construction industry—at the expense of more traditional export sectors, such as manufacturing and agriculture;

(3) *Volatility*, that is, when oil and gas are considered sources of income, it has three sources of volatility: (i) the variation over time in rate of extraction; (ii) the variability in the timing of payments by corporations to states; and (iii) the fluctuations in the value of the natural resources produced;

(4) *Living off capital*, is a problem that arises once the government starts spending the earnings from mineral resources and views it as consumption of income rather than consumption of capital;

(5) *Insufficient investments in education*, is a problem arising from the lack of diversified and skilled workforce that can support other economic sectors as states start relying on natural resource wealth.

Resource curse theory, however, has been scrutinized for its use of resource measurement, calculation, and time sensitivity. To counter the argument, Auty (2001) proves that the tendency for resource-abundant countries to underperform is insensitive to classification criteria of the natural resources endowment. Nevertheless, he also shows that the tendency is not robust to the period under observation.

One of the causes of resource curse that has been studied extensively is the "Dutch disease" phenomenon. Corden and Neary (1982) explain the phenomenon in a three-sector model: (i) a resource sector, such as oil, gas or other primary export product; (ii) tradable sectors, which would include both manufacturing and agriculture; and (iii) non-tradables. They argue that a boom in the resource sector has three separate effects: a spending effect; a relative price effect; and a resource movement effect. A three-sector model has since been a standard approach in diagnosing a Dutch disease syndrome. In line with Corden and Neary (1982), Bevan, Collier, and Gunning (1999) argue, "Dutch disease is a story of resource allocation between sectors" (p. 46). Moreover, they state that,

> The oil windfall raises expenditure on both internationally tradable and nontradable goods but enhances only the supply of tradables (through imports). This imbalance is equilibrated by an increase in the relative price of the non-tradable sector, thereby attracting resources away from the non-oil tradable sector. In developed oil economies (such as the UK), this declining sector is manufacturing. In Nigeria, the non-oil tradable sector is primarily export-crop agriculture. (p. 46)

They further note that oil earnings as a Dutch disease phenomenon is due to its two distinctive respects: they accrued as foreign exchange and they accrued to the

government. “Because the earnings accrued as foreign exchange, the extra income could be spent only on tradable goods unless domestic resources were reallocated to the non-tradable sector” (p. 46).

There are several studies on the resource curse phenomenon in Indonesia both by national and international scholars. Early studies were done primarily by experts from the World Bank like Gelb and Associate (1988) and Bevan, Collier, and Gunning (1999). There is, however, a growing literature on the issue, albeit piecemeal, by national scholars addressing Indonesia’s natural resource management since Indonesia’s transformation to democracy in 1998.

Bevan, Collier, and Gunning (1999) compare Indonesia’s and Nigeria’s economic performance during 1950-85 in order to study why Indonesia was so much more successful than Nigeria in navigating the oil boom in the 70s to early 80s. They note that “Indonesia turned oil income into productive investment, whereas Nigerian oil income was either siphoned abroad or used for prestige projects” (p. 1). On the Dutch disease spending effect, they observe that Nigeria’s attempts, compared to Indonesia’s, to convert the oil windfall very quickly into domestic real assets—to buy more than its economy was capable of supplying, had exaggerated the disease’s effect (p. 389).

Accordingly, Bevan, Collier, and Gunning (1999) conclude that “There is no prima facie evidence of Dutch disease” (p. 304) in Indonesia. They argue, unlike in Nigeria, agriculture in Indonesia continued to grow through the oil boom. Furthermore, manufacturing grew extremely rapidly before, during, and after the oil boom, while services, if considered as non-tradable were not growing notably more rapidly than tradables. Given that both countries have marked difference in liberalization and windfall management, they conclude that the comparison “provides dramatic evidence that policy matters” (p. 424). They suggest three areas of policy

divergence where Indonesia: (1) put higher priorities on agriculture; (2) poverty targeting; and (3) a gradual shift away from import-substituting industrialization.

In relation to the importance of policy, a similar conclusion is put forward by Auty and Kiiski (2001). They illustrate the experience of Southeast Asian countries which confirms "that many tropical crops retained considerable potential for growth, but the outcome depended upon policy choices." They also conclude that "mineral economies are potentially more vulnerable to policy error than countries with more diffuse economic linkages are…." (p. 33).

Earlier, Gelb and Associate (1988) have also concluded that Indonesia "has managed to avoid the most serious problems of the Dutch disease, and its economic performances stands out as being relatively successful" (p. 224) compared to the other five resource rich countries in a six country comparative study. They argue that Indonesia's good performance during the oil booms reflected an institutional success to nurture the economy, the approach to policy set during Soeharto government's formative years, and the unusual degree of continuity.

Also in the case of Indonesia, Rosser (2004, 2007) presents evidence to claim that the curse cannot be generalized. Blessed with natural wealth, he argues, Indonesia had also been experiencing moderate economic performance. In fact, Rosser finds that Indonesia experienced higher economic growth during 1967-2000 relative to other oil exporting countries. Rosser suggests that Indonesia's success stemmed from two factors, the policy and institutional building employed during Soeharto's New Order era, and the nature of Indonesia's geo-economic environment, especially its proximity to high energy consuming countries like Japan, Taiwan and Korea.

In contrast, Pangestu (1990) claims that Indonesia did experience a Dutch disease after the oil boom. She studies the adjustment problem Indonesia had to face during the oil windfall of the 1973-1982. Using simulation of a simplified

macroeconomic model, she provides evidence of the Dutch disease in Indonesia in that period. The economy in the model was divided into three sectors: oil, non-traded goods, and non-oil traded goods. She finds that the real supply of non-oil traded goods was significantly lower, as predicted by Dutch disease literature.

At the regional level, studies on the resource curse phenomenon are still limited. However, with the decentralization and democratization process taking place in Indonesia, more can be expected. This is especially true for the resource rich regions tainted by conflict like Aceh, Papua, and Kalimantan where studies on conflict have been initiated earlier. For example, Komarulzaman and Alisjahbana (2006) test the natural resource curse hypothesis in Indonesia using data from 246 districts in 28 provinces. The authors empirically investigate the relationship between abundant resources and their impact on economic development at the regional level using a cross-section regression approach. They claim that when total resource rent is used, the results are insignificant, that is, there is no apparent resource curse phenomenon. However, they report significance when the resource rents are estimated in their three components: mining, oil and natural gas, and forestry. They conclude that "forestry and the oil and gas sector have a positive effect on regional economic growth, but the resource curse may occur if these resources revenues are not invested properly in the public sector." Additionally, they note that the mining sector has a persistent negative effect on regional economic growth.

With the adoption of a decentralization policy by Jakarta in 2001, studies on revenue sharing have also become more important. Mahi (2006), for example, studies the impact of oil price fluctuations on oil revenue sharing in Indonesia to understand problems of revenue sharing. He then analyzes the impact of oil revenue sharing on regional government expenditures. The author concludes that "oil price fluctuations give uncertainties both to central and regional government", the cause of resource

curse known as *volatility* as summarized by Humphreys, Sachs and Stiglitz (2007). Mahi (2006) also notes that oil producing regions in Indonesia can gain from the increase in oil price, but it also increases fiscal pressure to the central government. There are also concerns of increasing income disparity among the regions, and unwise spending in oil producing regions.

Resosudarmo and Vidyattama (2006) also find the significant role of oil and gas in sub-national level growth in Indonesia. They concur determinants of growth in an inter-country study such as physical investment, trade openness, and the role of oil and gas are also significant determinants of growth in an intra-country (sub-national) study. In the case of Indonesia, Resosudarmo and Vidyattama note that "The general situation in 1971 was that GDP per capita in Java's provinces was in general lower than in the off-Java islands, …". They also observe that

> From 1972 to 1983, the five fastest growing provinces were East Kalimantan, Aceh, Papua, Riau, and Jakarta. Looking at the GDP per capita without including mining for the same period, the growth rates for East Kalimantan, Aceh, Papua, and Riau were significantly lower, confirming the important role of mining for these provinces; i.e. oil and gas for East Kalimantan, Aceh, and Riau, and minerals for Papua. ….

Nevertheless, Resosudarmo and Vidyattama (2006) further observe, from the mid-1980s to the mid-1990s, "Aceh, Riau, and East Kalimantan, which were previously among the fastest growing provinces, were now among the five slowest."[16] By mid

[16] Resosudarmo and Vidyattama (2006) underline that "The number of provinces in Indonesia changes over time. From its independence up to 1976, there were twenty six provinces, namely: Aceh, North Sumatra, Riau, West Sumatra, Jambi, South Sumatra, Lampung, Bengkulu, Jakarta, West Java, Central Java, Yogyakarta, East Java, West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, North Sulawesi, Central Sulawesi, South Sulawesi, Southeast Sulawesi, Bali, West Nusa

90s to the early 2000s, Aceh was among nine provinces that had a negative average annual GDP per capita growth due to "the economic crisis and social unrest." This, they conclude, makes Aceh among only a few provinces whose growth rates fluctuated significantly. Others with similar high fluctuations include Papua and East Kalimantan, which, similar to Aceh, are conflict prone regions. Hence, Hill, Resosudarmo, and Vidyattama (2008) speculate that, "The indifferent record of the four resource-rich provinces is suggestive of a Sachs and Warner (2001) 'resource curse' at work." But then they argue that conflict has caused the problem at two provinces (Aceh and Papua) as the other two (Riau and East Kalimantan) have become more prosperous, thus failing to recognize the conflict as part of the curse. The nexus between economic crisis and social unrest on one hand and economic growth on the other is also investigated by Alm, Aten, and Bahl (2001), Tadjoedin, Sjuharyo, and Mishra (2001), Kuncoro and Resosudarmo (2004) as cited in Resosudarmo and Vidyattama (2006).

Hill, Resosudarmo, and Vidyattama (2008) expand Resosudarmo and Vidyattama (2006)'s findings with a longer series, a 30 years Indonesia's socio-economic database. Similarly, they conclude that "there continues to be diversity in economic and social outcomes" among provinces in Indonesia, "but growth and social progress have been remarkably even." They also conclude that, "As expected, conflict is harmful to economic development," and that "there is no clear natural resource curse story: the performance of the resource-rich provinces has varied considerably." On Aceh, Hill, Resosudarmo, and Vidyattama (2008) note that, "Aceh would have belonged in *'Consistently non-poor'* provinces, but the protracted conflict until 2005,

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Tenggara, East Nusa Tenggara, Maluku, and Papua. In 1976, East Timor, formerly occupied by the Portuguese, joined Indonesia, but was separated again in 1999. In 2001, Bangka-Belitung, Banten, Gorontalo, and North Maluku became new provinces separated from South Sumatra, West Java, North Sulawesi, and Maluku, respectively. In 2004, another new province was established, namely West Irian Jaya, which used to be part of Papua."

combined with the devastation of the 2004 tsunami, has sharply lowered living standards: its 2004 household expenditure was just under half the national average."

Studies on resource rich regions in Indonesia indeed involve examinations of the relation between natural resources and conflict, e.g. Ross (2003, 2004) and Tadjoeddin *et al* (2001, 2002). Tadjoeddin (2007) surveys international literature on resource conflicts and finds its relevance to Indonesia. He claims that initial literature on the issue only considered economic disruption as the channeling mechanism, while later developments in the literature on the subject have also emphasized institutional failure and conflict in addition to economic disruption. Thus, he terms conflict as part of the resource curse.

Schulze (2007) illustrates a compelling link between conflict and resources, particularly natural gas, in Aceh. Although she emphasizes that, "the struggle in Aceh was and remains above all ideological in nature" there were factors that determined "the dynamics of the violence…and served to prolong insurgency" (p. 220). One of the factors was "the uneven development of the economy and infrastructure… and the fact that throughout much of the conflict in Aceh, most of the gas and oil revenue went to Jakarta with little return." (p. 219)

There is only one study specifically dedicated to Aceh's economic outlook during and after the oil and gas boom. Dawood and Sjafrizal (1989) touch the issue of Dutch disease in Aceh's economy, but do not investigate it extensively. They examine 'enclave development' around Lhokseumawe, North Aceh as a spatial consequence of the LNG (liquefied natural gas) boom in the 1970s. The exploitation of massive natural gas reserves has transformed Aceh's economy, making Aceh one of provinces with the highest per capita GDP in Indonesia, as well as a major foreign exchange earner. The extraordinary rapid growth occurred in the three years of 1978-80, peaking at 69 percent in 1979. These were the early years of gas boom. Although mining led

the growth in Aceh, growth in "virtually all sectors" was surprisingly rapid during and after the boom. Therefore, they argue that there have been "no localized 'Dutch disease' effects." This argument is understandable as they include manufacturing of 'downstream linkages' such as fertilizer industries in 1983-4 into the balance, giving a boost to Aceh's GDP growth in 1985 due to "manufacturing" contribution.[17] Dawood and Sjafrizal (1989), however, observe that structural change outside the oil and gas sector was quite limited, "reflecting the relatively even sectoral growth rates." They suggest three key variables for Aceh to avoid enclave development. First, modification of the central government's rigid economy pricing policy to allow regional electricity prices to better reflect the real cost of power generation; Second, continuing massive investments in infrastructure, particularly roads; and third, expansion in agricultural extension programs in fisheries, forestry, livestock, non-rice food crops, and selected estate crops.

[17] Major developments following the gas industry included ASEAN Aceh Fertilizer plant (1983), nationally owned Iskandar Muda (PIM) fertilizer plant (1984), Kraft Paper factory (PT KKA), and LPG project all near Lhokseumawe. Andalas Cement factory (PT SAI) near Banda Aceh also started during the same period.

1.4. Data and Methodology

In order to examine the influence of the mining sector on agriculture and non-mining manufacturing in Aceh, this study uses series of values of Aceh's GDP in Mining, Non-mining Manufacture (NMM), and Agriculture (AGR) from 1977 to 2006. All series are in natural logarithm term of the GDP values, which are based on Year 2000 constant price. To investigate the influence of conflict on NMM and AGR, this paper employs manifest conflict intensity. The intensity is measured based on data from Age (2007) using an ordinal-scaled dummy variable generated by the Heidelberg Institute for International Conflict Research (HIIK, 2008). In this scale, 0 = no conflict; 1 = non-violent, latent conflict; 2 = non-violent, manifest conflict; 3 = crises, partly violent; 4 = serious crises, repeated and/ or organized use of violence; and, 5 = war, which are in line with Age (2007) proposition of no conflict, fragmentation, confrontation, violence, and escalation, respectively. A brief description of HIIK scale can be found in Appendix 1A. Furthermore, a binary dummy variable of 0 and 1 is used to indicate series before and after the Asian economic crisis. As there are not enough series after the autonomy and the Tsunami, these variables are neglected in this study. Variables used in the model estimation, therefore, are as shown in Table 1.2.

Table 1.2 Variables in the model and data sources

Notation	Variable	Data source
$\ln(NMM)_t$	Log of non-mining manufacturing output in year *t*	BPS, CEIC
$\ln(AGR)_t$	Log of agricultural output in year *t*	BPS, CEIC
$\ln(NMM)_{t-1}$	Log of non-mining manufacturing output in year *t-1*	BPS, CEIC
$\ln(AGR)_{t-1}$	Log of agricultural output in year *t-1*	BPS, CEIC
$\ln(MINING)_t$	Log of mining output in year *t*	BPS, CEIC
CONFLICT	Dummy variable of 0 to 5, measuring manifest conflict intensity	Age (2007), HIIK (2008)
ACRISIS	Dummy variable of 0 or 1, indicating before (1977-1997) and after (1998-2006) the Asian economic crisis	Author's

The model used in this study is straightforward. Using OLS method, a dependent variable of log difference in output of non-mining manufacturing (*NMM*) sector of year *t* and *t-1* is regressed on ln(NMM)$_{t-1}$, ln(*MINING*), *CONFLICT*, and *ACRISIS*. Similarly, log difference of agricultural output of year *t* and *t-1* is regressed on ln($AGRI$)$_{t-1}$, *ln*(*MINING*), *CONFLICT*, and *ACRISIS*.

1.5. Results and Discussion

This section presents results and discussion on observations based on descriptive data in sub-section 1.5.1, followed by results and discussion on empirical models found in this study in 1.5.2.

1.5.1. Structural Change in Aceh's GDP

Although it is fairly more challenging to collect a long series of economic data at the sub-national level in Indonesia, series extending over 30 years have recently started to emerge in Indonesia so one can draw inferences about regional development dynamics (Hill, Resosudarmo, and Vidyattama, 2008). This is also the case for Aceh where early series were diligently compiled by the Aceh Development Board, now BAPPEDA (Aceh Development Planning Board), and newer series have been more widely available after the autonomy and after the tsunami.[18] Earlier in the first section, a 31 year pattern, 1975-2006, of Aceh's GDP annual growth based on year 2000 constant price is shown in Figure 1.1. As expected, the pattern is similar to the pattern found by Dawood and Sjafrizal (1989) for the early series and of Hill, Resosudarmo, and Vidyattama (2008) for overall series. Aceh experienced an extraordinary rapid growth in the three years of 1978-80, peaking in 1979 due to gas production. The

[18] Heavy presence of international organizations after the 2004 Indian Ocean Tsunami has helped refine better data collection, documentation, and especially, publication on various sectors in Aceh.

second spike of growth occurred in 1984 after the gas derivative industries (fertilizer plants, paper pulp and other petro chemical) started production in 1983, which is also similar to the finding of Booth (1992). However, as military operations to crush the GAM movement were launched in late 80s, Aceh's GDP started to dwindle.

Then, like the rest of Indonesia, Aceh's GDP also experienced the worst contraction, some negative 9.26 percent at 2000 constant price in 1998, following the 1997 Asian economic crisis. But, Aceh's GDP increased quite drastically again in 2002 after the special autonomy, which gave Aceh a bigger share of revenues from its mineral sectors, was adopted by Jakarta in 2001. The growth was again in its declining pattern when the Tsunami hit Aceh's coastal-urban areas in December 2004, further decreasing the growth to about negative 8.5 percent.

It is worth noting here that Aceh's economy contraction triggered by the Tsunami was actually not as bad compared to the one caused by the Asian economic crisis. Exacerbated by the intensifying military operations, Aceh experienced negative growth between 1997 and 2001, all in five consecutive years. Meanwhile, the declining growth caused by the Tsunami in 2004, resulting in negative growth in 2005, was immediately corrected by huge aid and reconstruction spending started also in 2005, but with a positive effect only in 2006. Aceh's economic growth has been declining again after 2006. By 2007 the growth was -2.2 percent and the preliminary figure for 2008 is -5.8 percent (World Bank, 2008c). Whether this is an indication of resource curse from aid, as described by Djankov, Montalvo, and Reynal-Querol (2005), will need to be further investigated and can only be observed in the coming years.

Overall, GDP growth in Aceh has been positive on average, but with a wide range from negative 9.26 percent at the height of Asian economic crisis in 1998 to positive 87.71 percent at the peak of the gas and oil boom in 1979. Table 1.3 shows

summary statistics of growth in GDP, mining, agriculture, and non oil-gas manufacture sectors in Aceh from 1975 to 2006. The growth mean is 8.07 percent, but its median of 5.10 percent probably is a better simple and arbitrary estimate of Aceh's long term economic growth average.

All the four sectors in Table 1.3 had at least once experienced negative growth as indicated by its minimum growth. However, the negative growth in mining and non oil-gas manufacturing is more extreme while the agricultural sector growth is more moderate. This indicates volatility in the mineral sector as noted by Humphreys, Sachs and Stiglitz (2007).

Table 1.3

Summary statistics of Aceh's GDP and three economic sectors, 1975-2006
2000 constant price)

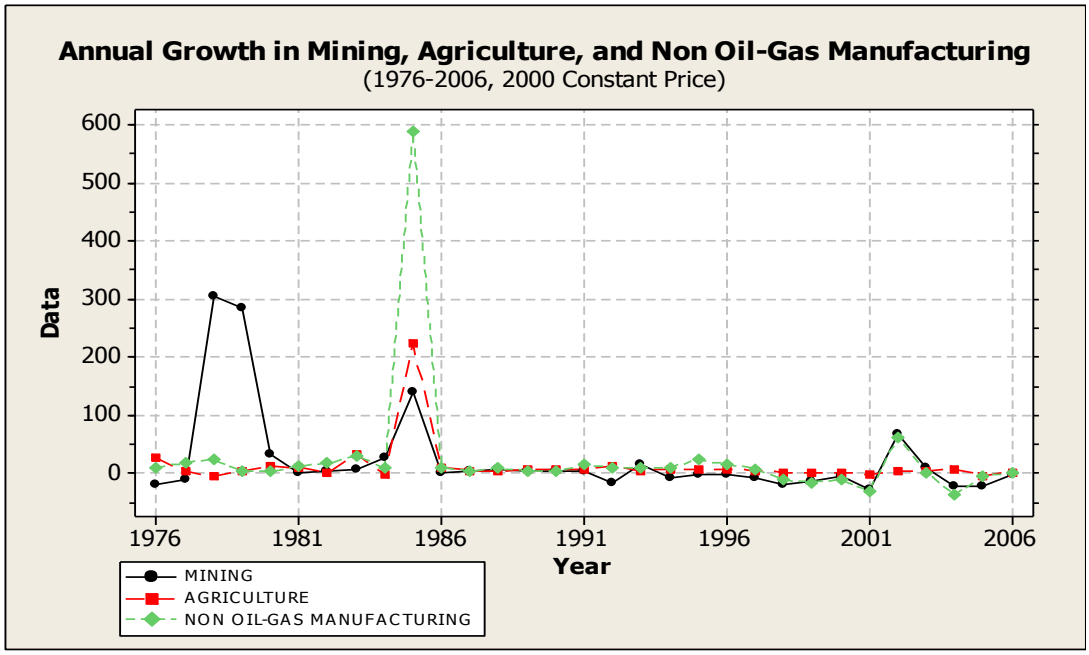
Growth	*Mean*	*Std.Dev*	*Min*	*Q1*	*Median*	*Q3*	*Max*
GDP	8.07	17.78	-9.26	0.48	5.10	9.06	87.71
Mining	23.40	78.80	-27.90	-10.50	1.40	9.90	304.80
Agriculture	12.56	39.70	-5.21	1.52	4.41	7.53	222.36
Non oil-gas manufacture	25.40	106.10	-37.30	1.60	9.40	15.80	589.30

Source: author calculation based on BPS and CEIC data

In addition, as indicated by Figure 1.6, while indicating steady growth along in the overall period, the agricultural sector did not indicate significant growth until recently. In fact, agriculture is one of the few sectors experiencing positive growth after the conflict and Tsunami, with 1.5 percent growth in 2006, 4.9 percent in 2007 and 4.5 percent in the first half of 2008. In the same period, mining declined by 2.6 percent in 2006, worsened in 2007 with a decline of 21.6 percent, and already noted a decline of 39.1 percent in the first half of 2008 (World Bank, 2008c).

The pattern is confirmed by sectoral contributions to total GDP as shown in Figure 1.7. Between 1973 and 1983, obviously mining (oil and gas) was booming

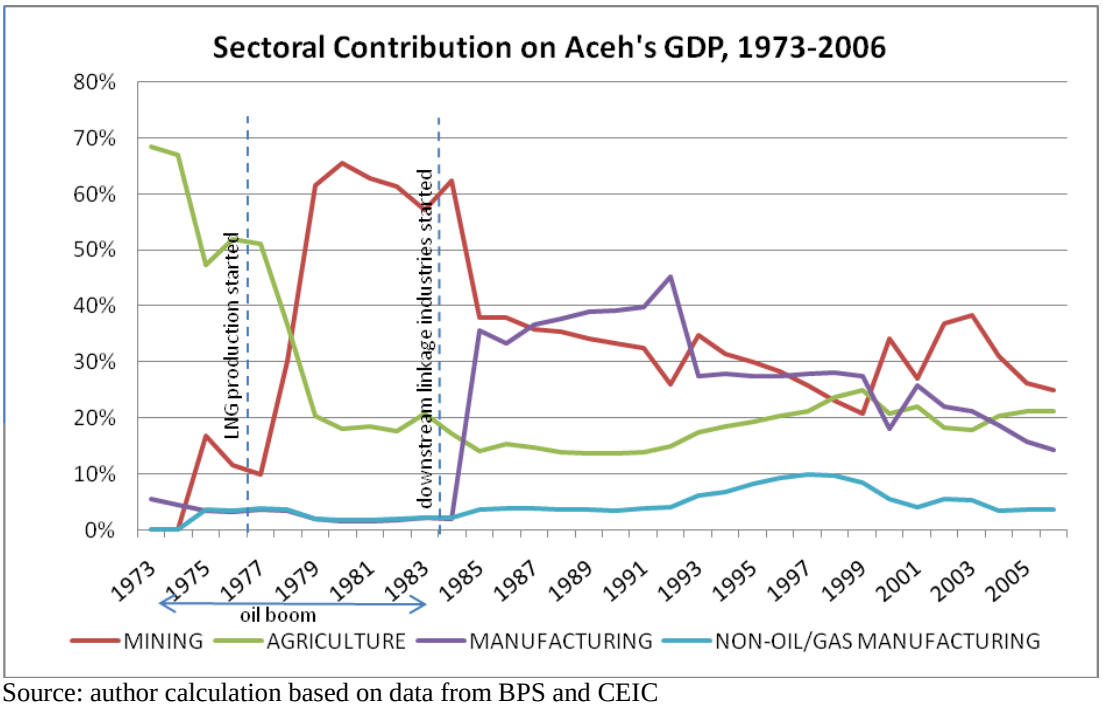
alongside the decline of the agricultural sector. This might be an indication of "Dutch disease", which will be discussed in later section. Additionally, when overall manufacturing contribution spiked in 1984, reaching 35-40 percent of GDP, agriculture contributed only about 12-13 percent of GDP. Non oil-gas manufacturing, however, remained weak, contributing only fewer than 10 percent along the period under this study.



Source: author calculation. Non oil-gas manufacturing includes output from gas downstream industries

Figure 1.6
Aceh Sector Growth in Mining, Agriculture, and Non Oil-Gas Manufacturing, 1976-2006 (2000 Constant Price)

Figure 1.7 clearly indicates that Aceh's economy was dominated by the agricultural economy prior to the gas boom. But since 1978, the mining sector, dominated by gas production in North Aceh, changed Aceh's economic structure for the rest of the period under study. The increase in the mining sector's share came alongside the decrease of the agriculture sector's contribution.



Source: author calculation based on data from BPS and CEIC

Figure 1.7
Sectoral Contribution in Percentage to Aceh's GDP, 1976-2006 (2000 Constant Price)

The structure might change again in the near future as the mining sector has been declining due to reserve depletion while other sectors have been increasing or at least remained constant. The implementation of special autonomy for Aceh since 2002, and post Tsunami – post conflict reconstruction after 2004 might be another turning point for Aceh. Aceh's government, with a huge fund at its disposal, can determine the path of Aceh's future economic trajectory. Aceh's 2009 budget, for example, is IDR 9.7 trillion (about USD 97 billion), among the highest in the country. In addition, Aceh now has a fairly better physical infrastructure as the result of post-tsunami rehabilitation and reconstruction.

1.5.2 Empirical Models

A multivariate regression analysis is employed to clarify whether there is a presence of a "Dutch disease" in Aceh's economy as indicated in Section 1.5.1. To start with, some characteristics of the variables in the analysis are investigated, as shown in Table 1.4.

Table 1.4 Some characteristics of the variables in the model

Variable	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
ln $MINING_t$	9.197	1.143	5.657	10.112
ln AGR_t	8.090	0.969	6.460	8.996
ln NMM_t	6.512	1.433	3.848	7.981

The result of the OLS for non-mining manufacturing (NMM) output is presented in Table 1.5. Regression (1) in this table is the initial model estimated using complete series. Diagnostic tests indicate a reasonable normal probability plot and residual scattered around zero, although with a couple of obvious outliers. Taking out the outlier with large leverage, namely observation 1 (1977), produces the results as in Regression (2). In both models, previous year non-mining manufacturing output is a significant negative determinant of a designated year non-mining manufacturing output.

Table 1.5 Results of the OLS for non-mining manufacturing

	Model (1)			*Model (2)*		
	Coefficient		*t-stat*	*Coefficient*		*t-stat*
ln $(NMM)_{t-1}$	-0.201	**	-2.44	-0.308	***	-3.28
ln $(MINING)_t$	0.246	**	2.30	0.509	***	3.10
CONFLICT	-0.073		-0.91	-0.045		-0.58
ACRISIS	0.039		0.21	0.206		1.08
R-squared	0.325			0.424		
adj. *R*-squared	0.217			0.327		
D-W statistics	2.041			1.984		

Note: *, **, and *** are 10 percent, 5 percent, and 1 percent significance respectively
The dependent variable is $(\ln(NMM)_t - \ln(NMM)_{t-1})$.

Meanwhile, contrary to the resource curse theory, mining has a positive influence on non-mining manufacturing output. That is, the higher mining output, the higher non-mining manufacturing output is, too. Conflict, while showing the expected negative sign, is not significant in both models. Interestingly, Asian economic crisis indicate positive influence on non-mining manufacturing output, but is also not significant in both models.

A similar procedure is used to investigate how independent variables influence agricultural output. Model (3) and Model (4) in Table 1.6 are models with complete series and without observation 1 (1977), respectively. Again, contrary to what the resource curse theory predicts, mining has a positive impact on the output of agriculture sector. Similar to non-mining manufacturing output, conflict also has an expected negative impact, though not statistically significant, on agricultural output. Model (4) indicates that the Asian economic crisis indeed has a positive impact on agricultural output.

Table 1.6 Results of the OLS for agriculture output

	Model (3)			*Model (4)*		
	Coefficient		*t-stat*	*Coefficient*		*t-stat*
ln $(AGRI)_{t-1}$	-0.189	***	-2.72	-0.285	***	-3.75
ln $(MINING)_t$	0.160	***	2.83	0.315	***	3.73
CONFLICT	-0.047		-1.04	-0.038		-0.92
ACRISIS	0.139		1.21	0.266	**	2.24
R-squared	0.313			0.438		
adj. *R*-squared	0.203			0.345		
D-W statistics	2.330			2.372		

Note: *, **, and *** are 10 percent, 5 percent, and 1 percent significance respectively
The dependent variable is $(\ln(AGRI)_t - \ln(AGRI)_{t-1})$.
.

Recall that the main goal of this paper is to investigate whether Aceh experienced a "resource curse" between 1977 and 2006. Models (1) to (4) show both 'non-mining manufacturing' and 'agriculture' outputs in Aceh have not been reduced

by the increase of ‘mining’ output as indicated by descriptive analysis in Sub-section 1.5.1. Quite to the contrary, the models indicate that the ‘mining’ sector in Aceh has actually helped increase output in the other two sectors as ‘mining’ always has a positive coefficient in all the models. Therefore, it can be safely inferred that there is not enough empirical support to claim that Aceh experienced a resource curse. That is, no indication of ‘mining’ sector has taken over the more traditional sectors in Aceh like agriculture and manufacturing. The decline in output of non-mining manufacturing and agriculture along the years of 1977 to 2006, thus, cannot be attributed to the mining sector. Instead, the model indicates that ‘conflict’ might indeed be the main culprit for such decline. However, as the ‘conflict’ in Aceh intertwined closely with the management of its natural resources, one might argue that Aceh had experienced a resource curse that was channeled through the protracted conflict as theorized by, for example, Tadjoeddin (2007).

On the other hand, the Asian financial crisis might have contributed to the return of the significance of ‘agriculture’ and ‘non-mining manufacturing’ in Aceh’s economy as found in other part of Indonesia. It has a positive impact on agricultural sector output.

1.6 Concluding Remarks

Aceh’s GDP growth has two booms and two busts. The first and biggest boom was between 1978 and 1984 known as the “natural gas boom”. Then, there was a boom as a result of special autonomy in 2002. The first boom was followed by slow economic growth due to the conflict, but it did not bust until the Asian economic crisis in 1998. The second boom of 2002 was followed by a second bust due to the 2004 Indian Ocean Tsunami. Based on sector contribution to the GDP, the “natural gas

boom" changed Aceh's economic structure, from one previously based on diffused 'agriculture' source to 'unsustainable point source' of gas-based industries.

There is a compelling relationship between natural resources and conflict in Aceh. It can be seen as part of the curse as premised by Tadjoeddin (2007) when a resource boom effect is assumed to have been channeled through non-economic measures. This paper, however, shows there is not enough empirical evidence of a "resource curse" syndrome in Aceh's economy. 'Mining' sector had not caused a much lower output in 'agriculture' and 'non-mining manufacture'. Instead, it might have helped the later two sectors have an increased output. With such inference from the model, the hypothesis of 'resource curse' in Aceh can be rejected.

Nevertheless, as the conflict is closely related to natural resources management in Aceh, and if the 'conflict' is considered as part of or a resource curse itself, as suggested by Tadjoeddin (2007), one can still argue that Aceh did experience the resource curse before the peace agreement. Although Aceh is now enjoying a relative peace, the management of its unexploited natural resources might trigger another conflict in the future. Whether Aceh can escape the "resource curse" in the form of new conflict in the coming years remains to be seen. Although not being discussed in this paper, several authors such as Resosudarmo and Vidyattama (2006), Tajdoeddin (2007) and Hill, Resosudarmo and Vidyattama (2008) argue that the management of increasing revenues from Aceh's special autonomy since 2002 might determine how Aceh copes with the curse. In addition, Aceh can also tap into the boom of its post-conflict and post-tsunami reconstruction.

Even though Aceh's fund from its natural resources has been declining, mainly due to depleting oil and gas reserves, its "fiscal revenues will increase further" until 2028 (World Bank, 2006) as it enjoys the new special autonomy fund—mainly from oil and gas, and a higher General Allocation Fund (*Dana Alokasi Umum*, or DAU)

from the decentralization scheme enacted in 1999. Thus, as the World Bank concludes, "Aceh has the resources to fight poverty", although by 2006, "it has not yet made much progress" (p. xvi). Acehnese and Indonesian alike hope that the new Aceh Government's initiative to invest heavily in infrastructure, education, and health will remedy "the curse" Aceh has experienced so far. Aceh has, for example, adopted the policy to invest at least 30 per cent of its revenues from oil and gas in education (Aceh Government, 2007:12). In 2009, from its IDR 9.7 trillion total budget (about USD 97 billion), the government allocates IDR 1.5 trillion (15.46 per cent) for education, and IDR 2.2 trillion (22.68 per cent) for infrastructure.[19]

[19] Aceh Government's Official Website: http://www.nad.go.id/index2.php?option=isi&do_pdf=1&id=3678 (retrieved 9 March 2009)

APPENDIX 1A

HIIK Conflict Intensity Scale

Conflict intensity

State of Violence	Intensity Group	Level of Intensity	Name of Intensity	Definition
non-violent	low	1	Latent Conflict	A positional difference over definable values of national meaning is considered to be a latent conflict if respective demands are ar ticulated by one of the parties and perceived by the other as such.
Non-violent	low	2	Manifest Conflict	A manifest conflict includes the use of measures that are located in the preliminary stage to violent force. This includes for example verbal pressure, threatening explicitly with violence, or the imposition of economic sanctions.
Violent	medium	3	Crisis	A crisis is a tense situation in which at least one of the par ties uses violent force in sporadic incidents.
Violent	high	4	Severe Crisis	A conflict is considered to be a severe crisis if violent force is repeatedly used in an organized way.
Violent	high	5	War	A war is a type of violent conflict in which violent force is used with a certain continuity in an organized and systematic way. The conflict parties exercise extensive measures, depending on the situation. The extent of destruction is massive and of long duration.

Source: *Conflict Barometer*, Heidelberg Institute for International Conflict Research, 2008

APPENDIX 1B
Partial Computer Output

A. Impact on Non Mining Manufacturing (NMM)

1. Regression Analysis: D1LnNMM versus LnNMMt-1, LnMINING, ... (All observations)

```
The regression equation is
D1LnNMM = - 0.608 - 0.201 LnNMMt-1 + 0.246 LnMINING - 0.0729 CONFLICT
          + 0.039 ACRISIS

Predictor      Coef  SE Coef      T      P
Constant    -0.6076   0.7229  -0.84  0.409
LnNMMt-1   -0.20058  0.08227  -2.44  0.022
LnMINING     0.2460   0.1071   2.30  0.030
CONFLICT   -0.07292  0.08055  -0.91  0.374
ACRISIS      0.0387   0.1821   0.21  0.833

S = 0.341855   R-Sq = 32.5%   R-Sq(adj) = 21.7%

Analysis of Variance

Source          DF      SS      MS     F      P
Regression       4  1.4069  0.3517  3.01  0.037
Residual Error  25  2.9216  0.1169
Total           29  4.3286

Unusual Observations

Obs  LnNMMt-1  D1LnNMM      Fit  SE Fit  Residual  St Resid
  1      3.85   0.1620  -0.2066  0.2824    0.3686      1.91 X
  9      4.91   1.9305   0.6258  0.1733    1.3047      4.43R

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.


Durbin-Watson statistic = 2.04122
```

2. Regression Analysis: D1LnNMM versus LnNMMt-1, LnMINING, ... (Without Outlier: Obs. 1977)

```
The regression equation is
D1LnNMM = - 2.56 - 0.308 LnNMMt-1 + 0.509 LnMINING - 0.0447 CONFLICT
          + 0.206 ACRISIS

Predictor      Coef  SE Coef      T      P
Constant     -2.561    1.180  -2.17  0.040
LnNMMt-1   -0.30756  0.09379  -3.28  0.003
LnMINING     0.5091   0.1644   3.10  0.005
CONFLICT   -0.04473  0.07721  -0.58  0.568
ACRISIS      0.2064   0.1905   1.08  0.289
```

```
S = 0.322344   R-Sq = 42.4%   R-Sq(adj) = 32.7%

Analysis of Variance

Source          DF      SS      MS     F      P
Regression       4  1.8321  0.4580  4.41  0.008
Residual Error  24  2.4937  0.1039
Total           28  4.3259

Unusual Observations

Obs  LnNMMt-1  D1LnNMM      Fit  SE Fit  Residual  St Resid
  1      4.01   0.2063  -0.3817  0.2602    0.5880      3.09RX
  8      4.91   1.9305   0.8381  0.1940    1.0924      4.24R

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.

Durbin-Watson statistic = 1.98375
```

B. Impact on Agriculture

1. Regression Analysis: D1LnAGR versus LnAGRt-1, LnMINING, ... (All observations)

```
The regression equation is
D1LnAGR = 0.249 - 0.189 LnAGRt-1 + 0.160 LnMINING - 0.0467 CONFLICT
          + 0.139 ACRISIS

Predictor      Coef  SE Coef      T      P
Constant     0.2490   0.3885   0.64  0.527
LnAGRt-1   -0.18860  0.06923  -2.72  0.012
LnMINING    0.16034  0.05672   2.83  0.009
CONFLICT   -0.04668  0.04477  -1.04  0.307
ACRISIS      0.1388   0.1145   1.21  0.237

S = 0.191441   R-Sq = 31.3%   R-Sq(adj) = 20.3%

Analysis of Variance

Source          DF       SS       MS     F      P
Regression       4  0.41698  0.10424  2.84  0.045
Residual Error  25  0.91624  0.03665
Total           29  1.33321

Unusual Observations

Obs  LnAGRt-1  D1LnAGR      Fit  SE Fit  Residual  St Resid
  1      6.48   0.0287  -0.2069  0.1570    0.2356      2.15RX
  9      6.96   1.1705   0.3857  0.0978    0.7848      4.77R

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.

Durbin-Watson statistic = 2.32989
```

2. Regression Analysis: D1LnAGR versus LnAGRt-1, LnMINING, ... (Without Outlier: Obs. 1977)

```
The regression equation is
D1LnAGR = - 0.512 - 0.285 LnAGRt-1 + 0.315 LnMINING - 0.0381 CONFLICT
          + 0.266 ACRISIS

Predictor      Coef  SE Coef      T      P
Constant    -0.5118   0.4844  -1.06  0.301
LnAGRt-1   -0.28456  0.07592  -3.75  0.001
LnMINING    0.31490  0.08440   3.73  0.001
CONFLICT   -0.03814  0.04142  -0.92  0.366
ACRISIS     0.2661   0.1188   2.24  0.035

S = 0.176417   R-Sq = 43.8%   R-Sq(adj) = 34.5%

Analysis of Variance

Source          DF       SS       MS     F      P
Regression       4  0.58322  0.14581  4.68  0.006
Residual Error  24  0.74695  0.03112
Total           28  1.33017

Unusual Observations

Obs  LnAGRt-1  D1LnAGR      Fit  SE Fit  Residual  St Resid
  1      6.51  -0.0535  -0.2960  0.1431    0.2426      2.35RX
  8      6.96   1.1705   0.5144  0.1056    0.6561      4.64R

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.

Durbin-Watson statistic = 2.37160
```

C. Using "die-down" dummy of Asian Economic Crisis (*ACRISIS_1*)

1. Regression Analysis: D1LnNMM versus LnNMMt-1, LnMINING, ... (with ACRISIS_1 and all observations)

```
The regression equation is
D1LnNMM = - 0.577 - 0.200 LnNMMt-1 + 0.245 LnMINING - 0.0802 CONFLICT
          + 0.126 ACRISIS_1

Predictor      Coef  SE Coef      T      P
Constant    -0.5774   0.7091  -0.81  0.423
LnNMMt-1   -0.20002  0.07225  -2.77  0.010
LnMINING    0.24538  0.09927   2.47  0.021
CONFLICT   -0.08022  0.08515  -0.94  0.355
ACRISIS_1   0.1261   0.3776   0.33  0.741


S = 0.341404   R-Sq = 32.7%   R-Sq(adj) = 21.9%


Analysis of Variance

Source          DF      SS      MS     F      P
Regression       4  1.4147  0.3537  3.03  0.036
```

```
Residual Error  25  2.9139  0.1166
Total           29  4.3286


Source     DF  Seq SS
LnNMMt-1    1  0.5130
LnMINING    1  0.7981
CONFLICT    1  0.0905
ACRISIS_1   1  0.0130


Unusual Observations

Obs  LnNMMt-1  D1LnNMM      Fit  SE Fit  Residual  St Resid
  1      3.85   0.1620  -0.1997  0.2692    0.3617      1.72 X
  9      4.91   1.9305   0.6306  0.1695    1.2999      4.39R
 22      7.98  -0.1252  -0.0896  0.2936   -0.0357     -0.20 X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.

Durbin-Watson statistic = 2.05291
```

2. Regression Analysis: D1LnNMM versus LnNMMt-1, LnMINING, ... (with ACRISIS_1 and without 1985)

```
The regression equation is
D1LnNMM = 0.052 - 0.0554 LnNMMt-1 + 0.0490 LnMINING - 0.0199 CONFLICT
          - 0.194 ACRISIS_1


Predictor      Coef  SE Coef      T      P
Constant     0.0516   0.3546   0.15  0.885
LnNMMt-1   -0.05538  0.03893  -1.42  0.168
LnMINING    0.04903  0.05337   0.92  0.367
CONFLICT   -0.01990  0.04227  -0.47  0.642
ACRISIS_1   -0.1938   0.1885  -1.03  0.314


S = 0.167320   R-Sq = 25.7%   R-Sq(adj) = 13.3%


Analysis of Variance

Source          DF       SS       MS     F      P
Regression       4  0.23203  0.05801  2.07  0.116
Residual Error  24  0.67190  0.02800
Total           28  0.90393


Source     DF   Seq SS
LnNMMt-1    1  0.11806
LnMINING    1  0.05830
CONFLICT    1  0.02608
ACRISIS_1   1  0.02959


Unusual Observations
```

```
Obs  LnNMMt-1  D1LnNMM      Fit  SE Fit  Residual  St Resid
  1      3.85   0.1620   0.0561  0.1350    0.1058      1.07 X
 21      7.98  -0.1252  -0.2123  0.1446    0.0871      1.03 X
 25      7.19   0.4802  -0.0144  0.0514    0.4946      3.11R
 27      7.69  -0.4672  -0.0397  0.0630   -0.4275     -2.76R

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.


Durbin-Watson statistic = 2.09266
```

3. Regression Analysis: D1LnAGR versus LnAGRt-1, LnMINING, ...

(with ACRISIS_1 and all observations)

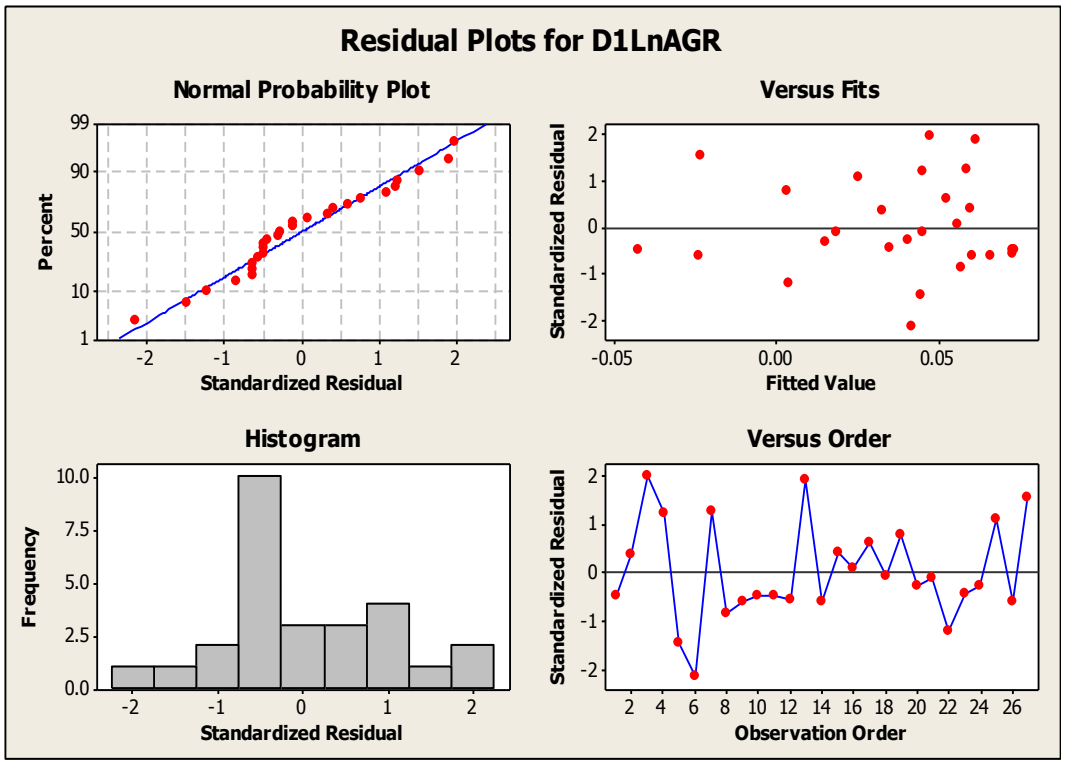
Regression Analysis: D1LnAGR versus LnAGRt-1, LnMINING, ...

```
The regression equation is
D1LnAGR = 0.179 - 0.146 LnAGRt-1 + 0.134 LnMINING - 0.0469 CONFLICT
          + 0.156 ACRISIS_1


Predictor      Coef  SE Coef      T      P
Constant     0.1785   0.3909   0.46  0.652
LnAGRt-1   -0.14601  0.05510  -2.65  0.014
LnMINING    0.13402  0.05098   2.63  0.014
CONFLICT   -0.04689  0.04836  -0.97  0.342
ACRISIS_1    0.1557   0.2151   0.72  0.476


S = 0.194960   R-Sq = 28.7%   R-Sq(adj) = 17.3%

Analysis of Variance

Source          DF       SS       MS     F      P
Regression       4  0.38298  0.09575  2.52  0.067
Residual Error  25  0.95023  0.03801
Total           29  1.33321

Source     DF   Seq SS
LnAGRt-1    1  0.09316
LnMINING    1  0.24940
CONFLICT    1  0.02051
ACRISIS_1   1  0.01991


Unusual Observations

Obs  LnAGRt-1  D1LnAGR      Fit  SE Fit  Residual  St Resid
  1      6.48   0.0287  -0.1508  0.1501    0.1794      1.44 X
  9      6.96   1.1705   0.3501  0.0922    0.8204      4.78R
 22      8.88   0.0147   0.0918  0.1699   -0.0771     -0.81 X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.

Durbin-Watson statistic = 2.38483
```

4. Regression Analysis: D1LnAGR versus LnAGRt-1, LnMINING, ...

(with ACRISIS_1, without 1977, 1983, 1985)

```
The regression equation is
D1LnAGR = - 0.297 - 0.0278 LnAGRt-1 + 0.0552 LnMINING + 0.0115 CONFLICT
          - 0.0410 ACRISIS_1


Predictor      Coef   SE Coef      T      P
Constant   -0.29667   0.09311  -3.19  0.004
LnAGRt-1   -0.02783   0.01139  -2.44  0.023
LnMINING    0.05518   0.01365   4.04  0.001
CONFLICT   0.011476  0.008501   1.35  0.191
ACRISIS_1  -0.04097   0.03772  -1.09  0.289


S = 0.0328627   R-Sq = 51.5%   R-Sq(adj) = 42.7%

Analysis of Variance

Source          DF        SS        MS     F      P
Regression       4  0.025276  0.006319  5.85  0.002
Residual Error  22  0.023759  0.001080
Total           26  0.049035


Source     DF    Seq SS
LnAGRt-1    1  0.000011
LnMINING    1  0.022951
CONFLICT    1  0.001040
ACRISIS_1   1  0.001274


Unusual Observations

Obs  LnAGRt-1   D1LnAGR      Fit   SE Fit  Residual  St Resid
  6      6.98  -0.02268  0.04194  0.01332  -0.06462     -2.15R
 19      8.88   0.01470  0.00308  0.02925   0.01163      0.78 X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.


Durbin-Watson statistic = 2.06016
```


Residual Plots for D1LnAGR
Normal Probability Plot
Percent
99
90
50
10
1
-2
-1
0
1
2
Standardized Residual
Versus Fits
Standardized Residual
2
1
0
-1
-2
-0.05
0.00
0.05
Fitted Value
Histogram
Frequency
10.0
7.5
5.0
2.5
0.0
-2
-1
0
1
2
Standardized Residual
Versus Order
Standardized Residual
2
1
0
-1
-2
2 4 6 8 10 12 14 16 18 20 22 24 26
Observation Order

REFERENCES

Abdullah, T. & Syahrel, M. (2005). The poor on the rich land. *Seumike, Journal of Aceh Studies,* 1, p.11. Banda Aceh: The Aceh Institute

Aceh Government. (2007). *Education policy, strategy, and financing framework*: *NAD strategic plan (NADESP) 2007-2011.* Banda Aceh: The Aceh Government and Aceh's Education Council.

Age, L. (2007). *Peranan masyarakat sipil dalam tranformasi konflik di Aceh* (The role of civil society in conflict transformation in Aceh). Unpublished thesis, School of Social Sciences, Universiti Sains Malaysia, Penang, Malaysia (cited and quoted with permission).

Akita, T. (2003). Decomposing regional income inequality in China and Indonesia using two-stage nested Theil decomposition method. *The Annals of Regional Science*, 37, p. 55-77.

----------. (1988). Regional development and income disparities in Indonesia. *Asian Economic Journal,* September, p. 165-191

Akita, T. & Lukman, R.A. (1995). Interregional inequalities in Indonesia: A sectoral decomposition analysis for 1975-92. *Bulletin of Indonesia Economic Studies*, 31(2), 61-81

Alm, J., Aten, R.H., & Bahl, R. (2001). Can Indonesia decentralize successfully? Plans, problems, and prospects. *Bulletin of Indonesian Economic Studies,* 37(1), 83–102.

Anderson, K. (1998). Are resource-abundant economies disadvantaged? *The Australian Journal of Agricultural and Resource Economics*, 42(1), 1-23.

Atkinson, G. and Hamilton, K. (2003). Savings, growth, and the resource curse Hypothesis. *World Development,* 31(11), 1793-1807

Auty, R. M. (1993). Sustaining development in mineral economies: The resource curse thesis, London: Routledge.

----------. (2001). Introduction and overview. In Richard M. Auty (Ed), *Resource abundance and economic development* (pp. 3-16). New York: Oxford University Press

Auty, R. M. & Kiiski, S. (2001). Natural resources, capital accumulation, structural change, and welfare. In Richard M. Auty (Ed), *Resource abundance and economic development* (pp. 19-35). New York: Oxford University Press.

Azis, I.J. (2000). Pre and Post Crisis Indonesia: The Vital Roles of Institutional Factors. Presented at international conference on *"Global Financial Restructuring and Asian Recovery"*. United Nations University, Tokyo.

----------. (1989) Key issues in Indonesia regional development. In H. Hill (Ed), *Unity and Diversity: Regional Economic Development in Indonesia since 1970* (pp. 55-74). Singapore: Oxford University Press.

Balisacan, A. M., & Fuwa, N.(2003). Growth, inequality and politics revisited: A developing-country case. *Economics Letters,* 79, 53–58.

Barnes, P. (1995). *Indonesia: The political economy of energy*, Oxford: Oxford University Press/Oxford Institute for Energy Studies.

Barro, R.J. (1997). Human capital and growth in cross-country regressions. *Swedish Economic Policy Review,* 6(2), 237-277

Becker, G.S., Glaeser, E.L., Murphy, K.M. (1999). Population and economic growth. *American Economic Review*, 89(2), Papers and Proceedings, 145-149.

Bergheim, S. (2008). *Long-run growth forecasting.* Berlin: Springer

Bevan, D., Collier, P., and Gunning, J. W. (1999). *Nigeria and Indonesia*, A World Bank comparative study: The political economy of poverty, equity, and growth. New York: Oxford University Press.

Bhagwati, J. (1994). Free trade: old and new challenges. *Economic Journal*, 104(423), 231–46

Boediono & Hasan, I. (1974). An economic survey of D.I. Aceh. *Bulletin of Indonesian Economic Studies*, 10(2), 35-55.

Booth, A. (1992). Introduction. In A. Booth (Ed.). *The oil boom and after: Indonesian economic policy and performance in the Soeharto era* (pp. 1-38). Singapore: Oxford University Press.

Booth, A. (1992a). Income distribution and poverty. In A. Booth (Ed.). *The oil boom and after: Indonesian economic policy and performance in the Soeharto era* (pp. 323-362). Singapore: Oxford University Press.

Brown, G. (2005). *Horizontal inequalities, ethnic separatism, and violent conflict: The case of Aceh, Indonesia*. Human Development Report Office Occasional Paper, Human Development Report 2005, United Nations Development Programme.

Caselli, F., Esquivel, G., & Lefort, F. (1996). Reopening the convergence debate: A new look at cross-country growth empirics". *Journal of Economic Growth*, 1(3), 363–89.

Corden, M., & Neary, J.P. (1982). Booming sector and Dutch disease economics: A survey. *Economic Journal*, 92, 826-844

Dawood, D., & Sjafrizal. (1989). Aceh: The LNG boom and enclave development. In H. Hill (Ed), *Unity and diversity: Regional economic development in Indonesia since 1970* (pp. 107-123). Singapore: Oxford University Press.

Djankov, S., Montalvo, J., & Reynal-Querol, M. (2008). The curse of aid. *Journal of Economic Growth,* 13(3), 169-194.

Easterly, W. (2001). *The elusive quest for growth: economists' adventures and misadventures in the tropics*. Cambridge, Massachusetts: The MIT Press.

Esmara, H. (1975a). Regional income distribution. *Bulletin of Indonesian Economic Studies*, 11(1), 41-57.

----------. (1975). *Perkiraan pembagian pendapatan di Indonesia 1925-1973/74.* Proyek penelitian mengenai perspektif-perspektif pertumbuhan Indonesia jangka panjang. Padang: Lembaga Penelitian Ekonomi Regional, Fakultas Ekonomi, Univeristas Andalas.

Ferreira, F. (1999). Inequality and economic performance: A brief overview to theories and distribution". Available at http://www1.worldbank.org/prem/poverty/inequal/econ/ cquired.pdf.1999.

Forbes, K. (2000). A reassessment of the relationship between inequality and growth. *American Economic Review* 90(4), 869–86.

Frederick, W. H., & Worden, R.L. (Eds.). (1993) *Indonesia: A country study*, 5th Edition, Washington: Federal Research Division, Library of Congress.

Garcia-Garcia, J., & Soelistianingsih, L. (1997). Why do differences in provincial incomes persist in Indonesia. *Indonesia Discussion Paper Series No. 8,* East Asia and Pacific Region Country Department III, the World Bank.

Gelb, A. and Associates. (1988). *Oil windfalls: Blessing or curse,* New York: Oxford University Press.

Grossman, G. M., & Helpman, E.(1991). *Innovation and growth in the global economy*. Cambridge, MA: MIT Press

Gylfason, T. (2001). Natural resources, education, and economic development. *European Economic Review*, 45 (May), 847–59

----------. (2000). Resources, agriculture, and economic growth in economies in transition," *Kyklos*, 53(4), 545-79.

Gylfason, T., & Zoega, G. (2006). Natural resources and economic growth: The role of investment. *World Economy*, 29(8), 1091-1115

Haseman, J. B. (1993). National security. In Frederick, W. H. & Worden, R. L. (Eds.), *Indonesia: A country study*, 5th Edition, Washington: Federal Research Division, Library of Congress.

Heidelberg Institute for International Conflict Research. (2008). *Conflict Barometer*. Available at http://hiik.de/en/konfliktbarometer/index.html (Retrieved 20 April 2009).

Hill, H. (1992). Manufacturing industry. In A. Booth (Ed.). *The oil boom and after: Indonesian economic policy and performance in the Soeharto era* (pp. 204-257). Singapore: Oxford University Press.

Hill, H., Resosudarmo, B.P., & Vidyattama, Y. (2008). Indonesia's changing economic geography. *Bulletin of Indonesian Economic Studies*. 44(3), 407-435

Hill, H., & Weidemann, A. (1989). Regional development in Indonesia: Patterns and issues. In H. Hill (Ed.), *Unity and diversity: Regional economic development in Indonesia since 1970* (pp. 3-54), Singapore: Oxford University Press.

Humphreys, M., Sachs, J. D., & Stiglitz, J. E. (Eds.). (2007). *Escaping the resource curse*, New York: Columbia University Press.

Husin, Z. (1998). *Strategy for Aceh's Economic Development in the Era of Reform*. Paper prepared for symposium, Telaah Pembangunan D.I. Aceh Memasuki Era Reformasi, Jakarta, 22 August 1998.

Islam, I., & Khan, H. (1986). Spatial patterns of inequality and poverty in Indonesia. *Bulletin of Indonesian Economic Studies*, 22(2), 80-102.

Johnston, D. (2007). How to evaluate the fiscal terms of oil contracts. In Humphreys, M., Sachs, J. D., & Stiglitz, J. E. (Eds.), *Escaping the resource curse* (pp. 53-88), New York: Columbia University Press.

Juynboll, Th.W. (1960). *Atjeh* in The Encyclopedia of Islam, Leiden: E.J.Brill

Karl, T. (1997). *The paradox of plenty: Oil booms and petro-states*, Barkeley: University of California Press.

Kell, T. (1995). *The roots of Acehnese rebellion, 1989-1992*. Ithaca, NY: Cornell Modern Indonesia Project.

Komarulzaman, A. & Alisjahbana, A.S. (2006). Testing the Natural Resource Curse Hypothesis in Indonesia: Evidence at the Regional Level. Presented at *The 8th Indonesia Regional Science Association International Conference*, Malang, East Java, August 18-19.

Koostra, M. (2001). *Indonesia: regional conflicts and state terror.* London: Minority Rights Group International.

Kuncoro, A., & Resosudarmo, B.P. (2004). *Understanding Indonesian Economic Reform: 1983–2000*. Report for the Understanding Reforms Project, New Delhi: Global Development Network.

Lal, D., & Myint, H. (1996). *The political economy of poverty, equity, and growth.* Oxford: Clarendon Press.

Lujala, P. (2003). *Classification of natural resources*. Paper prepared for presentation at the 2003 ECPR Joint Session of Workshops, Edinburgh, UK (quoted with permission)

Mahi, B.R. (2006). Oil prices fluctuations and regional finance in Indonesia. Presented at *The 8th Indonesia Regional Science Association International Conference*, Malang, East Java, August 18-19.

Mankiw, N. G., Romer, D., & Weil, D. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics*, 107(2), 407–37.

Marshall, K.G. (1993). The economy. In Frederick, W. H., & Worden, R. L. (Eds.). *Indonesia: A country study*, 5th Edition, Washington: Federal Research Division, Library of Congress

Milich, L. (2001). Civil society: Food security in the 'New' Indonesia. *Development*, 44(4), 93-96.

Newitt, M. (2005). *A History of Portuguese Overseas Expansions 1400 – 1668.* New York: Routledge.

O'Connor, M. (1994). On the misadventures of capitalist nature. In M.O'Connor (Ed.). *Is capitalism sustainable: political economy and the politics of Ecology* (pp. 125-151). New York: The Guilford Press.

Pangestu, M. (1990). Adjustment problems of a small oil-exporting country: Did Indonesia suffer from the Dutch Disease? In Seiji Naya and Akira Takayama (Eds.). *Economic development in East and Southeast Asia: Essays in honor of Professor Shinichi Ichimura*. Singapore: ISEAS

Panggabean, M.P.H. (2003). War in Aceh: Its economic impact. *Viewpoints*, ISEAS, May 20, 2003.

Ranis, G. (1991). Towards a model of development. In L.B. Krause and K. Kihwan (Eds.). *Liberalization in the process of economic development* (pp.59-101). Barkeley, CA: University of California Press.

Resosudarmo, B.P., & Vidyattama, Y. (2006). Regional income disparity in Indonesia: A panel data analysis. *ASEAN Economic Bulletin*, 23(1), 31–44

Robinson, G. (2001). Rawan *is as* rawan *does.* In B. Anderson (Ed.) *Violence and the state in Suharto's Indonesia* (pp. 213-242). Ithaca: SEAP, Cornell University

Ross, M. L. (2001). *Natural resources and civil conflict: Evidence from case studies*. Unpublished paper, (quoted with permission)

----------. (2002). *Oil, drugs, and diamonds: How do natural resources vary in their impact on civil war?* Produced for the International Peace Academy project on Economic Agendas in Civil Wars (quoted with permission)

----------. (2003). *Resources and rebellion in Aceh, Indonesia.* Unpublished paper, prepared for The Yale-Word Bank project on "The Economics and Political Violence" (cited with permission).

----------. (2004). What do we know about natural resources and civil war? *Journal of Peace Research*, 41(3), 337-356

Rosser, A. (2007). Escaping the resource curse: The case of Indonesia. *Journal of Contemporary Asia*, 37 (1), 38-58.

----------. (2004). Why did Indonesia overcome the resource curse? *IDS Working Paper 222.*

Sachs, J.D., & Warner, A.M. (2001). Natural resources and economic development: The curse of natural resources. *European Economic Review*, 45, 827-838.

----------. (1999). The big push, natural resource booms and growth. *Journal of Development Economics*, 59(1), 43-76.

----------. (1995). Natural resource abundance and economic growth. *NBER Working Paper 5398.*

Sakamoto, H. (2007). *The dynamics of inter-provincial income distribution in Indonesia*. Working Paper Series Vol. 2007-25, November 2007. Kitakyushu: The International Centre for the Study of East Asian Development.

Schulze, K.E. (2007). The conflict in Aceh: struggle over oil? In M. Kaldor, T.L. Karl, and Y. Said (Eds.). *Oil Wars* (pp. 183-224). Ann Arbor, MI: Pluto Press.

Siegel, J.T. (1969). *The Rope of God.* Michigan University Press

Sulaiman, M.I. (2000). *Aceh Merdeka: Ideologi, Kepemimipinan dan Gerakan* (Free Aceh: Its Ideology, Leadership, and Movement). Jakarta: Pustaka Kautsar.

Sulistiyanto, P. (2001). Whither Aceh? *Third World Quarterly.* 22(3), 437-452.

Solow, R.M. (1957). Technical change and the aggregate production function. *The Review of Economics and Statistics*, 39, 312-320.

Solow, R.M. (1956). A contribution to the theory of economic growth. *Quarterly Journal of Economics* 70, 65-94.

Tadjoedin, M.Z., Sjuharyo, W.I., & Mishra, S. (2001). Regional disparity and centre-regional conflicts in Indonesia. *UNSFIR Working Paper* No. 01/01-E

Tadjoeddin, M. Z. (2007). A future resource curse in Indonesia: The political economy of natural resources, conflict and development. *CRISE Working Paper No. 35*.

Temple, J. (1999). The new growth evidence. *Journal of Economic Literature,* 37(1), 112-156.

Tippe, S. (2000). *Aceh di persimpangan jalan*, Jakarta: Pustaka Cidesindo

Tiro, H.M. (1999). *Demokrasi Untuk Indonesia*, Jakarta: Teplok Press.

Van Leeuwen, B., & Földvári, P. (2007). *The development of inequality and poverty in Indonesia, 1932-1999* available at http://www.basvanleeuwen.net/bestanden/expinequalityIndonesia1.pdf (accessed 2 February 2008)

The World Bank. (2008c). *Aceh economic update,* October 2008. Retrieved from www.worldbank.org/id/reconstruction

----------. (2008b). *Aceh economic update,* April 2008. Retrieved from www.worldbank.org/id/reconstruction

----------. (2008a). *Aceh public expenditure analysis update 2008: Managing resources for better outcomes in a special autonomy region.* Jakarta: Decentralization Support Facilities (DSF). Retrieved from www.worldbank.org/id/reconstruction

----------. (2008). *Aceh poverty assessment 2008: The Impact of the Conflict, the Tsunami and Reconstruction on Poverty in Aceh,* Jakarta; The World Bank Office

----------. (2007a). *Aceh economic update,* November 2007. Retrieved from www.worldbank.org/id/reconstruction

----------. (2007). *Aceh economic update,* April 2007. Retrieved from www.worldbank.org/id/reconstruction

----------. (2006). *Aceh public expenditure analysis: Spending for reconstruction and poverty reduction*, Jakarta: Decentralization Support Facilities (DSF).

CHAPTER TWO:
DETERMINANTS OF INFLATION IN ACEH

Abstract

The wild increase of inflation in post-tsunami Aceh was assumed to be influenced by two "shocks", the tsunami and the fuel price increase. This paper examines determinants of inflation in Banda Aceh and investigates the change in the inflation structure due to the shocks. To integrate the findings into policy, an analysis of price and output relation is performed using Structural Vector Autoregression (SVAR) with Blanchard and Quah restriction. Based on models developed using multivariate time series regression, I find that Aceh's inflation is mainly determined by inflation expectancy and exchange rate, similar to Indonesia's national inflation behavior. Productivity also indicates significance but with a contradictory sign when divided into productivity based on oil-and-gas and non-oil-and-gas GDP. Contrary to the common assumption, Chow's structural change test indicates that it was the oil price increase, rather than Tsunami-driven factors, that changed the structure of Aceh's inflation. In regard to output-price relation, I find the AS and AD curves follow what the textbook predicts. The post-Tsunami AS curve, as expected, is flatter than that of pre-tsunami and overall series, but as the AD curve after Tsunami also becomes flatter. Therefore, a policy based on AS rather than AD shocks to increase growth while keeping price in control would have been more effective in post-tsunami Aceh.

2.1 Introduction

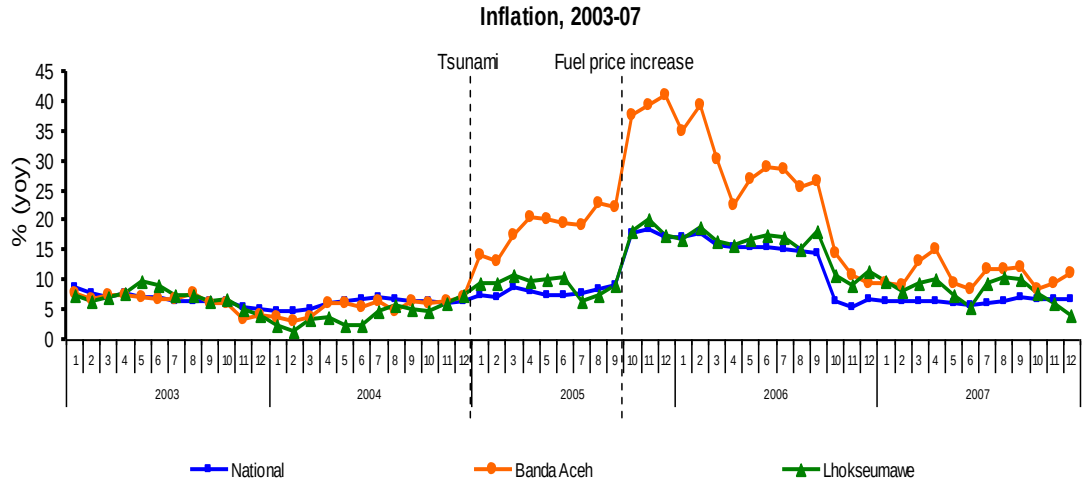
There is a growing concern of slowing economic growth in post-tsunami Aceh. "Aceh Economy Bankrupt" was the headline of the main local daily newspaper in Banda Aceh on February 1, 2008.[20] The news quoted the chairman of Banda Aceh Office of Indonesia Central Bank, Bank Indonesia (BI), saying Aceh's economic growth decreased by 0.6 percent in 2007 to become 1.8 percent, from an already low 2.4 percent in 2006. The next day, the governor of Aceh refuted the claim and argued that the low growth was only a reflection of the province's routine expenditure of January to October 2007, neglecting development projects starting afterwards.[21] The BI office in Banda Aceh also released a statement saying that the wording of the headline was negative and misleading. The governor and other analysts blamed high inflation as one of the main culprits for the slow growth.[22]

Indeed, inflation in post-tsunami Aceh has been consistently higher than that of Indonesia's national average as shown in Figure 2.1. The gap has been narrowing since the end of 2006, but it is still above the national average, at least as of the time this report is being written. Until the beginning of 2008, officials and analysts alike were still concerned about the high inflation in Aceh.[23]

Since the tsunami, prices in the affected regions have increased more sharply than those of the national average. The most dramatic increase has been in Banda Aceh, which serves as the regional hub for reconstruction activities. Year-on-year inflation in December 2005 reached 41 percent in Banda Aceh, while it was 23 percent in Medan, the neighboring province, and 18 percent in Lokseumawe, the second

[20] *Ekonomi Aceh Bangkrut: Merosot 0,6 Persen* (Aceh Economy Bankrupt: Slipped 0.6 Percent), Serambi Indonesia (local daily newspaper), 1 February 2008
[21] *Gubernur Bantah Ekonomi Aceh Bangkrut* (Governor Denies Aceh Economy Bankrupt), Serambi Indonesia, 2 February 2008
[22] *Ibid.*
[23] *Inflasi Aceh 'Lampu Kuning'* (Aceh's Inflation 'Yellow Light'), Serambi Indonesia, 3 January 2008

biggest city in North Aceh, compared to 17 percent at the national level. The major increase in prices occurred immediately after the tsunami. During the first four months, the CPI in Banda Aceh registered an increase of 15 percent. The second major increase took place during the nationwide fuel price increase in October 2005, after the government revoked the oil and gas subsides. The five year outlook of the inflation movement is shown in Figure 2.1.



Source : BPS

Figure 2.1
Inflation in Banda Aceh and Lhokseumawe (North Aceh) in comparison to national inflation in Indonesia

According to April 2008 *Aceh Economic Update* (AEU), a bi-annual joint analysis by the BI and The World Bank with support from the Multi Donor Fund (MDF) for Aceh and Nias, the high inflation in Aceh (as measured in Banda Aceh) is "a result of prolonged high demand for goods and services to supply the reconstruction effort, combined with little supply response in terms of increased production." The analysis also maintains that, "The festive season and the global increase in commodity prices contributed to higher year-end inflation" and that "Prices of many commodities, including fuel, are projected to remain high in international markets, which is likely to

translate into renewed inflationary pressures in 2008." On the other hand, some analysts assert that the high inflation in Aceh is also a result of increased *money supply* which has been coming along with the influx of international aid, agencies and their workers after the Indian Ocean tsunami of December 26, 2004.[24]

The inflation in Banda Aceh, therefore, is assumed to be directly or indirectly influenced by two "shocks", the tsunami and the fuel price increase. But did either or both of the shocks really change the structure that makes up the inflation mechanism in Banda Aceh? Which one is worse in affecting prices in the region? Moreover, what is the output-price relationship in Aceh's economy, given the shock of increasing demand for post-tsunami reconstruction?

Given the situation, a study on inflation in Aceh is, therefore, very important and strategic. This study is aimed at examining determinants of inflation in Aceh. Subsequently, a model is estimated and its finding is compared with other relevant studies and the factual situation. Structural change tests were performed to see whether one or both the two shocks, i.e. tsunami and fuel price increase, have caused structural change in Aceh's inflation structure. Further, the link between output and price in Aceh's economy is explored by applying a structural vector autoregression (SVAR) with the Blanchard-Quah (B-Q) restriction.

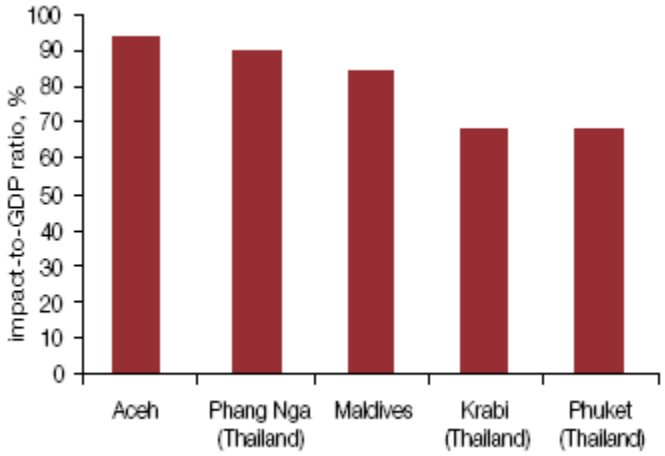
The remainder of this paper is structured as follows. Section 2.2 looks at the general impact of the 2004 Tsunami on Aceh's economy. Section 2.3 reviews literature on inflation modeling, followed by Section 2.4 which describes data and methodology used in the paper. Section 2.5 discusses the results, including model diagnostic and interpretation. This section also includes a brief description of structural change in Aceh's inflation and its output-price relationship. Finally, Section 2.6 concludes, followed by a note on limitations and further research direction in 2.7.

[24] See, for example, Kasim (2008)

2.2 Impact the 2004 Indian Ocean Tsunami

Based on the damage and loss assessment by the international donor community, it is estimated that the tsunami has had a total economic impact across all affected countries of 9.9 billion US dollars. Almost half of this total has been borne by Indonesia. The total impact relative to the overall size of the economy in Indonesia, however, is only about 2 percent; higher than India (0.2 percent) and Thailand (1.4 percent) but much lower to Maldives (83.6 percent) and Sri Lanka (7.6 percent).

In contrast, provincial-level statistics reveal that reconstruction and economic recovery requirements are equivalent to nearly the size of some provincial economies. The impact (damage and losses) to GDP ratio in Aceh province comes ***close to 100 percent***, followed by Phang Nga province in Thailand (90 percent), the entire Maldives (84 percent), and Krabi and Phuket in Thailand (68 percent each), as Figure 2.2 indicates.



Source: World Bank Staff calculations (in BRR, 2005)

Figure 2.2
Province-Level Impact-to-GDP Ratios, %

The overall impact of the disaster on the economy depends not only on its aggregate scale and geographic or spatial distribution but also on its sectoral distribution. The bulk of damage in Indonesia has been in the housing and human settlements sector, which accounts for 47.9 percent of the total damage. This percentage is much higher than in any other affected country. At the same time, relative damage to productive sectors in Indonesia has been substantially less severe than in other affected countries. A complete breakdown of cross country demographic and economic impact of the tsunami is provided in Appendix 2.A.

The projected aggregate impact of the tsunami on Aceh's GDP and poverty rates has been well documented by the Government's Master Plan. Initially, due to data limitations, the impact of the tsunami on Aceh's income growth and poverty headcount index is presented as a range (Table 2.1). A moderate scenario, which was considered most likely to materialize, predicted a 20 percent decline in Aceh's non-oil-and-gas GDP in 2005.[25] Accordingly, Aceh's economy would have contracted by 13.9 percent and an additional 600,000 people would have fallen below the poverty line.

Table 2.1 Growth and poverty impact scenarios

	Scenario 1 (Minor)	Scenario 2 (Moderate)	Scenario 3 (Worst)
Impact on Growth			
Aceh's Non-Oil and Gas GDP Declines by 1/ (%)	10.0	20.0	40.0
Aceh's Growth Rate (%)	-7.0	-13.9	-27.8
Impact On National GDP Growth (%)	-0.1	-0.2	-0.4
Revised GDP Growth Forecast (%)	5.3	5.2	5.0
Impact on Poverty			
Impact On National Poverty Headcount Index (%)	0.1	0.3	0.5
Increase in Number Of Poor (million)	0.2	0.6	1.1

Source: Master Plan for Reconstruction and Rehabilitation, March 2005, World Bank Staff Estimates. 1/ Based on *estimated* 2004 GDP

[25] Summary table of damages and losses (page. iii of the Master Plan) puts estimated losses in the next 4 years at US$1.5 billion (roughly Rp. 14 trillion). Assuming that about 40 percent of losses would be observed in 2005, estimated losses of non-oil and gas would be Rp 5.5 trillion. This is about 20 percent of Aceh's non-oil and gas GDP

Three years after the tsunami, its impact on poverty and growth seems to fall between Scenario 1 and Scenario 2. Based on this scenario, some 325,000 people in Aceh, and 149,000 in Nias and Nias Selatan combined, a total of about 475,000 people, would have fallen below the poverty line in the absence of mitigation mechanisms. The actual pre-disaster poverty headcount vs. estimated post-disaster poverty headcount by district is presented in Appendix 2.B. The headcount indicates the need to pay more attention to spatial disparity.

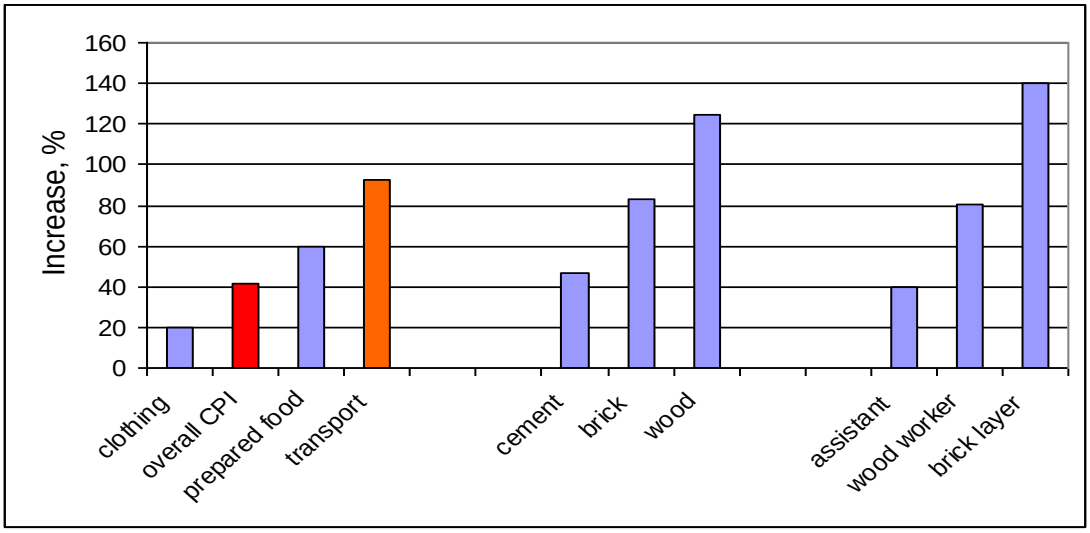
In regard to growth, AEU (April, 2008) reported that Aceh GDP declined by 9.6 percent in 2005, and further declined by 10.1 percent in 2006. Growth increased by 1.6 percent in 2005, but then fell again by 2.2 percent in 2007[26]. However, a more positive outlook is seen on GDP without oil and gas, which scores an increasing positive change from 1.2 percent in 2005 to 7.7 percent in 2006. Yet, although still preliminary, the growth seems to slow down again by 2007 with a percentage growth rate of 7.4.

In the months following the tsunami, the increase in prices has been mostly driven by rising transportation costs.[27] Rising transport costs also appear to be the major determinant of the increase in the prices of construction materials. While overall CPI increased by 41% from December 2004 to December 2005, the transportation prices grew by 93% during the same period. This rate of increase in transport costs has transformed into the respective increase in prices of construction materials (Figure 2.3).

House rents also jumped dramatically by almost 200 percent during the first two months after the tsunami, before stabilizing at an average of 9,600 rupiah per day

[26] 2007 growth rate is a preliminary figure provided by BI and the World Bank.
[27] Transportation prices increased initially due to interrupted road connections, and later due to transport supply constraints as the increasing amount of goods related to reconstruction process need to be delivered.

from March to May. But June 2005 saw another 42 percent jump in daily rent prices to 13,700 rupiah. Rent prices stayed at this level until August.[28] The high increase of rooms and house rents has triggered anxiety within the affected community. One study reported that economic problems caused by inflation are considered bigger concerns than security issues after the peace agreement.[29]



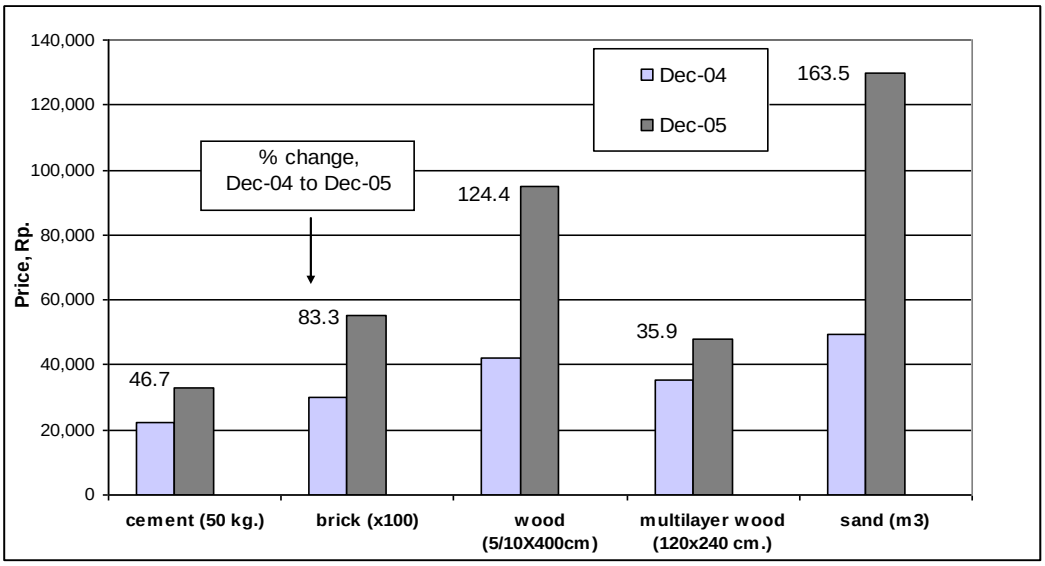
Source: BPS, World Bank staff calculations (In Aceh Economic Update, April 2008, World Bank)

Figure 2.3
Increase in prices of commodities and in wages, Dec. 2004 to Dec. 2005

Increase in prices during the course of 2005 affected all construction materials, but has been the highest for those major commodities facing the greatest demand – brick, wood and sand. From Dec. 2004 to Dec. 2005 the prices of brick, wood and sand have increased by 83%, 124%, and 164%, respectively (Figure 2.4).

[28] BPS reports annual rents for houses. Daily rents are calculated by dividing the reported rent by 365 days. However, the rent prices reported are under-estimated, since BPS' sample of houses has rent contracts fixed for one year and therefore does not capture fully the price trends in the housing market. The average price of a good quality room in a guesthouse is now around 300,000 – 350,000 ($25 - $35 per night).

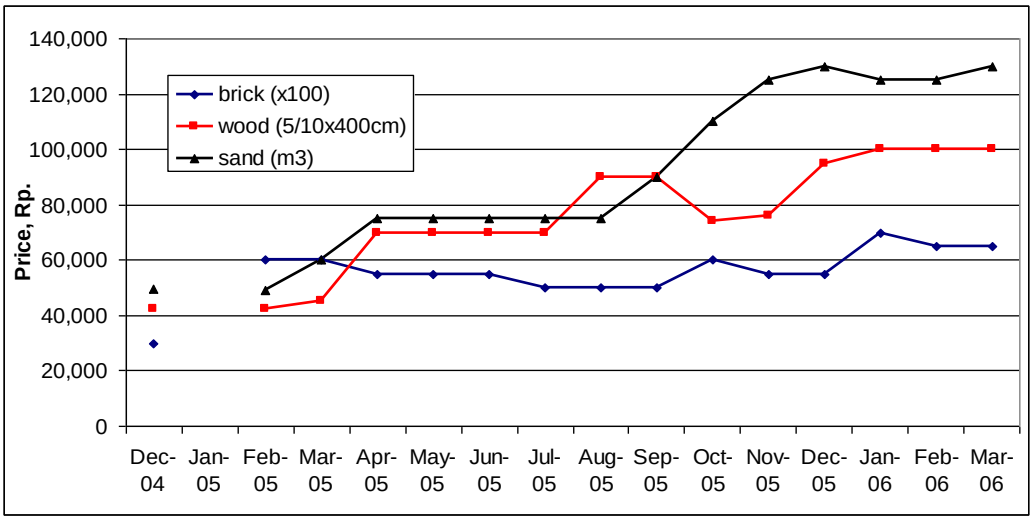
[29] "LSI: Aceh Aman tapi Kondisi Ekonomi Buruk," (LSI: Aceh is Safe but Economic Condition Worsening), Kompas, 28 Maret 2006



Source: BPS, World Bank staff calculations (In Aceh Economic Update, April 2008, World Bank)

Figure 2.4
Price trends for selected construction materials in 2005

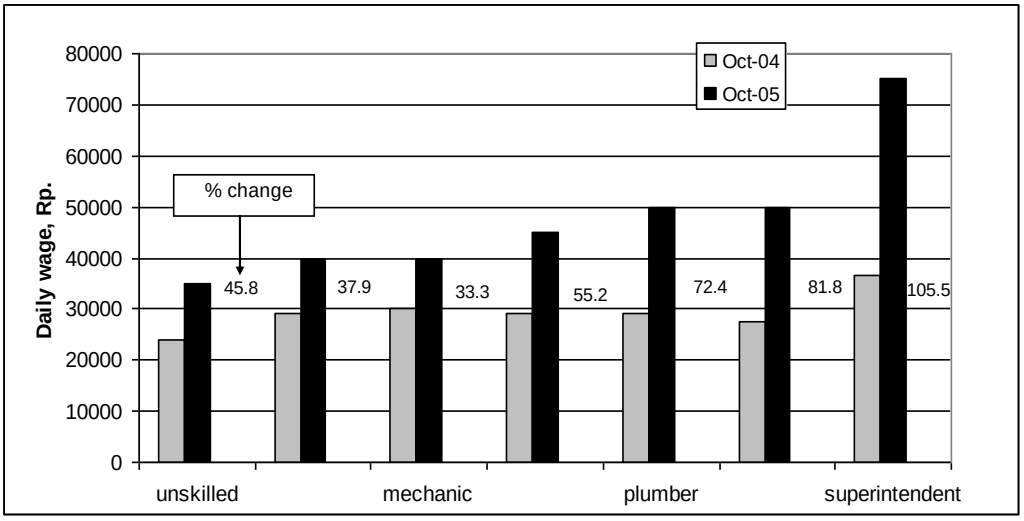
Since January 2006 prices stayed at high levels, but did not increase further. During the 1st quarter of 2006 the construction materials have on average registered no increase in prices. It is only the price of sand that increased by 4%, while the prices of other materials remained unchanged (Figure 2.5).



Source: BPS, World Bank staff calculations (In Aceh Economic Update, April 2008, World Bank)

Figure 2.5
Monthly price dynamics for key construction materials

The transition from the relief to the reconstruction phase pushed up the wages of construction workers**.** During 2005 the wages increased by at least 40-50% across all categories of construction workers. The largest rate of increase has been observed for higher skilled workers (Figure 6).



Source: BPS, World Bank staff calculations (In Aceh Economic Update, April 2008, World Bank)

Figure 2.6
Construction workers' wages, Oct. 2005 vs. Oct. 2004[30]

2.3 Inflation Modeling and Output-Price Relationship

Empirical studies on Aceh's inflation at the regional level are sketchy at best. For that reason, an alternative strain of literature on the study of inflation from developing countries and from Indonesia at the national level are used to illuminate the situation at the level of Aceh.

According to Bokil and Schimmelpfennig (2005), there is a large and growing literature on inflation forecasting in emerging market economies. This includes

[30] The survey of wages for categories of construction workers presented in Figure 5 is conducted only once a year (in October).

Chauvet (2000) and IMF (2001) for Brazil, Leigh and Rossi (2002) for Turkey, and Sun (2004) for Thailand. They observe similar findings to those for advanced economies. That is, changes in money growth, nominal exchange rates, price of imports, inflation expectations, and exogenous supply shocks, especially to oil and food prices are main determinants of inflation. It is consistent with theoretical work that views inflation to be a monetary phenomenon in the long run when prices and wages are flexible and output and employment are always at their natural rates. In the short run, however, the findings of these studies show that inflation is also driven by real and nominal shocks that affect aggregate demand relative to aggregate supply.

Subsequently, Bokil and Schimmelpfennig (2005) find that broad money growth, private sector credit growth, and lags in inflation as determinants for inflation in Pakistan. They used the leading indicator model (LIM), ARIMA and VAR approaches in the study, but suggested that LIM is superior in forecasting Pakistan's inflation.

Loungani and Swagel (2001) study sources of inflation in developing countries. Using VAR, they found that money growth and exchange rate changes are far more important determinants influencing inflation in countries with floating exchange rate regimes. On the other hand, they found that inertial factors dominate the inflation process in developing countries with fixed exchange rate regimes.

In the case of Indonesia, studies of inflation at the national level have been done by both national and international researchers. Kacaribu (2004) uses an asymmetric trimmed-mean approach to measure core inflation in Indonesia. He found that core inflation is more correlated with the growth of money supply in the past and that it is a reliable indicator of inflation trend.

According to Ramakrishnan and Vamvakidis (2002), among few empirical studies that analyze the inflation process in Indonesia, "exchange rate movements

often emerged as a significant determinant of inflation." Using multivariate regression models, their own study confirms previous empirical papers. They find exchange rate and foreign inflation to be the key contributors to inflation in Indonesia. Both factors also have a strong predictive power of inflation. Additionally, they found that base money growth is also statistically significant, "but has a smaller impact on the headline consumer price inflation." Excluding the exchange rate, they moreover found that base money growth emerges as a more important determinant of inflation, while productivity also becomes significant. Hence, they concluded that the effects of other important variables might be fed through the exchange rate.

McLeod (1997) argues that the cause of continuing moderately high inflation in the 80s through 90s in Indonesia is excessive growth of base money. He noted that the policies of monetary authority were responsible for inflation in the medium and long term through the impact of base money supply. In regard to policy, Taguchi (1995) noted that price stability and investment, the former required contraction and the later needed expansion, is balanced by Bank Indonesia through monetary policies. Meanwhile, Siregar (1996) shows that changes in nominal rupiah exchange rate Granger caused inflation.

Ahmed and Kapur (1990), on the other hand, find that the domestic price of imports and the price of rice affected domestic inflation in Indonesia. Therefore, they argued domestic inflation in Indonesia was only partly a monetary phenomenon. They concluded that the transmission of international inflation was immediate and large, although slowing the rate of money growth could reduce inflation.

The importance of the study of regional inflation in Indonesia has emerged since it introduced a more substantial regional autonomy in 2000.[31] With regional

[31] Based on Indonesia Law No. 22/1999 and Law No. 26/1999

autonomy, the source of inflation in Indonesian regions can be more widespread and is more difficult to control than those of previous years (Brojonegoro, 2001).

Brojonegoro *at al* (2005) study the relation between non-monetary factors and regional inflation. Using logistic regression, they found that non-monetary factors such as local government revenues, routine expenditure and local transportation cost determine regional inflation. They argue, therefore, that monetary policy alone, without coordination with local government, will be less effective to influence regional inflation. Although in this study they did not include Aceh in their survey, Brojonegoro *at al* did include Banda Aceh and Lhokseumawe (a city in North Aceh) in their analysis of Purchasing Power Parity (PPP). Based on the Philip-Peron test for unit root with intercept and trend, they found that consumer price indexes (CPI) in 43 cities in Indonesia, including Banda Aceh and Lhokseumawe are not cointegrated, thus rejecting PPP. The test with intercept but without trend, however, excludes Lhokseumawe from other cities, all of which also show no cointegration.

Githarie (2005, in Wimanda, 2006) finds that different regions have different inflation thresholds, which, she argues, is good for economic regional growth.

Hutabarat (2005) descriptively examines Indonesia's inflation. He found that the main determinant of inflation in Indonesia is *inflation expectation* which is formed by previous inflation (adaptive expectation). This behavior has caused *inflation persistency* due to the fact that Indonesia's inflation is often triggered by significant *cost-push* or *supply shocks* like oil and fuel price increases, and Indonesia's currency, the rupiah, devaluation and fluctuation. The inflation persistency is also determined by the cost-push of administered goods like electricity and minimum wage over-inflation indexation increase.

Wimanda (2006) evaluates the characteristics, convergence, and determinant of regional inflation in Indonesia using more formal methods. He studied 26 regions

using data with various length and frequency, some of which needed interpolation. The characteristics are studied through descriptive statistics, correlation analysis and the Granger causality test. Convergence is examined with the cointegration approach, while determinants are inferred from a model using OLS method. On the characteristics of regional inflation, Wimanda found that level and volatility of regional inflation after the Asian economic crisis of 1997 is higher than those before the crisis; that inflation of transportation and housing in most regions are higher than national inflation; that, other than transportation, high increases in fuel price cause price increase in other baskets, such as housing, food, and processed food in many regions. He also found that regions in Java, West Kalimantan, and Central Kalimantan can be categorized as "leaders" in inflation as their inflation is likely to affect other regional inflation.

On convergence, Wimanda finds that regional inflation and its component do not exhibit convergence. Only eight regions (31 percent) exhibit inflation convergence with national inflation, i.e. West Sumatra, Jambi, Bengkulu, Lampung, Yogyakarta, West Kalimantan, North Sulawesi and Maluku.

Lastly, using multivariate regression, the study finds that the main determinant of regional inflation is inflation expectation (backward looking) and exchange rate. Regional revenue, routine expenditure, and balanced fund from the central government are only significant at some regions, but with very small elasticity. Particularly for Aceh, Wimanda concludes that only persistency (or expected inflation) and exchange rates are significant determinants of inflation.

With regard to output-price relation, understanding aggregate supply (AS) and aggregate demand (AD) curves helps macroeconomics policy makers choose the appropriate shock to stimulate economic growth while managing inflation. However, both AD and AS shocks "jointly determine the changes in output and prices" (Azis,

2008:2). Therefore, a decomposition procedure is needed. A multivariate approach using structural vector autoregression (SVAR) has been widely used, e.g. Gamber 1996; Mio, 2002; Cover, Enders, and Hueng, 2004; Enders and Hurn, 2005; Azis, 2008; Azis & Putanapong, 2009. In these studies, aggregate demand and supply shocks are identified from the VAR residual using a long run restriction proposed by Blanchard and Quah (1989) (hereafter B-Q) or its modification (e.g. Cover, Enders, and Hueng, 2004).

2.4 Data and Methodology

Following previous studies, this paper empirically examines the domestic and international effects on inflation in Aceh. Using several factors described below, a multivariate regression model is developed to describe the inflationary process. The model initially follows those of Ramakrishnan and Vamvakidis (2002) and Wimanda (2006) but with some more in depth analysis. For example, a Chow Test for structural change is done to check for the supposedly structural change in Aceh's inflation in the wake of fuel price increase and the tsunami.

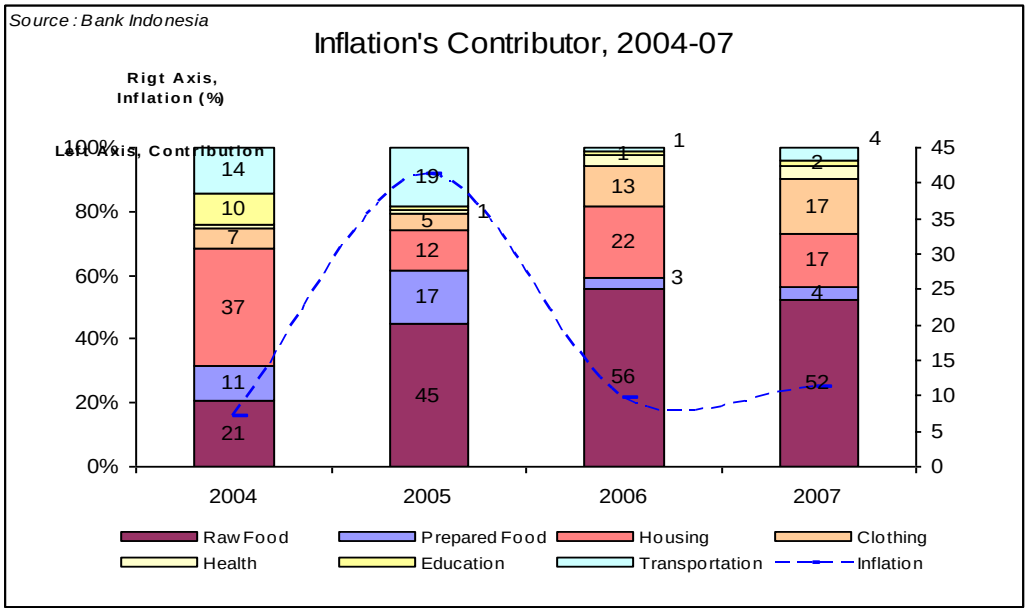
Most data are acquired from Indonesia's Office of Statistics (BPS) or CEIC with some supplement from Ministry of Labor (MoL) and Bank Indonesia (BI), the Indonesia Central Bank. Most data from CEIC originally also comes from BPS. Quarterly data of Aceh's GDP is cquired from the World Bank office in Banda Aceh.

The model is developed based on a premise that consumer price inflation in Aceh can arise due to wage inflation and imported inflation.[32] Wages are influenced by excess demand or supply of labor as reflected in unemployment rate. Shortages of labor, as seen in Aceh amidst the post-tsunami reconstruction, for example, results in

[32] As data is not available, monetary inflation due to money supply is not considered.

excess demand which is translated into higher wages and prices, as unit cost of production increases. This indicates that variables such as average wage rates and labor productivity have essential information about future inflation. In this case, labor productivity is defined as RGDP per worker. And given the substantial share of the mining sector, especially in oil and gas in Aceh's RGDP, a productivity variable without mining is also considered.

To capture the shock on supply side, rice and chicken production are also tested in the model. Rice production is included due to the fact that it contributed up to 0.50% year on year. Rice price inflation, as recorded in February 2007, was the highest among food commodities.[33] The food commodities themselves have consistently contributed higher to the overall inflation in Aceh since 2005 as shown in Figure 2.7.



Source: Aceh Economic Update, April 2008, World Bank

Figure 2.7
Inflation contributors in Aceh, 2004-2007

[33] http://www.bi.go.id/NR/rdonlyres/3DDB2FF8-030F-462E-9C20 E2C4B808351D/6754/Boks3TekananInflasikomoditiBeras.pdf. (accessed 8 July 2008)

Chicken production, both native and broiler chickens, is also tested in the model. With the influx of humanitarian workers and the booming of restaurant and hotel businesses in post-tsunami Aceh, there was an increased demand of chickens. Aceh, however, having imported at least partially from other regions even before the disaster, have had short supplies of poultry.

Transportation has also been a major factor influencing inflation in Indonesia's regions. This is especially true because most regions in Indonesia get their primary need goods from other regions. To take this into account, sugar price is included in the model, assuming that all sugar in Aceh comes from other regions, especially Medan in North Sumatra or, occasionally, by direct imports from India, Thailand and Vietnam. In addition, cement price influence on inflation is also tested as this product directly shows high demand during the reconstruction process in Aceh.

Meanwhile, external factors like the price of imported goods can have a direct impact on domestic inflation either directly by affecting imported goods in the consumption basket, or indirectly by influencing production costs. Import price may rise in two ways: in foreign currency terms, higher foreign inflation implies higher import prices; in domestic currency terms, a depreciation of the local currency implies higher import prices. Therefore, the spot exchange rate is included in the model.

Then, the general specification of the estimated model is

$$DCPI_t = \alpha_0 + \alpha_1(L)DCPI_t + \beta_1(L)DEXC_t + \beta_2(L)DWAG_t + \beta_3(L)DPRO_t + \beta_4(L)DPWO_t + \\ + \beta_5 DRICE_t + \beta_6 DCHIC_t + \beta_7 DSUGAR_t + \beta_8 DCEMENT_t + \beta_9 TSUND_t + \varepsilon_t$$

where *D* is the difference operator, and L is the lag operator. The list variables and data sources are described in Table 2.2.

Table 2.2 Variables in the inflation model and data sources

Notation	Variable	Data source
DCPI	Change in consumer price in percent	BPS
DEXC	Change in spot exchange rate per US$	BI
DWAG	Change in minimum wage rate in Aceh	Ministry of Labor (MoL)
DPRO	Change in productivity rate, defined as Aceh's RGDP per worker	MoL, BPS, processed
DPWO	Change in productivity rate without oil, defined as Aceh's RGDP without oil per worker	MoL, BPS, processed
DRICE	Change in rice production rate	CEIC
DCHIC	Change in chicken production rate	CEIC
DSUGAR	Change in sugar price	CEIC
DCEMENT	Change in cement price	CEIC
TSUND	Tsunami Dummy, 0 before December 2004, 1 afterwards	Author

To check for stationarity, variables are tested with Augmented Dickey Fuller (ADF) test using the following equation

$$\Delta Y_t = b_0 + \beta Y_{t-1} + \alpha_1 \Delta Y_{t-1} + ... + \alpha_n \Delta Y_{t-n} + \varepsilon \quad (2.1)$$

This test is based on the following hypothesis:

$H_0 : \beta = 0 \rightarrow$ non-stationary (unit root)

$H_1 : \beta < 0 \rightarrow$ stationary

Residuals of estimated model is tested using ADF test based on the following equation

$$\Delta \hat{e}_t = \rho \hat{e}_{t-1} + \sum_{i=1}^{T} \Delta \hat{e}_{t-i} + \varepsilon_t \quad (2.2)$$

This test is based on the following hypothesis:

$H_0 : \rho = 0 \rightarrow$ non-stationary (unit root)

$H_1 : \rho < 0 \rightarrow$ stationary

It should be noted that all terms in the general specification model discussed here are in year-to-year growth. Thus, it is expected that the variables are all *I*(0), that is, integrated stationary. This also means that data must be collected from January 2002 in order to get a year-to-year growth rate starting January 2003. While the starting point of the observation is arbitrary, using 2002 as the base year (2002 = 100) has two advantages, that is, (1) it gives enough series to observe Aceh's inflation prior to the tsunami, and (2) most statistics, especially those collected by BPS (Indonesia Office of Statistics), use 2002 as the base year. The CPI published by the BPS, for example, uses 2002 as the base year until May 2008.[34]

Since the observations in wage, productivity, and production are few, it is necessary to change the frequency from low (annually) to high (monthly) as for CPI, spot foreign exchange rate, and retail price of sugar and cement. The low frequency data are interpolated into high frequency data using cubic spline approximations. This spline method is available is SAS.[35]

To investigate output-price relationship in Aceh's economy, I use Aceh's quarterly data of 2000 to 2008 GDP. I then create GDP Deflator to proxy the price. I then adopt a bivariate SVAR with B-Q restriction and a decomposition technique as used in Gamber (1996), Azis (2008), and Azis and Putanapong (2009). An outline of this methodology can be found in Appendix 1 of Azis (2008). A unit root test is performed using ADF test on GDP and GDP deflator series, followed by a lag selection using Ljung-Box test as in Gamber (1996). The tests results are shown in Appendix 2.F and Appendix 2.G.

[34] See, for example, Monthly Indonesia's CPI at http://www.bps.go.id/sector/cpi/table3.shtml (last accessed July 20, 2008)
[35] http://support.sas.com/rnd/app/examples/ets/expa/index.htm (accessed on June 10, 2008)

2.5 Results and Discussion

The model development begins with analysis of inflation in Banda Aceh. The monthly year-to-year inflation from January 2003 to December 2007 shows non-stationarity. This is apparent from the plot as shown in Figure 2.8.

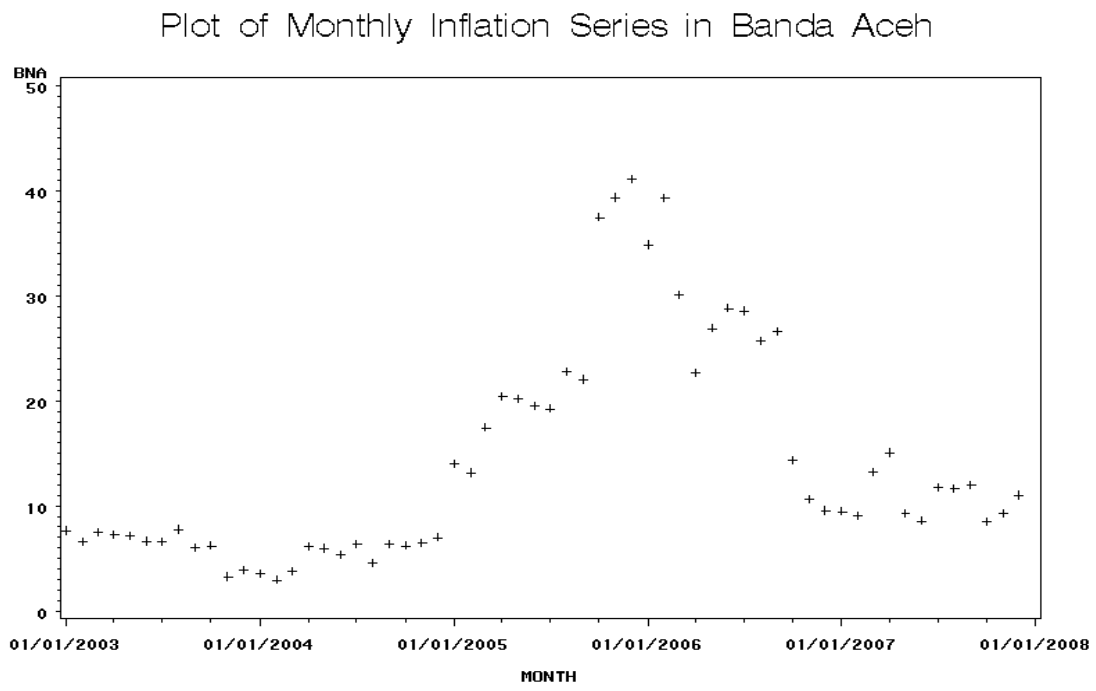


Figure 2.8
Plot of monthly inflation series in Banda Aceh, Jan. 2003-Dec. 2007

Since the OLS τ statistics from the above analysis is –1.39 > -1.95 of Table B.6 in Hamilton (1994), we would not reject the null hypothesis of unit root (non-stationarity), thus conclude that inflation series in Banda Aceh is non-stationary. This confirms the inference from informal test using the plot above. However, it is also proved here that the residual of the model is a white noise, indicating that there is a long term equilibrium of the model. The estimated models based on data from January 2002 to December 2007 are shown in Table 2.3.

Table 2.3
General inflation model for Aceh, January 2002-December 2007

Independent Variables	***Regression (1)***	***Regression (2)*** /1
Constant	44.74** (2.10)	8.17** (2.42)
DCPI(-1)	0.44*** (3.76)	0.63*** (5.91)
DEXC	0.27** (2.53)	0.12 (1.47)
DWAG	-0.62 (-1.59)	…
DPRO	1.65 (1.57)	…
DPWO	-4.40** (-2.05)	-0.69** (-2.44)
DRICE	-1.31* (-1.82)	-0.07 (-0.58)
DCHIC	-0.00 (-0.03)	…
DSUGAR	0.05* (1.71)	0.04* (1.77)
DCEMENT	0.16** (2.28)	0.08 (1.25)
TSUND	-1.43 (-0.52)	…
F-statistics	74.68***	108.22***
Adjusted R-Square	0.928	0.917
D-W Statistics	2.221	2.219
SBC	322.335	318.127
AIC	299.482	303.584

(-1) first lagged value; t-statistics in parentheses
* p-value < 0.1 **p-value < 0.05 *** p-value < 0.001
1/ Regression (2) drops insignificant variables in Regression (1)

Model (1) indicates a good fit with Adjusted R-square of 0.93 and Durbin-Watson Statistics of 2.22, which is relatively close to the expected 2.00, indicating no spurious regression. As expected, inflation persistency (expectation) is highly

significant in determining inflation in Aceh, as the case reported at the national level. In Aceh's case, however, besides the inflation persistency and exchange rate, productivity without oil and gas as well as cement price are also significant at p-value < 0.05. Rice production and sugar price are significant although only at p-value < 0.1. Meanwhile, wage rate, productivity with oil and gas, chicken production, and tsunami dummy variables are all not significant.

All the significant variables show expected signs. That is, inflation expectation and exchange rate depreciation increase or positively related to the inflation. The increase of cement and sugar price can also increase inflation. On the other hand, an increase in productivity without oil and gas, would mean a decrease of inflation in Aceh. Also, an increase of rice production can ease the inflation.

When insignificant variables in Model (1) were dropped simultaneously, there were no significant changes in Adjusted R-square and D-W Statistics as shown in Model (2). However, the structure of the model is now totally different, where, unexpectedly, the exchange rate, rice production rate and cement price become insignificant.

Nevertheless, if the insignificant variables are dropped using backward regression selection, more variables show significance. It is done by dropping the insignificant variables with the least *t*-statistics first from Model (1). Therefore, chicken production was dropped first, and then followed by tsunami dummy variable and sugar price rate consecutively. The estimated model based on this method is shown as Model (3) in Table 2.4.

Table 2.4
Backward selection regression model for inflation in Aceh, January 2002-December 2007

Independent Variables	***Regression (3)***	***Regression (4)***
Constant	46.61*** (4.08)	7.82** (3.20)
DCPI(-1)	0.39*** (3.46)	0.63*** (7.56)
DEXC	0.30** (2.98)	0.15** (2.10)
DWAG	-0.59*** (-3.37)	…
DPRO	1.83** (3.35)	…
DPWO	-4.71*** (-3.88)	-0.60** (-2.74)
DRICE	-1.49*** (-3.42)	…
DCHIC	…	…
DSUGAR	…	…
DCEMENT	0.17** (2.81)	0.14** (2.59)
TSUND	…	…
F-statistics	106.25***	154.48***
Adjusted R-Square	0.927	0.915
D-W Statistics	2.211	2.239
SBC	313.680	314.027
AIC	297.060	303.640

(-1) first lagged value; t-statistics in parentheses
* p-value < 0.1 **p-value < 0.05 *** p-value < 0.001

Though almost no additional gain in terms of adjusted R-square compared to Model (1), Model (3) indicates a slightly better D-W Statistics, thus further suppressing the presence of spurious regression. Moreover, it has four highly significant determinants of inflation in Aceh; that is, previous inflation, wage rate, productivity without oil and gas, and rice production. Except for the wage, the signs

for all other variables are as expected. Exchange rate, productivity with oil and gas, and cement price are all significant at $p<0.05$.

It should be noted here that there is a contradicted sign in productivity account. When counting oil and gas in the RGDP, the productivity sign is positive in relation to the CPI. This means, increased productivity can increase inflation. However, when productivity is derived from the RGDP without oil and gas, it shows the expected negative sign. That is, increased productivity will likely ease the pressure of inflation. This might be due to limited trickle effect of oil and gas sector contribution to Aceh economy.

If variable WAGE, which has the unexpected positive sign, is dropped, and then a backward selection process is followed, Model (3) becomes Model (4). In the process, variables productivity with oil and gas, as well as rice production rate were also dropped as they are no longer significant in the model.

2.5.1 Model Diagnostic

Statistically, Model (3) seems to be the "best" model, at least based on Durbin-Watson, AIC, and SBC statistics. But given the relatively similar high Adjusted R-Square, and most importantly, the unexpected sign of the WAGE in Model (3), we opt for Model (4) for further analysis.

After fitting the model, we proceed with diagnostic check of the residual. It is done by residual plot and, formally, by Augmented Dickey-Fuller (ADF) test. The plot of residual for Model (4) over time shows a quite pattern around zero, except for several outliers. Overall, the pattern indicates a fairly good fit of the model and the existence of long term equilibrium (Figure 2.9). Residual plots for other models show similar patterns, as shown in Appendix 2.C.

A more formal test on the residuals using ADF confirms the appearance of the plot to be acceptable. The OLS τ statistics for Model (4) is –3.56, which is more negative than -2.93 (using case 2) or –3.50 (using case 4) of Table B.6 (Hamilton, 1994), assuming n = 50 (more conservative) and probability that $(\hat{\rho}-1)/\hat{\sigma}_{\hat{\rho}}$ is less than 0.05. Since it is more negative, we would reject the null hypothesis of unit root (non-stationarity).

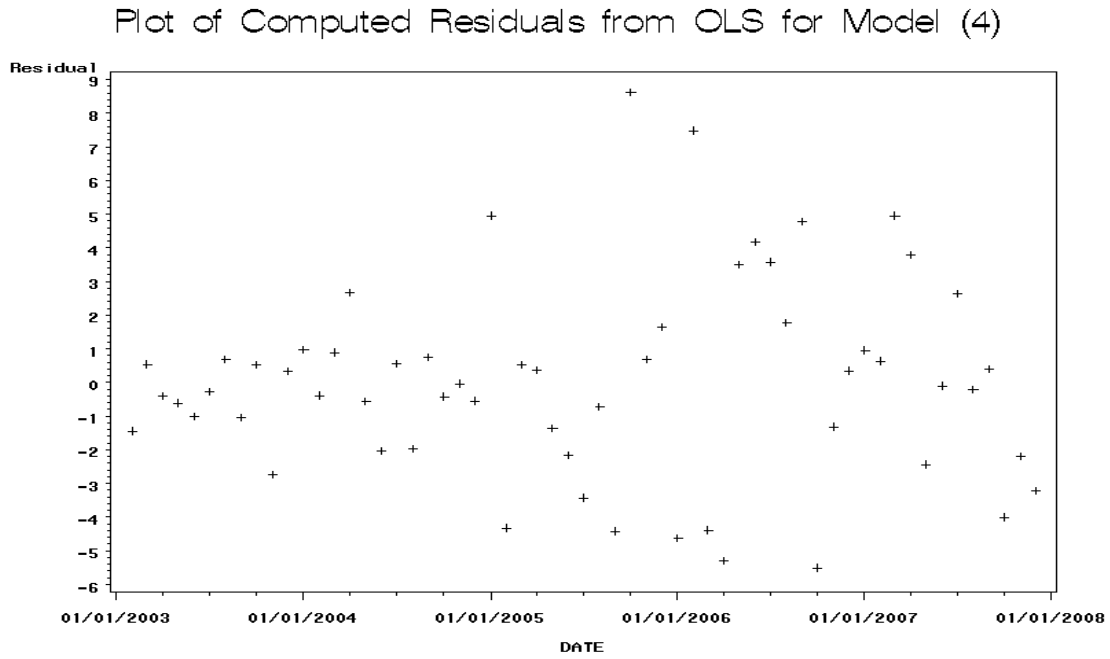


Figure 2.9
Residual Plot of inflation model (4) for Banda Aceh, January 2002-December 2007

The Durbin-Watson (DW) statistics for the residuals of Model (4) is 1.94, which is relatively close to 2. Therefore we conclude that residuals of the model are stationary. This means, the regression in Model (4) is a *cointegrating* regression. The same test applied to the other three models also suggests similar results. The estimated OLS τ statistics and D-W statistics for ADF tests of all four models are given in Table 2.5.

Table 2.5 Augmented Dickey-Fuller test

Model	***τ statistics***	***D-W statistics***
Model (1)	-4.51	2.050
Model (2)	-3.45	1.937
Model (3)	-4.39	2.039
Model (4)	-3.56	1.940

Next, causality tests were performed on variables in Model (4). Using Granger-Causality Wald tests[36], the causality relations as shown in Table 2.6 were found. The null hypothesis for the Granger causality test is that Group 1 is influenced only by itself, and not by Group 2. Decision is made based on $\alpha = 0.05$. The tests were performed at two and four lags of the designated variables.

Table 2.6 Causality test among variables in Banda Aceh's Inflation Model

Group 1	Group 2	Number of lags	Chi-Square	*p-value*	Decision
DCPI	DEXC	2	11.08	0.0039	Reject
DEXC	DCPI	2	7.01	0.0301	Reject*
DCPI	DEXC	4	11.14	0.0250	Reject
DEXC	DCPI	4	12.29	0.0153	Reject
DCPI	DPWO	2	9.43	0.0090	Reject
DPWO	DCPI	2	2.94	0.2298	Do not reject
DCPI	DPWO	4	11.55	0.0211	Reject
DPWO	DCPI	4	12.52	0.0139	Reject
DCPI	DCEMENT	2	13.55	0.0011	Reject
DCEMENT	DCPI	2	3.11	0.2115	Do not reject
DCPI	DCEMENT	4	16.36	0.0026	Reject
DCEMENT	DCPI	4	8.21	0.0842	Do not reject
DCPI	DEXC DPWO DCEMENT	2	37.91	<0.0001	Reject
DEXC DPWO DCEMENT	DCPI	2	13.77	0.0323	Reject*
DCPI	DPWO DCEMENT	2	20.61	0.0004	Reject
DPWO DCEMENT	DCPI	2	7.91	0.0949	Do not reject

*Do not reject at $\alpha = 0.01$

[36] http://support.sas.com/documentation/cdl/en/etsug/60372/HTML/default/etsug_varmax_sect009.htm

Based on findings in Table 2.6, the assumption of *weak exogeneity* of regressor variables on CPI seems to be reasonable. In the case of cement price (DCEMENT), we can even make the assumption of *strong exogeneity* of cement price to inflation. In addition, the causality test was also performed between CPI of Banda Aceh and Lhokseumawe and between CPI of Banda Aceh and of those from the national level. The result is shown in Table 2.7.

The findings in Table 2.7 indicates that inflation rate in Lhokseumawe of North Aceh is influenced by the inflation rate in Banda Aceh, but not the other way around. On the other hand, no directional causality can be established between Banda Aceh and national level inflation.

Table 2.7 Causality of inflation in Banda Aceh, Lhokseumawe, and National level

Group 1	Group 2	Number of lags	Chi-Square	*p-value*	Decision
DCPI Bna	DCPI Lsm	2	4.62	0.0991	Do not reject
DCPI Lsm	DCPI Bna	2	9.22	0.0100	Reject
DCPI Bna	DCPI Nat'l	2	9.89	0.0071	Reject
DCPI Nat'l	DCPI Bna	2	9.82	0.0074	Reject

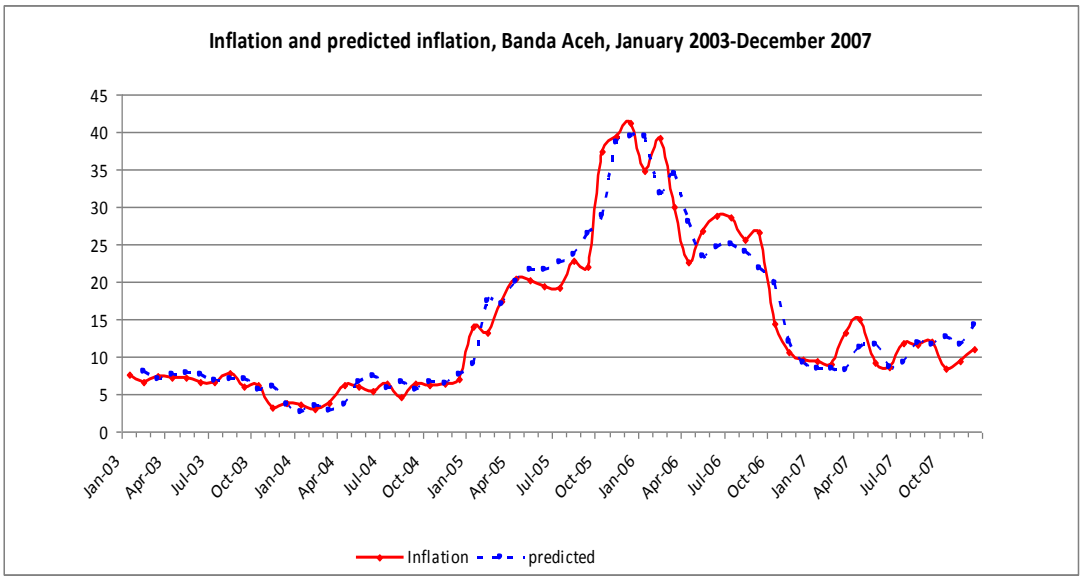
2.5.2 Model Interpretation

Based on Model (4), the estimated model can be written as

$$DCPI_t = 7.82 + 0.63\,DCPI_{t-1} + 0.15\,DEXC_t - 0.60\,DPWO_t + 0.14\,DCEMENT_t \quad \textbf{(2.3)}$$

This model indicates that inflation expectation (persistency) is the main determinant of inflation in Aceh with *p-value* of <0.001. Exchange rate is also significant at *p-value* <0.05. This finding is similar to previous empirical studies on regional and national inflation in Indonesia in which persistency and exchange rate have been found to be consistently influential (e.g. Wimanda, 2006; Ramakrishnan

and Vamvakidis, 2002). Based on this model, for every percentage increase of inflation expectation people perceived, it can be expected that there would an increase of inflation in Banda Aceh as much as 0.63 percent. Meanwhile, a percentage point depreciation of rupiah increases the inflation by 0.15 percent on a year to year basis. The plot of Banda Aceh's inflation and its predicted value based on Model (4) is shown in Figure 2.10.

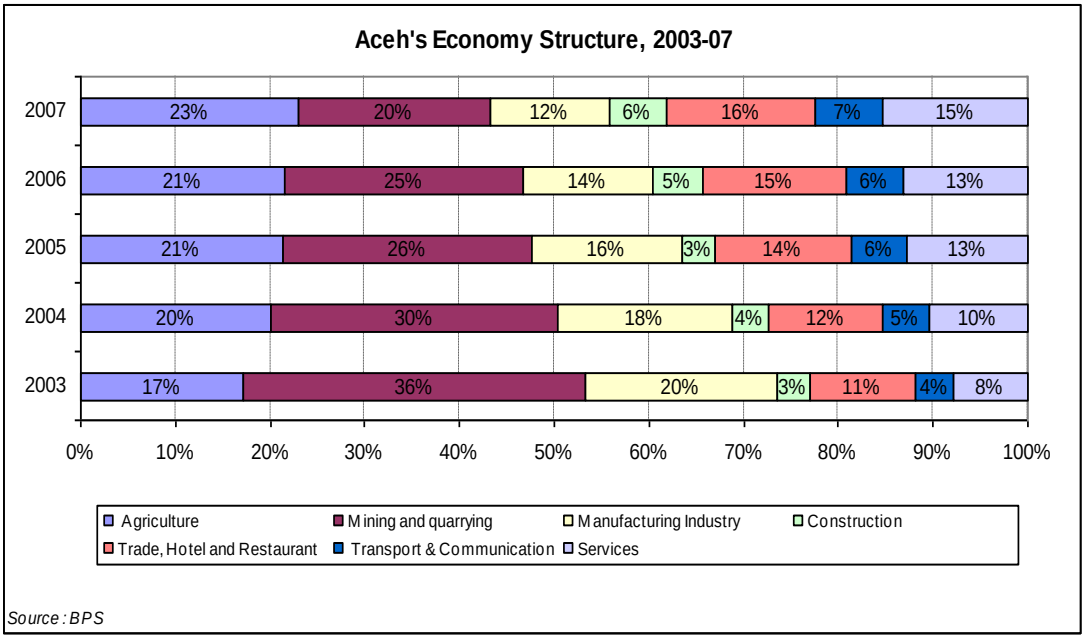


Source: author calculation

Figure 2.10
Inflation and predicated inflation, Banda Aceh, January 2003-December 2007

Productivity growth, without oil and gas, indicates significant negative relation to inflation at *p-value* < 0.05. An increase in one percentage growth of productivity will reduce the inflation by 0.60 percent. Model (3), however, interestingly indicates contradicting signs of the coefficients of productivity. While the expected sign for productivity is negative, total productivity which includes the mining sector is positive. That is, a percentage increase of growth in productivity in all sectors, including the mining sector, instead of reducing the inflation, it increases it by 0.28

percent in a year. In contrast, when productivity growth of the non-mining sector increases by one percent, it decreases the inflation by 1.5 percent in a year. This might be the case for Aceh which once has a very significant contribution of oil and gas in its RGDP, despite its depletion since 2003 as shown in Figure 2.11. It is an indication that the non-mining sector has been expanding since then, and especially after the tsunami; notably in agriculture, as well as trade, hotel and restaurant, transportation and services.



Source: Aceh Economic Update, April 2008, World Bank

Figure 2.11
Aceh's Economy Structure, 2003-2007

The *F*-statistics for Model (4) is 154.58 with D-W statistics of 2.24, which indicates a fairly good fit of the model. The adjusted R-square is relatively high—more than 0.92—suggesting a high explanatory power of the model.

2.5.3 Structural Change

The tsunami disaster and oil price increases are two shocks that are apparent from the plot in Figure 2.1. It is therefore essential to formally test whether one or both of these shocks has changed the structure of Aceh's economic outlook, especially in relation to inflation. To do so, a Chow test for structural breaks[37] was used to test for any structural breaks in Banda Aceh's inflation model based on Model (1) – (4). The result for each test is shown in Appendix 2.C.

In general, Model (1) and Model (3) did not detect any structural breaks. However, Model (2) and Model (4) show clear structural breaks in the inflation model. Interestingly, none of the models captured any structural change due to the tsunami of December 2004. Both models (2) and (4) only captured the shock due to oil price increase. Model (2) indicates breaks at observation 34 (October 2005) when the government revoked the subsidies causing the oil and gas price to increase (with *p-value* < 0.05). The breaks continue to observation 35, a month after, but with *p-value* < 0.10. Then, there are significant breaks again (*p-values* < 0.05) at observations 42-44, which is June-August 2006, when the shock seems to die down.

Model (4) indicates breaks at observations 42-45, at about similar periods shown by Model (2) with *p-value* < 0.05. But Model (4) also indicates break, albeit a softer break, at observations 34 (*p-value* < 0.20) and at observations 48-50 (*p-value* < 0.10). The results of structural change tests based on Model (2) and Model (4) is summarized into a graph as shown in Figure 2.12.

Although Figure 2.12 shows there is a hike of inflation rate after the tsunami, the formal test indicates no structural break due to the tsunami. The first structural change took place almost immediately after the government announced the fuel price in October 2005, causing a "shock" to the inflation structure. The high inflation did

[37] http://support.sas.com/rnd/app/examples/ets/chow/index.htm (accessed July 20, 2008)

not immediately fall down to its "normal" rate after the shock, but remained on its "medium" rate between May and September 2006. It closed the gap and fell back to its normal rate at the end of 2006.

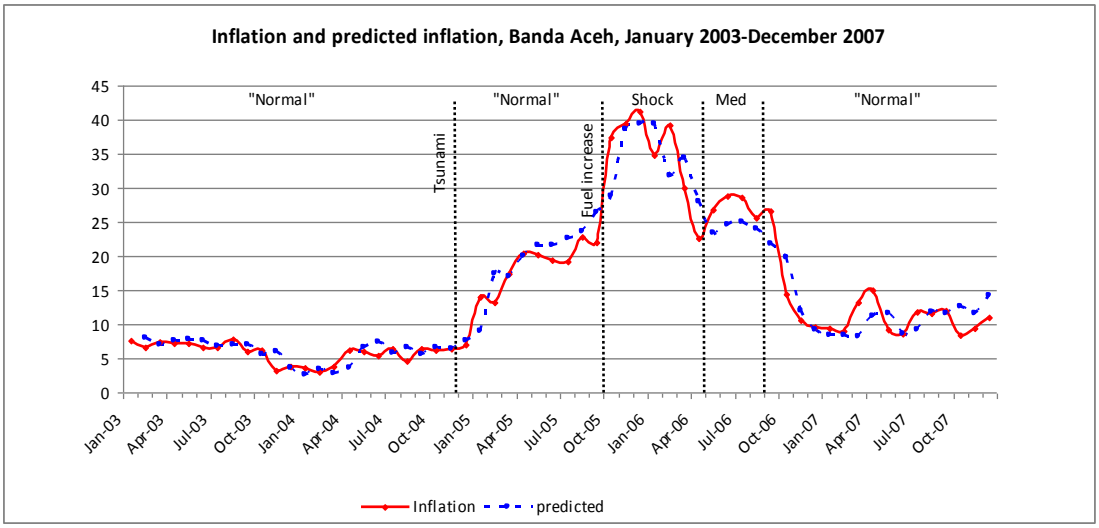


Figure 2.12
Banda Aceh's inflation structural breaks

2.5.4 AS-AD Curves

While models in the previous section are useful in understanding the inflation mechanism in Aceh descriptively, policy makers do need to come up with certain kind of "prescription" as the basis for future actions. For this, understanding the output-price relation is very helpful to enable policy makers to choose an appropriate approach to tame inflation while maintaining growth.

Plots of AS-AD curves based on Aceh's total GDP (including oil and gas) produce anomaly results, i.e. the AS curve is always negative instead of positive as the theory predicts. On the other hand, Aceh's GDP without oil and gas provides evidence as the theory predicts, that is, negative AD slope and positive AS slope. Thus, I focus on decompositing the series without oil and gas.

The ADF test suggests that when first-differences of log GDP and GDP deflator are used, the null hypothesis of unit root is rejected at 1 percent level (see Appendix 2.G). Then, following the selection process in Gamber (1996), Azis (2008) and Azis and Putanapong (2009), the Ljung-Box test indicates that by using the lag of 5, all residuals are no longer serially correlated.

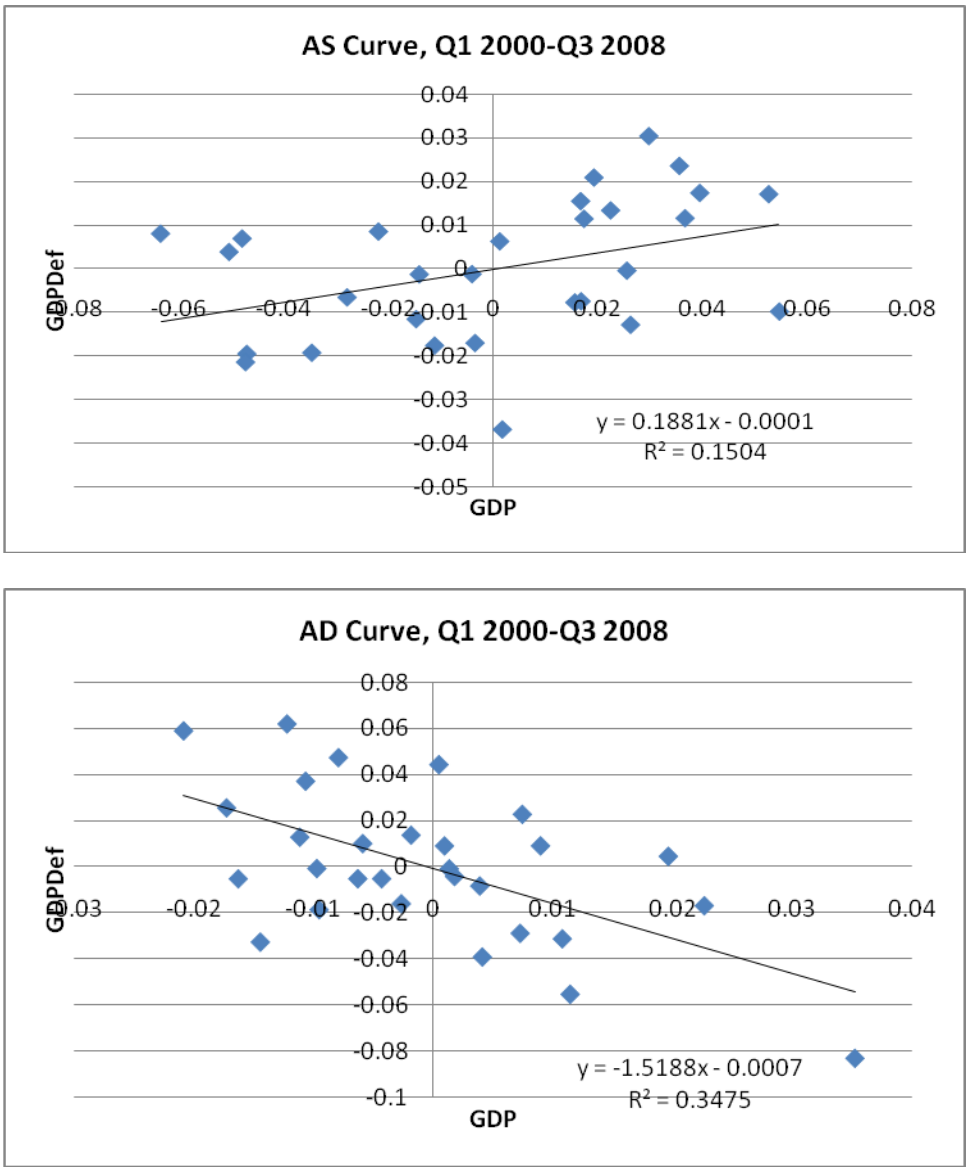


Figure 2.13
AS curve and AD curve in Aceh, 2000-2008.

The AS-AD curves, depicted in Figure 2.13, show that the slopes of AS and AD are according to what the theory predicts, i.e. positive for AS and negative for AD. With the known slopes, it can be deduced that along the AS-Curve, a positive inflation innovation of 1 percent corresponds to a positive output growth of 5.32 percent. Using the same slope, it can also be said that along the AS-Curve, a positive growth innovation of 1 percent corresponds to a positive inflation innovation of 0.19 percent.

The AD curve has a much steeper slope, indicating growth is more sensitive to inflation innovation. Along the AD-Curve, a positive inflation innovation of 1 percent corresponds to a negative output growth of -0.66 percent. According Azis and Putanapong (2009) "to the extent that monetary authority focuses its policy on inflation control, a steep AD curve indicates that AS shock rather than AD policy to lower the price level would have been more effective."

In Aceh case, it is also necessary to see how the shock caused by the December 2004 Tsunami influences the output-price relationship. Broken into prior to and after the Tsunami, the AS and AD curves, again, indicate similar behavior as predicted by the theory, except that the post-Tsunami AS curve is flatter than that of pre-tsunami and overall series (Table 2.8). But, as the AD curve after Tsunami also becomes flatter, policy based on AS rather than AD shocks to increase growth while keeping price in control would still have been more effective. Based on the slope after the Tsunami, 1 percent innovation in growth corresponds to 0.14 percent inflation along AS curve compared to -1.20 percent along AD curve. On the other hand, for 1 percent innovation in inflation generates as much as 7.31 percent growth along AS curve, while AD shocks would still create growth in the negative, that is -0.84 percent.

Table 2.8 Slopes of AS and AD curves before and after the 2004 Tsunami

	AS curve slopes	***AD curve slopes***
Overall (Q1 2000-Q3 2008)	0.188	-1.519
Pre-Tsunami	0.274	-1.704
Post-Tsunami	0.137	-1.199

2.6 Concluding Remarks

Based on the estimated model, inflation expectation (persistency) and exchange rate appear to be the most significant determinants of inflation in Aceh. This finding is similar to previous empirical studies of regional and national inflation in Indonesia in which persistency and exchange rate have been found to be consistently influential. Productivity also indicates significance but with contradictory sign when divided into productivity based on oil-and-gas and non-oil-and-gas GDP. Productivity involving mining pushes the inflation up; while it eases inflation when considered without mining. Although the theory suggests that productivity lowers inflation, the finding might be reasonable for the case in Aceh where point (oil and gas) rather than diffused (agriculture, fishery) resource economy makes up the biggest contribution.

Contrary to what some people assume, the structural change test indicates that it was the oil price increase, rather than tsunami-driven factors, that changed the structure of Aceh's inflation. Thus, while the Tsunami might have exacerbated the pressure on Aceh's inflation, the inflation process itself should also be seen in relationship to the energy policy taken by the government prior to the disaster.

In post-tsunami Aceh, AS and AD curves indicate that AS shock rather than AD policy to stimulate growth while keeping inflation in control would have been

more effective. This is in line with what has been observed by analysts in Aceh after the disaster.

2.7 Limitation and Further Research Direction

Research at the sub-national level in Indonesia such as this study bear the burden of data availability and quality. Findings in this study, therefore, should be seen as preliminary until they can be confirmed empirically with better and longer series of data. This should be the case even when they agree with the body of theories available at such a level. Alas, the theory, at least in the case of Indonesia, was not generated until late 90s when Indonesia adopted a decentralization policy.

That said, there is an urgent need in the vast archipelago for studies at the regional level. Especially for Aceh with its special autonomy, regional-based empirical studies have never been more imperative. This preliminary study is expected to encourage the regional government to take regional-based policies based on regional-based studies. In the end, it is expected that the government will see the incentive to have a better availability and quality of data.

APPENDIX 2.A

Table 2.9 The demographic and economic impact in the disaster-affected region: cross country comparisons

	India	**Indonesia**	Maldives	Sri Lanka	Thailand
Demographic impact					
Population, million	1,064.4	**214.7**	0.293	19.2	62.0
Population loss (incl. missing)	16,389	**221,291**	108	35,386	8,221
Population loss (incl. missing), % of total population	0.002	**0.103**	0.037	0.184	0.013
Population loss in the most affected province, % of total province population	n/a	**3.0**	n/a	2.7	1.5
Economic impact					
GDP per capita, US$	564	**970**	2,440	950	2,306
Total damages and losses (D & L) from tsunami, US$ million	1,224	**4,451**	603	1,454	2,198
Total D & L from tsunami, % of GDP	0.2	**2.0**	83.6	7.6	1.4
Pre-disaster forecasted GDP growth rate for 2005, %	7.2	**5.4**	7.5	6.0	6.0
Estimated change in the 2005 GDP growth rate due to the disater	n/a	**-0.2**	-9.2	-0.6	-0.3
Private vs. public sector D & L					
Private sector, US$ million	891.0	**3,168.0**	374.0	1,060.0	2,137.0
Private sector, % of total	72.9	**71.2**	62.1	72.9	97.2
Public sector, US$ million	332	**1,283.0**	228.0	394.0	61.0
Public sector, % of total	27.1	**28.8**	37.9	27.1	2.8
Damage vs. losses					
Damage, US$ million	575	**2,920**	450	1,144	508
Damage, % of total D & L	47.0	**65.6**	74.6	78.7	23.1
Damage, % of annual gross capital formation (GCF)	0.5	**7.1**	217.0	28.1	1.5
Losses, US$ million	649	**1,531**	153	310	1,690
Losses, % of total D & L	53.0	**34.4**	25.4	21.3	76.9
Losses, % of GDP	0.1	**0.7**	21.3	1.5	1.0
Sectoral composition of damage, % of total damage					
Housing	*33.6*	***47.9***	*20.9*	*36.0*	*4.3*
Physical infrastructure	*13.6*	***21.8***	*27.3*	*23.9*	*5.3*
Transport	6.1	**14.0**	16.2	19.7	1.4
Water supply	-	**0.9**	10.0	2.7	0.2
Electricity	-	**2.3**	1.1	1.5	0.8
Other infrastructure	7.5	**4.5**	0.0	0.0	3.0
Social sectors	*1.9*	***9.5***	*7.3*	*7.2*	*1.8*
health	1.9	**3.8**	2.7	5.0	1.8
education	0.0	**5.7**	4.7	2.2	0.0
Productive sectors	*46.1*	***12.1***	*28.4*	*31.8*	*88.6*
Fisheries	40.0	**3.5**	3.1	9.1	13.2
Tourism	0.0	**0.0**	22.2	21.9	73.8
Agriculture	2.6	**2.9**	2.4	0.3	1.6
Industry and Commerce	3.5	**5.7**	0.7	0.5	0.0
other	*4.9*	***8.8***	*16.0*	*1.1*	*0.0*
Provincial level impact*					
Total impact (D & L), % of provincial GDP	4.0	**97.0**	84.0	90.0	8.0
Damage, % of provincial GDP	1.9	**63.6**	62.7	70.8	1.8
Losses, % of provincial GDP	2.1	**33.4**	21.3	19.2	6.2

Source: compiled based on the data from the Asian Disaster Preparedness Center.
Note: * - most affected province in each country; for Maldives the data refers to total country.

(*Table from "Indonesia: Preliminary Damage and Loss Assessment, December 26, 2004 Natural Disaster: A Technical Report prepared by Bappenas and the International Donor Community, 2004"*)

APPENDIX 2.B

Poverty Headcount Before and After the Disaster, %

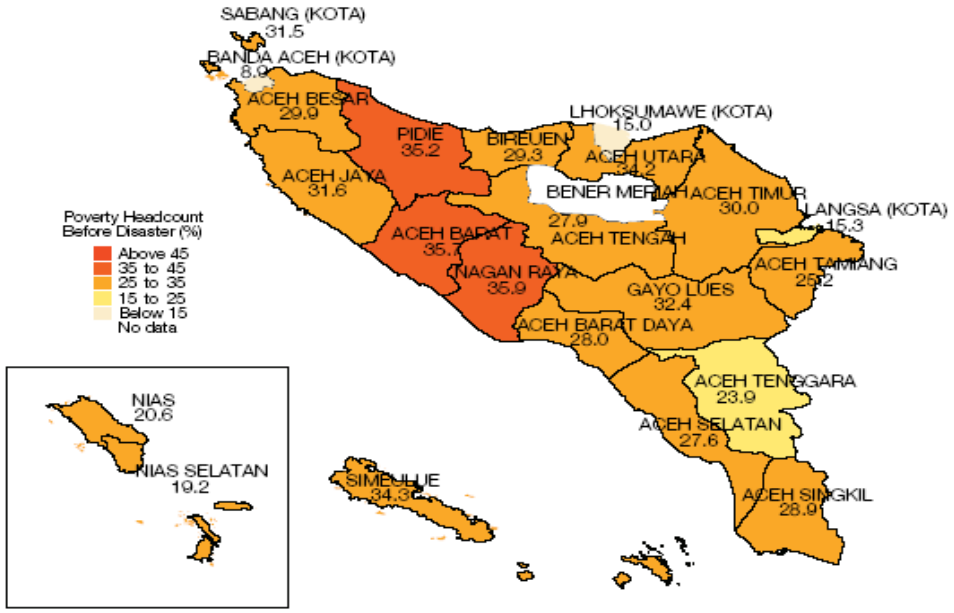
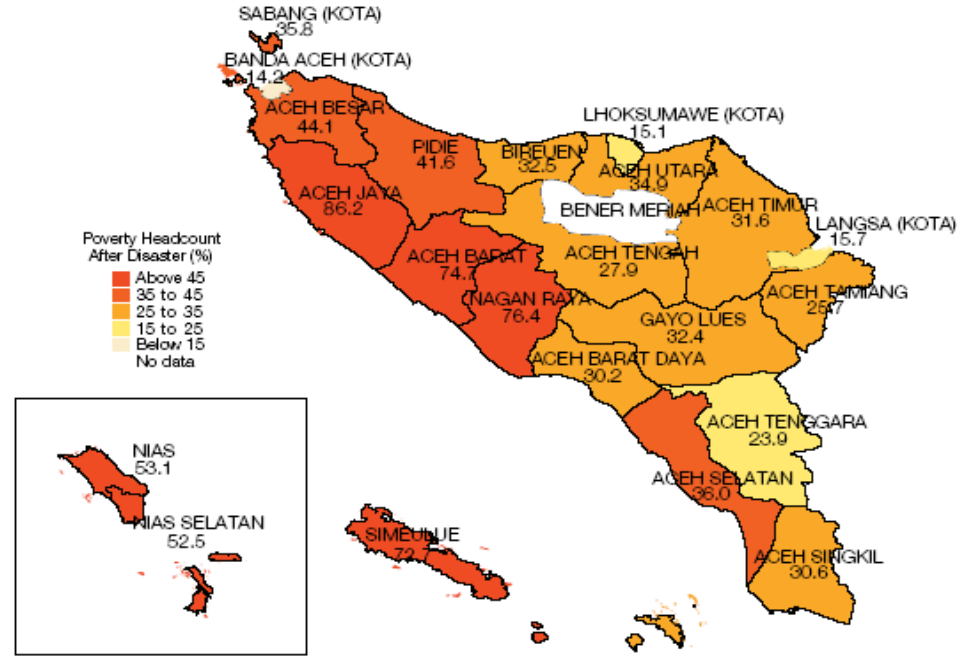


Figure 2.14

Poverty headcount before the disaster



Source: World Bank staff estimates (in World Bank, 2008)

Figure 2.15

Poverty headcount after the disaster

APPENDIX 2.C

Computer output for model development and structural change tests

Model 1

The SAS System

The REG Procedure
Model: MODEL1
Dependent Variable: BNA

Number of Observations Read	60
Number of Observations Used	59
Number of Observations with Missing Values	1

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	10	5927.08251	592.70825	74.68	<.0001
Error	48	380.98247	7.93713		
Corrected Total	58	6308.06498			

Root MSE	2.81729	R-Square	0.9396
Dependent Mean	14.34701	Adj R-Sq	0.9270
Coeff Var	19.63679		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	44.73790	21.26113	2.10	0.0406
L1BNA	1	0.43940	0.11687	3.76	0.0005
DSPEXC	1	0.26912	0.10620	2.53	0.0146
DWAGE	1	-0.61554	0.38703	-1.59	0.1183
DTPROD	1	1.64695	1.05193	1.57	0.1240
DPRODWO	1	-4.39978	2.15052	-2.05	0.0463
DRICEPRO	1	-1.31390	0.72380	-1.82	0.0757
DCHIPROD	1	-0.00210	0.07217	-0.03	0.9769
DCEMENTP	1	0.15815	0.06926	2.28	0.0269
DSUGARP	1	0.04775	0.02794	1.71	0.0939
DM	1	-1.43492	2.74671	-0.52	0.6038

The SAS System

The REG Procedure
Model: MODEL1
Dependent Variable: BNA

Durbin-Watson D	2.221
Number of Observations	59
1st Order Autocorrelation	-0.113

The SAS System

The AUTOREG Procedure

Dependent Variable BNA

Ordinary Least Squares Estimates

SSE	380.982468	DFE	48
MSE	7.93713	Root MSE	2.81729
SBC	322.335398	AIC	299.482486
Regress R-Square	0.9396	Total R-Square	0.9396
Durbin-Watson	2.2211		

Structural Change Test

Test	Break Point	Num DF	Den DF	F Value	Pr > F
Chow	21	11	37	0.73	0.7003
Chow	22	11	37	0.74	0.6906
Chow	23	11	37	0.77	0.6677
Chow	24	11	37	0.75	0.6826
Chow	25	11	37	1.03	0.4416
Chow	26	11	37	1.38	0.2241
Chow	27	11	37	1.53	0.1627
Chow	34	11	37	1.22	0.3104
Chow	35	11	37	1.45	0.1920
Chow	36	11	37	1.51	0.1686
Chow	42	11	37	0.89	0.5603
Chow	43	11	37	0.93	0.5223
Chow	44	11	37	0.94	0.5166
Chow	45	11	37	0.94	0.5136
Chow	46	11	37	0.46	0.9159
Chow	47	11	37	0.43	0.9322
Chow	48	11	37	0.46	0.9159
Chow	49	11	37	0.59	0.8275

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	44.7379	21.2611	2.10	0.0406
L1BNA	1	0.4394	0.1169	3.76	0.0005
DSPEXC	1	0.2691	0.1062	2.53	0.0146
DWAGE	1	-0.6155	0.3870	-1.59	0.1183
DTPROD	1	1.6470	1.0519	1.57	0.1240
DPRODWO	1	-4.3998	2.1505	-2.05	0.0463
DRICEPRO	1	-1.3139	0.7238	-1.82	0.0757
DCHIPROD	1	-0.002097	0.0722	-0.03	0.9769
DCEMENTP	1	0.1582	0.0693	2.28	0.0269
DSUGARP	1	0.0477	0.0279	1.71	0.0939

Model 2

The SAS System

The REG Procedure
Model: MODEL1
Dependent Variable: BNA

Number of Observations Read	60
Number of Observations Used	59
Number of Observations with Missing Values	1

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	5840.34815	973.39136	108.22	<.0001
Error	52	467.71682	8.99455		
Corrected Total	58	6308.06498			

Root MSE	2.99909	R-Square	0.9259
Dependent Mean	14.34701	Adj R-Sq	0.9173
Coeff Var	20.90396		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	8.16723	3.37383	2.42	0.0190
L1BNA	1	0.62934	0.10656	5.91	<.0001
DSPEXC	1	0.12424	0.08460	1.47	0.1480
DPRODWO	1	-0.69363	0.28463	-2.44	0.0183
DRICEPRO	1	-0.06946	0.11894	-0.58	0.5617
DCEMENTP	1	0.07629	0.06094	1.25	0.2162
DSUGARP	1	0.04206	0.02383	1.77	0.0834

The SAS System

The REG Procedure
Model: MODEL1
Dependent Variable: BNA

Durbin-Watson D	2.219
Number of Observations	59
1st Order Autocorrelation	-0.114

The SAS System

The AUTOREG Procedure

Dependent Variable BNA

Ordinary Least Squares Estimates

SSE	467.716825	DFE	52
MSE	8.99455	Root MSE	2.99909
SBC	318.126719	AIC	303.583957
Regress R-Square	0.9259	Total R-Square	0.9259
Durbin-Watson	2.2189		

Structural Change Test

Test	Break Point	Num DF	Den DF	F Value	Pr > F
Chow	21	7	45	0.69	0.6788
Chow	22	7	45	0.71	0.6600
Chow	23	7	45	0.77	0.6115
Chow	24	7	45	0.77	0.6149
Chow	25	7	45	0.63	0.7263
Chow	26	7	45	1.17	0.3412
Chow	27	7	45	1.14	0.3534
Chow	34	7	45	2.36	0.0386
Chow	35	7	45	1.89	0.0932
Chow	36	7	45	1.60	0.1606
Chow	42	7	45	2.73	0.0190
Chow	43	7	45	2.42	0.0340
Chow	44	7	45	2.30	0.0429
Chow	45	7	45	1.77	0.1166
Chow	46	7	45	1.27	0.2850
Chow	47	7	45	1.26	0.2920
Chow	48	7	45	1.36	0.2470
Chow	49	7	45	1.35	0.2497
Chow	50	7	45	1.44	0.2122
Chow	51	7	45	0.92	0.4981
Chow	52	7	45	0.70	0.6716

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	8.1672	3.3738	2.42	0.0190
L1BNA	1	0.6293	0.1066	5.91	<.0001
DSPEXC	1	0.1242	0.0846	1.47	0.1480
DPRODWO	1	-0.6936	0.2846	-2.44	0.0183
DRICEPRO	1	-0.0695	0.1189	-0.58	0.5617
DCEMENTP	1	0.0763	0.0609	1.25	0.2162
DSUGARP	1	0.0421	0.0238	1.77	0.0834

Model 3

The SAS System

The REG Procedure
Model: MODEL1
Dependent Variable: BNA

Number of Observations Read	60
Number of Observations Used	59
Number of Observations with Missing Values	1

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	5903.26614	843.32373	106.25	<.0001
Error	51	404.79884	7.93723		
Corrected Total	58	6308.06498			

Root MSE	2.81731	R-Square	0.9358
Dependent Mean	14.34701	Adj R-Sq	0.9270
Coeff Var	19.63691		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	46.60649	11.40998	4.08	0.0002
L1BNA	1	0.38876	0.11235	3.46	0.0011
DSPEXC	1	0.30430	0.10204	2.98	0.0044
DWAGE	1	-0.59139	0.17538	-3.37	0.0014
DTPROD	1	1.83013	0.54610	3.35	0.0015
DPRODWO	1	-4.71435	1.21482	-3.88	0.0003
DRICEPRO	1	-1.48735	0.43488	-3.42	0.0012
DCEMENTP	1	0.17188	0.06112	2.81	0.0070

The SAS System

The REG Procedure
Model: MODEL1
Dependent Variable: BNA

Durbin-Watson D	2.211
Number of Observations	59
1st Order Autocorrelation	-0.109

The SAS System

The AUTOREG Procedure

Dependent Variable BNA

Ordinary Least Squares Estimates

SSE	404.798843	DFE	51
MSE	7.93723	Root MSE	2.81731
SBC	313.680363	AIC	297.060063
Regress R-Square	0.9358	Total R-Square	0.9358
Durbin-Watson	2.2108		

Structural Change Test

Test	Break Point	Num DF	Den DF	F Value	Pr > F
Chow	21	8	43	0.59	0.7787
Chow	22	8	43	0.59	0.7816
Chow	23	8	43	0.57	0.7925
Chow	24	8	43	0.58	0.7924
Chow	25	8	43	1.22	0.3116
Chow	26	8	43	1.39	0.2271
Chow	27	8	43	1.39	0.2275
Chow	34	8	43	1.51	0.1825
Chow	35	8	43	0.83	0.5844
Chow	36	8	43	0.84	0.5699
Chow	42	8	43	1.30	0.2698
Chow	43	8	43	1.17	0.3415
Chow	44	8	43	1.20	0.3215
Chow	45	8	43	1.29	0.2745
Chow	46	8	43	0.66	0.7246
Chow	47	8	43	0.46	0.8789
Chow	48	8	43	0.43	0.8942
Chow	49	8	43	0.55	0.8112
Chow	50	8	43	0.56	0.8041
Chow	51	8	43	0.34	0.9442
Chow	52	8	43	0.24	0.9803

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	46.6065	11.4100	4.08	0.0002
L1BNA	1	0.3888	0.1123	3.46	0.0011
DSPEXC	1	0.3043	0.1020	2.98	0.0044
DWAGE	1	-0.5914	0.1754	-3.37	0.0014
DTPROD	1	1.8301	0.5461	3.35	0.0015
DPRODWO	1	-4.7143	1.2148	-3.88	0.0003
DRICEPRO	1	-1.4873	0.4349	-3.42	0.0012

The SAS System

The AUTOREG Procedure

Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
DCEMENTP	1	0.1719	0.0611	2.81	0.0070

Model 4

The SAS System

The REG Procedure
Model: MODEL1
Dependent Variable: BNA

Number of Observations Read	60
Number of Observations Used	59
Number of Observations with Missing Values	1

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	5807.06732	1451.76683	156.48	<.0001
Error	54	500.99766	9.27773		
Corrected Total	58	6308.06498			

Root MSE	3.04594	R-Square	0.9206
Dependent Mean	14.34701	Adj R-Sq	0.9147
Coeff Var	21.23047		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	7.82335	2.44542	3.20	0.0023
L1BNA	1	0.62752	0.08302	7.56	<.0001
DSPEXC	1	0.14698	0.06994	2.10	0.0403
DPRODWO	1	-0.60329	0.21988	-2.74	0.0082
DCEMENTP	1	0.13667	0.05283	2.59	0.0124

The SAS System

The REG Procedure
Model: MODEL1
Dependent Variable: BNA

Durbin-Watson D	2.239
Number of Observations	59
1st Order Autocorrelation	-0.132

The SAS System
The AUTOREG Procedure
Dependent Variable BNA

Ordinary Least Squares Estimates

SSE	500.997656	DFE	54
MSE	9.27773	Root MSE	3.04594
SBC	314.027209	AIC	303.639522
Regress R-Square	0.9206	Total R-Square	0.9206
Durbin-Watson	2.2390		

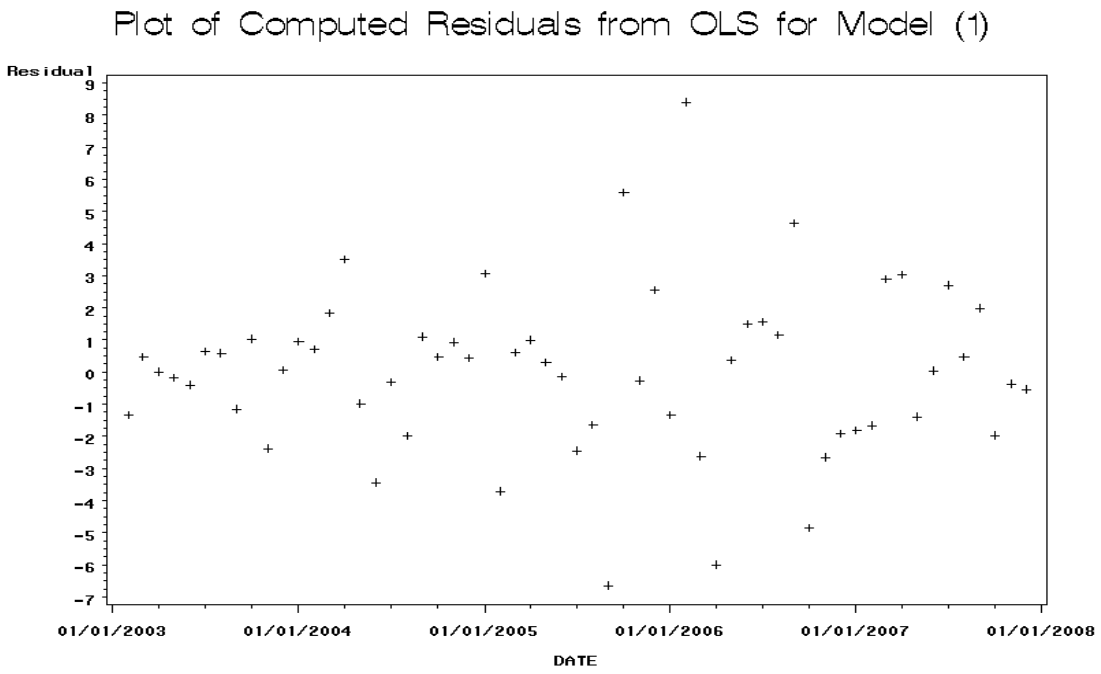
Structural Change Test

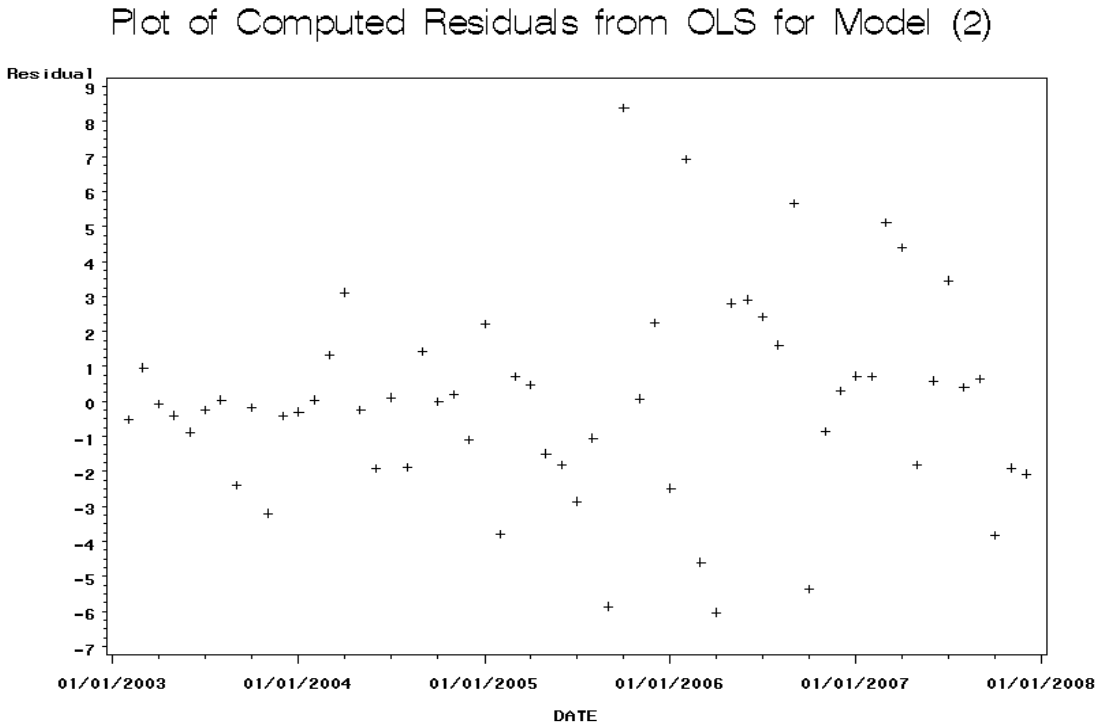
Test	Break Point	Num DF	Den DF	F Value	Pr > F
Chow	21	5	49	0.31	0.9048
Chow	22	5	49	0.31	0.9048
Chow	23	5	49	0.30	0.9109
Chow	24	5	49	0.32	0.8985
Chow	25	5	49	0.25	0.9379
Chow	26	5	49	0.73	0.6026
Chow	27	5	49	0.62	0.6867
Chow	34	5	49	1.54	0.1939
Chow	35	5	49	0.71	0.6168
Chow	36	5	49	0.42	0.8303
Chow	42	5	49	3.38	0.0105
Chow	43	5	49	2.99	0.0195
Chow	44	5	49	2.74	0.0293
Chow	45	5	49	2.44	0.0473
Chow	46	5	49	1.73	0.1464
Chow	47	5	49	1.78	0.1337
Chow	48	5	49	1.97	0.0996
Chow	49	5	49	1.96	0.1008
Chow	50	5	49	2.06	0.0860
Chow	51	5	49	1.54	0.1944
Chow	52	5	49	1.30	0.2804

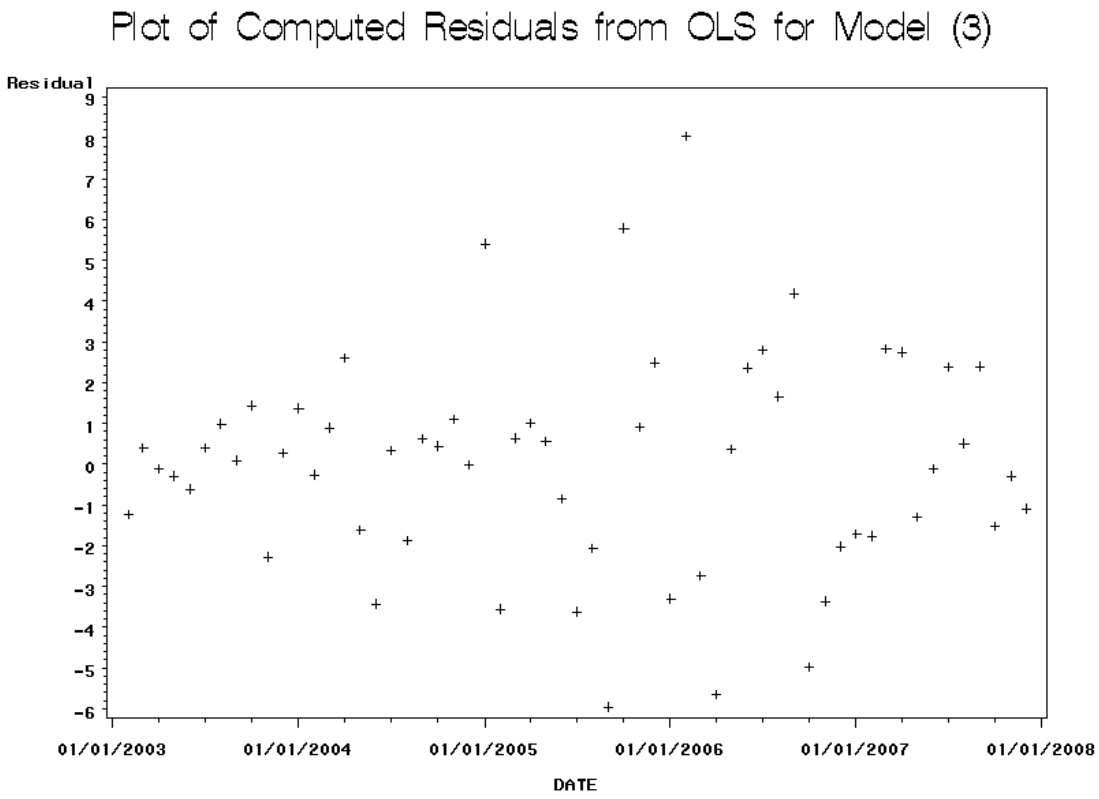
Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	7.8234	2.4454	3.20	0.0023
L1BNA	1	0.6275	0.0830	7.56	<.0001
DSPEXC	1	0.1470	0.0699	2.10	0.0403
DPRODWO	1	-0.6033	0.2199	-2.74	0.0082
DCEMENTP	1	0.1367	0.0528	2.59	0.0124

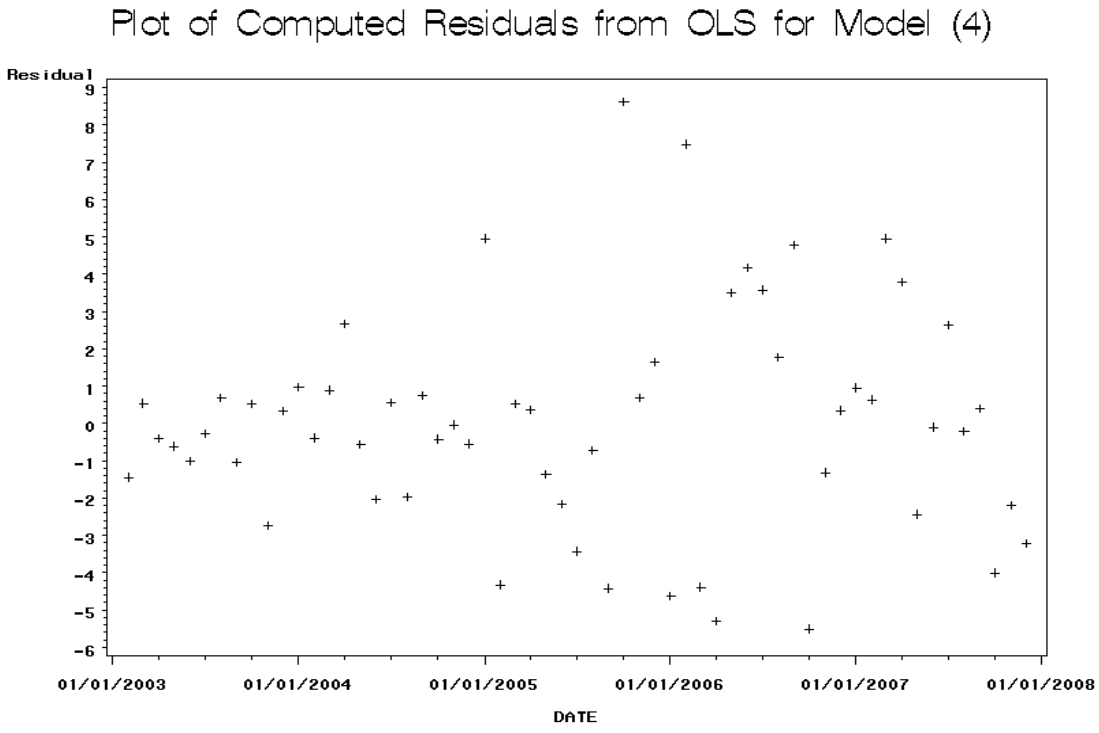
APPENDIX 2.D

Residual Plots






Plot of Computed Residuals from OLS for Model (3)
Residual
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
01/01/2003
01/01/2004
01/01/2005
01/01/2006
01/01/2007
01/01/2008
DATE


Plot of Computed Residuals from OLS for Model (4)
Residual
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
01/01/2003
01/01/2004
01/01/2005
01/01/2006
01/01/2007
01/01/2008
DATE

APPENDIX 2.E

Augmented Dickey-Fuller Tests for Model 1 to Model 4

Residual Test for Model 1

The REG Procedure
Model: MODEL1
Dependent Variable: dlagres

Number of Observations Read	60
Number of Observations Used	55
Number of Observations with Missing Values	5

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	485.29344	121.32336	16.97	<.0001
Error	50	357.35947	7.14719		
Corrected Total	54	842.65291			

Root MSE	2.67342	R-Square	0.5759
Dependent Mean	-0.00657	Adj R-Sq	0.5420
Coeff Var	-40716		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.04248	0.36075	0.12	0.9067
lagres	1	-1.49754	0.33210	-4.51	<.0001
dlagres1	1	0.35344	0.27143	1.30	0.1988
dlagres2	1	0.25828	0.21260	1.21	0.2301
dlagres3	1	0.05596	0.14220	0.39	0.6956

The REG Procedure
Model: MODEL1
Dependent Variable: dlagres

Durbin-Watson D	2.050
Number of Observations	55
1st Order Autocorrelation	-0.025

Residual Test for Model 2

The REG Procedure
Model: MODEL1
Dependent Variable: dlagres

Number of Observations Read	60
Number of Observations Used	55
Number of Observations with Missing Values	5

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	580.61335	145.15334	15.99	<.0001
Error	50	453.75207	9.07504		
Corrected Total	54	1034.36542			

Root MSE	3.01248	R-Square	0.5613
Dependent Mean	-0.03037	Adj R-Sq	0.5262
Coeff Var	-9919.89126		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.00898	0.40767	0.02	0.9825
lagres	1	-1.13281	0.32805	-3.45	0.0011
dlagres1	1	0.02338	0.27727	0.08	0.9331
dlagres2	1	0.01390	0.22069	0.06	0.9500
dlagres3	1	-0.07341	0.14521	-0.51	0.6154

The REG Procedure
Model: MODEL1
Dependent Variable: dlagres

Durbin-Watson D	1.937
Number of Observations	55
1st Order Autocorrelation	0.025

Residual Test for Model 3

The REG Procedure
Model: MODEL1
Dependent Variable: dlagres

Number of Observations Read	60
Number of Observations Used	55
Number of Observations with Missing Values	5

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	507.96433	126.99108	16.53	<.0001
Error	50	384.01660	7.68033		
Corrected Total	54	891.98092			

Root MSE	2.77134	R-Square	0.5695
Dependent Mean	-0.01443	Adj R-Sq	0.5350
Coeff Var	-19199		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.04510	0.37397	0.12	0.9045
lagres	1	-1.43365	0.32652	-4.39	<.0001
dlagres1	1	0.30288	0.26848	1.13	0.2647
dlagres2	1	0.23330	0.21169	1.10	0.2757
dlagres3	1	0.04923	0.14236	0.35	0.7309

The REG Procedure
Model: MODEL1
Dependent Variable: dlagres

Durbin-Watson D	2.039
Number of Observations	55
1st Order Autocorrelation	-0.021

Residual Test for Model 4

The REG Procedure
Model: MODEL1
Dependent Variable: dlagres

Number of Observations Read	60
Number of Observations Used	55
Number of Observations with Missing Values	5

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	635.04245	158.76061	16.48	<.0001
Error	50	481.69968	9.63399		
Corrected Total	54	1116.74213			

Root MSE	3.10387	R-Square	0.5687
Dependent Mean	-0.04749	Adj R-Sq	0.5341
Coeff Var	-6536.52014		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.06483	0.42161	0.15	0.8784
lagres	1	-1.23714	0.34755	-3.56	0.0008
dlagres1	1	0.09871	0.29165	0.34	0.7364
dlagres2	1	0.06101	0.22852	0.27	0.7906
dlagres3	1	-0.04778	0.14703	-0.32	0.7466

The REG Procedure
Model: MODEL1
Dependent Variable: dlagres

Durbin-Watson D	1.940
Number of Observations	55
1st Order Autocorrelation	0.015

APPENDIX 2.F

ADF Test for Unit Root

Table 1. Null Hypothesis: Ln(GDP) or its difference has a unit root

	T-Statistics, Z(t)	P-value*
Ln(GDP)	-0.955	0.7694
ΔLn(GDP)	-6.440	0.0000
Δ^2 Ln(GDP)	-7.272	0.0000

*MacKinnon approximate p-value for Z(t)

Table 2. Null Hypothesis: Ln(GDP Deflator) or its difference has a unit root

	T-Statistics, Z(t)	P-value*
Ln(GDPDef)	0.428	0.9825
ΔLn(GDPDef)	-6.392	0.0000
Δ^2 Ln(GDPDef)	-9.468	0.0000

*MacKinnon approximate p-value for Z(t)

Based on results from Tables 1 and 2, when first difference of log is used, the null hypothesis of unit-root is rejected at 1 percent level

APPENDIX 2.G

Ljung-Box Test

Ljung-Box Test: Testing null hypothesis that is no autocorrelation after lag *k*

		$\varepsilon_t^{\Delta y}$			$\varepsilon_t^{\Delta p}$	
Lag	ACF	T-Stat	Q-Stat	ACF	T-Stat	Q-Stat
1	-0.10131	-0.59071	0.380665	-0.14174	-0.82646	0.745137
2	-0.58586	-3.38157	13.50909	-0.15137	-0.86544	1.621605
3	-0.12465	-0.55630	14.12255	-0.13526	-0.75682	2.343972
4	0.74751	3.30617	36.92043	0.14889	0.81941	3.248474
5	-0.04307	-0.14863	36.99873	-0.05390	-0.29094	3.371092
6	-0.51645	-1.78089	48.65823	0.08563	0.46104	3.691595
7	-0.07376	-0.23349	48.90485	-0.17733	-0.94889	5.117095
8	0.52447	1.65764	61.85429	-0.04671	-0.24356	5.219790
9	-0.10322	-0.30269	62.37594	0.01783	0.09282	5.235355
10	-0.37741	-1.10377	69.64031	0.21152	1.10082	7.517111
11	-0.02099	-0.05929	69.66375	-0.00150	-0.00752	7.517230

Since there is none of the absolute value of Q-Stat is greater than 2 after lag 4, we can assume that there is no autocorrelation beyond *k=5*.

REFERENCES

Ahmed, S., & Kapur, B.K. (1990). *How Indonesia's monetary policy affects key variables.* World Bank Policy, Research, and External Affairs Working Paper (February).

Azis, I.J, & Putanapong, N. (2009). Revisiting output-price relations in East Asia.*China-USA Business Review,* 8(1), 1-11.

Azis, I.J. (2008). Macroeconomic policy and poverty. *ADB Institute Discussion Paper No. 111,* Tokyo-Japan.

Bank Indonesia. (2007). *Monetary Policy Report,* Quarter IV-2007

BAPPENAS. (2004). *Indonesia: Preliminary damage and loss assessment, December 26, 2004 natural disaster: A technical report* prepared by Bappenas (National Planning Agency) and the International Donor Community.

----------. (2005). *Master Plan for Reconstruction and Rehabilitation*. Jakarta, March 2005.

Blanchard, O. & Quah, D. (1989). The dynamic effects of aggregate demand and supply disturbances. *American Economic Review,* 79, 655-673.

Bokil, M., & Schimmelpfennig, A. (2005). *Three attempts at inflation forecasting in Pakistan,* IMF Working Paper, WP/05/105.

Breitung, J., Bruggeman, R., & Lutkepohl, H. (2004). Structural vector autoregressive modeling and impulse responses. In Lutkepohl, H., & Kratzif, M. (Ed.). *Applied Time Series Econometrics.* Cambridge University Press.

Brodjonegoro, B.P.S. (2000). *Otonomi daerah dan kondisi fiskal Indonesia* (Regional autonomy and Indonesia's fiscal condition). Jakarta: Komite Pemantauan Pelaksanaan Otonomi Daerah.

Brodjonegoro, P.S., Falianty, T.A., & Gitaharie, B.Y. (2004). Determinant factors of regional inflation in decentralized Indoensia. *Economic and Finance in Indonesia,* 53(1), 1-31

BRR. (2005). *Rebuilding a better Aceh and Nias: Stocktaking of the reconstruction Effort*. BRR/World Bank, 2005.

------ (2005a) *Aceh and Nias one year after the Tsunami: The recovery effort and way forward, A joint report of the BRR and international partners,* December 2005.

Cover, J.P., Enders, W., Hueng, C.J. (2006). Using the aggregate demand – aggregate supply model to identify structural demand-side and supply-side shocks: Results using a Bivariate VAR. *Journal of Money, Credit, and Banking,* 38(3), 777-790.

Downes, A. S. (1985). Inflation in Barbados: An Econometric Investigation. *Economic Development and Cultural Change,* 33(3), 521-532.

Gamber, E. N. (1996). Empirical estimates of the short run aggregate supply and demand curves for the post-war US economy. *Southern Economic Journal,* 62(4), 856-872.

Gitaharie, B.Y. (2004). *Identifikasi jalur mekanisme transmisi dan efektifitas kebijakan moneter dalam mencapai tingkat inflasi yang mendukung pertumbuhan ekonomi daerah* (Identification of transmission mechanism channel and the effectiveness of monetary policy in achieving regional economic growth supporting inflation rate). Unpublished Dissertation. Jakarta: Universitas Indonesia

Hamilton, J.D. (1994). *Time series analysis.* Princeton, NJ: Princeton University Press.

Hutabarat, A. R. (2005). *Determinan inflasi Indonesia* (Indonesia inflation determinants). Occasional Paper, Bank Indonesia, OP/06/2005, Jakarta: Bank Indonesia.

Kacaribu, F. N. (2004). *Measuring core inflation in Indonesia: An asymmetric trimmed-mean approach,* Stochastic Finance 2004, Autumn School and International Conference.

Kasim, S.I. (2008). *Menatap ekonomi Aceh: Antara harapan investasi dan inflasi tinggi* (Looking at Aceh's economy: Between investment expectation and high inflation). Available at www.acehinstitute.org with the following link: http://id.acehinstitute.org/index.php?option=com_content&view=article&id=140:menatap-ekonomi-aceh-antara-harapan-investasi--inflasi-tinggi&catid=20:ekonomi&Itemid=31 (accessed 10 January 2008)

Loungani, P., & Swagel, P. (2001). *Sources of inflation in developing countries.* IMF Working Paper, WP/01/198.

McLeod, R. H. (1997). Explaining chronic inflation in Indonesia. *Journal of Development Studies,* 33(3), 392-410.

Mio, H. (2002). Identifying aggregate demand and aggregate supply components of inflation rate: A structural vector autoregression analysis for Japan. *Monetary and Economic Studies,* 20(1), 33-56.

Ramakrishnan, U. & Vamvakidis, A. (2002). *Forecasting inflation in Indonesia*. IMF Working Paper, WP/02/111.

Rogoff, K. (1996). The purchasing power parity puzzle. *Journal of Economic Literature.* 34(2), 647-668

Siregar, R.Y. (1997). *Real exchange rate targeting and inflation in Indonesia: Theory and empirical evidence.* San Francisco: Pacific Basin Working Paper Series No. PB96-07

Taguchi, M.J.C. (1995). Policy assignment and money supply: The case of Indonesia in the 1980s. *ASEAN Economic Bulletin*, 12(1)

Verbeek, M. (2004). *A Guide to Modern Econometrics*, 2nd edn., John Wiley & Sons Ltd. Chichester

Wimanda, R. E. (2006). *Regional inflation in Indonesia: Characteristics, convergence, and determinants.* BI Working Paper, WP/13/2006

World Bank. (2008). *Aceh Economic Update, April 2008*. Retrieved from www.worldbank.org/id/reconstruction

CHAPTER THREE:
SOCIAL CAPITAL AS DETERMINANTS TO RETURN AMONG WOMEN IDPs OF 2004 TSUNAMI IN ACEH

Abstract

While moving out from affected areas is a common survival strategy, many, if not all displaced persons of the 2004 Indian Ocean Tsunami in Aceh returned to their original settlement (village) sooner or later. Women made-up about 42-46 percent of the total tsunami internally displaced persons (IDPs) in the province. This paper investigates whether and, if so, how women IDPs in Aceh use social capital as determinants in their decision to-return or not-to-return to their original settlement. Slightly different from the growing literature on migration, this study investigates pull factors for migration from the source instead of host region. Data from the UNIFEM woman situation survey in post-tsunami Aceh was used. With logistic regression analysis, it is found that women IDPs with strong association to friendships in temporary settlements and acquaintances from original villages are more likely to return than those with less or without such associations. Indirect associations to community through shelter type, shelter size and land ownership are also found to be significant factors in the decision to return. Understanding determinants in the decision to leave temporary shelters among women IDPs is expected to help refine post-disaster shelter management so it can be more gendered and culturally sensitive. Women IDPs in Aceh, for example, see shelter types as being the most important factor in their decision to return to their original settlements, and underline the unfavorable barrack type provided by the government.

3.1 Introduction

The tsunami of 26 December 2004 caused major displacement problems in Aceh. More than half a million people were displaced from their homes and villages; most lost their livelihood and properties. The *internally displaced persons* (IDPs) have to live in tents, government-provided barracks, and host families/communities throughout Aceh.[38] As the tsunami devastated coastal, mostly urbanized areas in Aceh like Banda Aceh, Aceh Besar, Aceh Jaya, and West Aceh, the IDPs generally moved to the interior districts (Kabupaten/Kota) or across districts in the province. Many who still had social relationships to communities in the interior went back to villages in the rural areas. About 42-46 percent of these IDPs are women while 8-10 percent of them are children under five years old who traditionally fall under the care of women.

History has shown that women in Aceh have always been at the forefront of many facets of life. During the thirty year long conflict before the tsunami, women were at the core of survival strategies that sustained the family and community despite war and division. After the tsunami, women of Aceh again showed their pivotal role in re-organizing communities both during the emergency period and during the post tsunami relief and rehabilitation period. Many national and international humanitarian workers working on the ground in Aceh were amazed at the resilience shown by many women survivors amidst unimaginable horror and loss caused by the tsunami.

Being a place where the seed that spread Islam throughout Southeast Asia was first sown, the culture of the people continues to be steeply influenced by Islam, including social relationships and structures. Women in Aceh have excelled in every field and they often work hand-in-hand with men in every sphere of activity. For example, the province's many well-known warriors who led the fight alongside men to

[38] Hedman (2005) and Age (2005) provide early observations on displacement in Aceh after the quake and tsunami, especially on barracks issues.

defeat the Dutch and Portuguese in Sumatra and the Malacca Straits during colonial wars were women such as Tjut Njak Dhien, widows' battalion (*inong balee*) leaders like Admiral Keumalahayati, Tjut Meutia and Pocut Meurah Inseun. Much earlier, four *sulthanah* (female monarchs) in succession ruled Aceh, which was then a Muslim kingdom, for half a century (1641-1699) as chronicled by Khan (2007).

During the conflict of 1989-2004, many husbands had to flee their homes and villages escaping military operations, leaving their wives and children behind. Many young males, often suspected as guerilla sympathizers, also left their villages. When the situation deteriorated, the wives, the elderly, and children sometimes had to move to safer places, living in displacement for months or years. They took refuge in IDP camps, public buildings, and host families within or outside their districts (Hugo 2002 and Aulia 2005).[39]

In the wake of the tsunami, many survivors returned to their original villages in the interior as their first sanctuary (Mahdi 2006). Considered vulnerable, children, the elderly, and women were often left behind with host families while men returned to the coastal areas—living under tents, barracks or the remnants of their houses, to assure access to relief supplies and gain permanent housing. Later, some families were reunited when they secured better living conditions. Again, women determined how a family and a community survived after such a tragedy followed by grim displacement situations. That said, to understand how women in Aceh cope with the catastrophe is to understand community survival strategy. Many women, who lost their family or otherwise, survived by utilizing their associations with their communities including

[39] See also: Towards a mapping of 'at risk' ethnic, religious and political groups in Indonesia. *Inside Indonesia*, 1999: 86 [cited 10 April 2006].
Available from: http://www.serve.com/inside/digest/dig86.htm. and in Global IDPS Project, *Internal Displacement: A Global Overview of Trends and Developments in 2003.* Geneva, February 2004. In this report, the entry is specifically written "Indonesia (Aceh)" which I assume based on IDPS situation in Aceh rather than a combined number throughout Indonesia.

kinship, acquaintances, friends, family ties and other social networks and structures, especially village structures. Their decisions in regard to steps to take in the future seem to be influenced by these associations.

This paper explores the relationship between women IDPs association with their communities, "the social capital", and decision making from the temporary shelters setting in Aceh. Using logistic regression, a decision to return or not to return to the original settlement is assessed by demographics and several "social capital" or its proxy explanatory variables such as age, age group, pre- and post-tsunami marital status, shelter type, shelter size, and the number of acquaintances and friends in the shelter. Similarly, the decision is also explored with a number of dichotomous explanatory variables: whether a woman IDP is head of household, whether she lost a family member to the tsunami, involvement in community activities, whether a woman IDP has land, and whether they have friend(s) in the shelters they were staying. Probit with sample selection model and multinomial logistic regression were used to test for the robustness of the logit model found.

The rest of this paper is structured as follows. Section 3.2 briefly chronicles displacement in Aceh and its impact on women. A literature review and empirical observations on migration and social capital follows in Section 3.3. After concisely describing data and methodology used in this paper in Section 3.4, I explain how an empirical model is developed in this study. Section 3.5 discusses the result of model estimation and selection, including univariate and multivariate analysis, as well as a model's diagnostic and robustness. Section 3.6 concludes and is followed by a note on the study limitation in Section 3.7.

3.2 Women and Displacement in Aceh

Aceh has witnessed human migration and displacement due to both man-made and natural disasters. The civil war during DI/TII (Darul Islam) in late 40s to early 50s and three decades of Free Aceh Movement (GAM) struggle for independence since 1976 has caused IDPs and a refugee crisis along the fragile history of Aceh within Indonesia. The great quake and tsunami devastated Aceh on 26 December 2004 and caused a major IDPs crisis with half a million people displaced and homeless.[40]

The prolonged conflict attested to the Acehnese ability to survive with almost no outside intervention[41]. During the war, most of the clashes between the rebel groups and the government troops took place in the rural-interior areas of Aceh, forcing people to leave, take refuge and settle in urban-coastal regions. The 26 December 2004 great quake and tsunami hit most of Aceh's populous urban-coastal regions. Survivors, who still have connections with the rural-interior regions, their *gampöng*, returned back, took refuge temporarily or even re-settled, thus reversed the direction of mobility among the Acehnese IDPs of those during the war. Resettling in the rural areas after the tsunami was made easier by the historic Helsinki peace accord on 15 August 2005. However, the humanitarian relief services centered in Banda Aceh and other urban areas caused indecisiveness among IDPs about where to temporarily resettle during the first months following the catastrophe. Resettling in the rural interior regions, temporarily or otherwise, meant the possibility of foregoing most of the relief aid provided by national and international organizations.

[40] Two year after the tsunami, Oxfam reported that about 70,000 are still living in military-style temporary shelters called "barracks" in Aceh, while more are still living with host communities throughout the region.
http://www.oxfam.org.uk/applications/blogs/pressoffice/2006/11/oxfam_calls_to_step_up_respons.html (accessed January 10, 2007)

[41] There was only a limited presence of reporting office of IOM and UN-OCHA working with Indonesia's Government Disaster Mitigation (Satkorlak) to report and monitor IDPS situation.

Migration within and across Aceh's geographical border has been one of the most important modes of survival for the Acehnese during the conflict and aftermath of the tsunami. This migration has been supported by certain structures, notably a structure of social relationships and networks among the Acehnese (Mahdi 2007). The networks involve individual(s) who want to move from one place and individual(s) or contacts from another, considered-better or safer, place. The latter are usually individuals that the former already knew through different relationships like family ties, and kinship.

Nearly thirty years ago, after three decades of perceived ill-treatment by the Indonesian government, the move to gain sovereignty for Aceh gathered momentum and exploded into a guerilla war which resulted in the province being forced into isolation from the world. The conflict claimed the lives of nearly 15,000 people and caused psychological trauma to nearly 7,000 women. Women in many part of Aceh have experienced multiple and repeated displacement—many as heads of households caring for children and the elderly.

As of 2003, out of about 2 million female population in the province, nearly 460,000 (23% of total women, around 11% of total population) were forced to be heads of household after the deaths of their husbands of which the majority were due to the conflict. From these female heads of households, 60% never attended school, 31% finished elementary school, 3% completed middle-school, and only 1% graduated from high school.[42] The fact that one out of five women was household-head indicates that women have been at the core of their family and community survival strategy. With the tsunami, Acehnese women are again at the forefront of the survival of their communities – at homes, in tents, barracks, and within host communities and devastated villages.

[42] Aceh NGO Forum reports in 2003, consolidated by author.

The tsunami caused huge destruction both in physical and non-physical terms. Latest available figures of casualties from official sources cited 129,498 deaths and 37,066 missing in Aceh alone[43]. Although no gender-disaggregated data are available, most of the victims are believed to be women. Oxfam reported that there were several villages that lost up to 80% of their female residents[44]. Oxfam also noted that there is a strong indication of gender imbalance after the tsunami. That is, there are more male survivors compared to female survivors and that both male and female survivors are mostly in their active reproductive ages.[45] It is also important to note that the Aceh pre-tsunami population consisted of approximately a 51-49 female-male ratio.

There are three main resources for data on IDPs in Aceh after the tsunami: (1) Satkorlak, the provincial government agency for disaster management, which produced IDP estimates in the first weeks after tsunami.[46] Satkorlak, in collaboration with Aceh's Dinsos (Social Affairs Office) derived the numbers "from a combination of general estimates of population figures and data collected from the sub-district heads (*Camats*)"[47]; (2) Aceh's Electronic Data Management Agency (BPDE) with its field surveyors from Garansi, an Indonesian NGO. "Garansi was contracted to register IDPs throughout the province and adopted an approach of finger printing IDPs to prevent double counting"[48]; (3) Population Census for Aceh and Nias (*Sensus*

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[43] http://www.humanitarianinfo.org/sumatra/products/statistics/docs/DeathStatisticMay2005.pdf (accessed 17 November 2005). As in many catastrophes, single agreed accurate number is difficult to get. It seems that reports on earthquake and tsunami victims often confused, for example, between total and death-missing numbers, total in Aceh only versus total with other countries.

[44] Oxfam Briefing Note "The tsunami's impact on women" (March 2005) http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/bn_tsunami_women.pdf (accessed 20 August 2007)

[45] "Two major changes after the tsunami", slides presentation by Sinta Dewi of Oxfam Banda Aceh at UNESCAP's Workshop on The Impact of the Tsunami on Vulnerable Groups and Women, Jakarta 13-15 September 2005.

[46] Satkorlak in cooperation with IOM and OCHA had also previously published some conflict IDPs data before the tsunami.

[47] In a letter from United Nations Recovery Coordinator for Aceh and Nias (UNORC) to the Head of Aceh and Nias Rehabilitation and Reconstruction (BRR) on IDPs definition.

[48] *Ibid.*

Penduduk Aceh dan Nias, SPAN) by Aceh Office for Statistics (BPS) which launched its partial results on 29 November 2005. The foreign-donors-funded SPAN reported somewhat lower figures of IDPs compared to the first two. But Cibulskis[49] concluded that "there is some comparability between SPAN and other sources of data, though not perfect partly because of different definitions and timing."

Garansi, the contractor for local government's BPDE defined IDPs as person(s) "being affected by the disaster and displaced from their residence and living in temporary accommodation"[50]. There are reports that the Garansi survey at some places counted host families among IDPs. SPAN census, on the other hand, defined IDPs based on whether respondents at the time of interview identified themselves as an IDP. Respondent, a household head, was asked "*Apakah saat ini Anda sebagai pengungsi?*" (Are you an internally displaced person at this time?). This subjective and self-identified question, culturally insensitive to proud Acehnese, might have attributed to far lower count of IDPs than the numbers previously produced by Satkorlak and Dinsos. SPAN reported 192,055 IDPs during August-September 2005 while BPDE/Dinsos reported 436,820 IDPs per 8 September 2005 (not including Nias).

BPDE/Dinsos reported that IDPs live in temporary living centers (TLC) or shelters—including government-built barracks (17.3%), self set-up tents (15.5%) and host communities (67.2%). From the total IDPs, some 181,516 (42%) are women, and 36,397 (8%) are babies and children under 5 years old, who traditionally fall under women's responsibility.

[49] Available on UNORC website http://www.humanitarianinfo.org/sumatra/reliefrecovery/livelihood/docs/doc/ inforesources/ IDPSSituationbyRichardCibulskisWB.ppt (18 July 2006), accessed 15 January 2007
[50] *Op. cit.* In a letter….

Based on 2005 SPAN[51], there were 508,671 out of 4,031,589 Aceh's population IDPs or used to be IDPs (ex-IDPs) after the tsunami and the earthquake. When the census was complete, of 209,882 IDPs, some 71,628 (34.14%) live with host families, 108,074 (51.51%) live in barracks, 22,695 (10.82%) live in tents (house destroyed) and some 7,425 (3.53%) live in tents but with parts of a house still intact. In addition, SPAN also reported that women constitute 46% (93,821) of total IDPs.

Some 298,849 ex-IDPs did not consider themselves IDPs anymore as they already returned to their original settlements; albeit the fact that they might still live in TLC in their villages. From those ex-IDPs, 46% lived with host families and 32% in tents when they were in displacement. Hatmadji (2006), doing Gender Analysis for UNDP, also concluded that Ex-IDPs phenomenon "might be caused by the availability of places in other areas which are not (not much) suffered from the disaster where they can live"[52]. In fact, many families with surviving mothers, women in general, the elderly, and children decided to place their loved ones in their original village or with relatives outside the affected areas. Table 3.1 shows number of IDPs from the three main sources which indicate that host-families are essential in helping IDPs in Aceh.

Table 3.1 Number of IDPs: comparison of three sources

		Data Sources		
	Temporary shelter	SPAN	Satkorlak	Dinsos/BPDE
IDPs	Tent		130,836	61,169
	Barrack		72,756	69,615
	Tent/Barrack	133,514	191,198	129,451
	Host families	70,303	306,188	259,871
	Total	203,817	565,384	425,434
Ex-IDPs		298,849		

Source: Richard Cibulskis of World Bank presentation[53]

[51] Aceh Office of Statistics, BPS Aceh, with support from multi-donor agencies, ran the first census after tsunami on 15 August – 15 September 2005. Report of this census was available to public in 2006.
[52] UNDP Gender Analysis SPAN Report by Hatmadji, S.H. (18 July 2006) available at http://www.humanitarianinfo.org/sumatra/reliefrecovery/livelihood/ (accessed 10 January 2007)
[53] *Op. cit.* Available on UNORC….

Based on Dinsos/BPDE data, host families used to constitute the biggest "shelter" (67.2%) for the tsunami IDPs in Aceh. Host families could mean family members, relatives, friends, or merely a social relationship based on *gampöng* (village) relations as reported in Mahdi (2007). The role of host families also mean that IDPs highly rely on the roles of women in the houses used as temporary shelters. In Aceh, wives are called "*po rumoh*", the "owner of the house" which does not only mean that women run the house, but, in many cases, also literally own the house from their parents[54]. At the very least, the *po rumoh* are the sole owner and decision maker in a kitchen of a house. The *po rumoh* in Aceh usually use the kitchen in the house to do much of daily activities, not only to cook but also to accept her friends and guests. That is why, Acehnese usually prefer houses with an ample size kitchen (Nursaniah *et al* 2007). A too small kitchen can cause a comfort problem, especially when there is more than one family in the house sharing a kitchen.

The SPAN report noted that 24% of the IDPs are heads of household and 15% are partners of the head of household. As a wife is usually considered the "partner" to a husband in Acehnese (and Indonesian) patriarchal society, this means that at least 15% of the IDPs are women heads of household, higher than the situation before tsunami and during the conflict which was around 11% as discussed before. Among the IDPs, the number of women separated from their spouses is also higher compared to men. After the tsunami, from 12,177 IDPs separated from their spouse by death, some 7,112 (58.4%) are women. Additionally, women were affected by the quake and tsunami as much as men. Some 90% of the IDPs said that they were personally affected, 40.9% of which are women. As a matter of fact, if the number of women

[54] Parents in Aceh usually built and give a house to their daughter upon their marriage while a son usually gets farm, cattle, and other heritage other than house.

who had to bear responsibility in hosting IDPs in their houses combined with the number of women IDPs themselves, one can arguably say that women in Aceh bear the most responsibility for their community's resilience in coping with the catastrophe and hardship that followed.

In terms of planning for future settlements, SPAN data reported that 49% of the IDPs wanted to stay where they were when the census was done, 33% wanted to return to their original settlements (villages) before tsunami, and 12% said they did not know where to re-settle. Unfortunately, the SPAN report did not specify this future-settlement-plan based on sex, as the survey was based on household. Therefore, it is not known the degree of women involvement in, and factors that contribute to, decision making for future settlement. This paper is intended to fill the gap by providing insights on women IDPs' decision to return or not to return to their original settlement using data from a survey organized by the United Nations Development Fund for Women (UNIFEM) on the condition of women tsunami IDPs in Aceh.

3.3 Literature Review and Empirical Observations

Traditionally, the reasons encouraging an individual or a group of individuals to migrate were categorized as "push" or "pull" factors. People who were pushed out from their original settlement by civil unrest and natural disaster resulted in "forced migration," while people who migrate to find a better life in a more developed region—pulled by economic factors, are said, arguably, to engage in "voluntary migration". The distinction is, of course, not clear cut. Therefore, there are also terms like "involuntary migration" and "encouraged migration" (Gardner 1981). The distinction, nevertheless, is much clearer in defining "source" versus "host" region/country. Much of the growing migration literature seems to concentrate on the "host" or "destination" country/region.

Human movement studies introduced to our lexicon the terms such as *migrant, refugee,* and more recently *IDPs.* The concept of internally displaced persons (IDPs) often only refers to displaced people caused by conflict, violence and persecution (Mooney 2005). But the global awareness of the problems of IDPs in the last 15 years has included IDPs caused by a natural disaster. In its *Guiding Principles on Internal Displacement,* the United Nations in 1998 defined IDPs as:

> Persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human made disasters, and who have not crossed an internationally recognized State border. (Introduction, para. 2)

In Indonesia, however, the term IDPs is still often confused with "refugees," a term used for state-border-crossing migration. The word *pengungsi* is used for people who move both because of conflict and natural disaster; and both for those who move within or across state border. Bahasa Indonesia (Indonesian language) actually knows only one word *pengungsi* to describe both IDPs and refugees. The problems of displaced people after the tsunami have introduced the term IDPs more widely in Aceh and Indonesia.

When catastrophe strikes a community, many individuals choose to move out from affected areas. "Migration from an area afflicted by a major disaster to an unaffected area would seem to be one of the most common responses to disaster and an important survival strategy" (Curson 1989:16). A man-made disaster like a war or a conflict had caused major permanent and temporary migration in the history of Asia

and Europe. Natural disasters often generate both large- and small-scale migrations of people away from affected areas. See for example Blaikie *et al.* 1994, Brook and Paul 2003, Cannon 1994, Lavell 1994, Parker *et al*. 1997, and Smith and Ward, 1998.

Paul (2005), however, argued that not all affected communities out-migrate permanently after a disaster when there is a "constant flow of disaster aid and its proper distribution by the government and non-governmental organizations (NGOs)". This is also the case in post-tsunami Aceh. But, as the rest of this paper will elaborate, IDPs, in Aceh at least, return not only for the disaster aid, but also for other personal and communal reasons such as property ownership, family and community ties, all the social structure and networks which might "pull" the IDPs back to return to their original settlement prior to tsunami. Thus, this paper pays more attention to the "source" region where the IDPs might return to.

That is, this paper focuses on the social networks in the *source* "region" while the growing literature on the nexus between migration and social networks, when it matters, usually focuses on the "region" *hosting* the migrant. The latter usually builds on the question "How many people do I know where I am migrating to and how can they can facilitate my decision to migrate?" Hence, typically, the expected sign of network effects as push factor of out-migration is positive. This paper, however, builds on a very different question, such as "How many people do I know from my own village where I am now and how will they facilitate/hinder my decision to migrate back?"

At the wake of an increasing number of major disasters taking place in the last decade, the literature studying migration and disaster is also growing. However, not many studies focus on natural disaster IDPs issues and most literature either combines analysis of refugees and IDPs or focuses on the conflict IDP issues (Irhamni, 2006). Toole and Waldman (1993), for example, examine the health issues of refugees and

IDPs caused by war and epidemic, while Amowitz *et al* (2002) examine the human rights and sexual abuse issues among IDPs in Sierra Leone.

The focus on natural disaster IDPs is more noticeable after the Indian Ocean Tsunami. Nishikiori *et al* (2006) investigate risk factors of mortality among IDPs in Sri Lanka using a retrospective cohort analysis. They observe a significantly high mortality in women and children among the displaced population in the eastern coastal district of Sri Lanka. They suggest that reconstruction activities should take into consideration these changes in population structure as also found and suggested by an Oxfam survey in Aceh.[55] Chandra *et al* (2006) examine the impact of the disaster on mental health among the survivors in the impacted countries.

Being worst hit by the Tsunami, the IDP situation in Aceh has also been the focus of some literature. Irhamni (2006) studies the determinants to leave temporary leaving center (TLC) among IDPs in Aceh. Using SPAN household level data, she found that housing, household and village characteristics are important determinants for leaving temporary shelter decision. This study suggests that differences in characteristics among households need to be taken into account in policy for IDPs. Rofi *et al* (2006) report mortality rate among Aceh tsunami IDPs based on a survey of 388 households. The report said "Risk of death was greatest in the youngest and oldest age groups, and among females," which is similar to the findings in Nishkiori *et al* in Sri Lanka. They also reported that 36 per cent of tsunami-displaced households indicate an intention to return to their original community. Additionally, "displaced households residing in host communities were 2.2 times more likely to state an intention to return to their original village or another community as those residing in camps." These are two studies on Aceh's tsunami IDPs which are fairly quantitative, while the rest are more qualitative in nature.

[55] *Op. cit.* "Two major changes…"

Siapno (2007) examines displacement, especially among Acehnese women, as a part of survival strategy and resilience. Hedman (2006) looks at the impact of the Helsinki Memorandum of Understanding (MoU) between The Free Aceh Movement (GAM) and the Indonesian Government on the livelihood of IDPs. Mahdi (2006) found a different pattern of mobility between the conflict IDPs and tsunami IDPs in Aceh. He observes that there was a strong correlation between the mobility of IDPs with livelihood options and relief services, while taking into account the role of social structure and network in the Acehnese community. Lee *et al.* (2005) reported how a team of medical relief workers faced challenges in providing medical relief at one of the tsunami IDPs camp in Meulaboh, West Aceh. This paper details the difficulties and lessons learnt, including the lack of important resources for healthcare delivery.

Several studies on Aceh's tsunami IDPs are more policy-focused. Age (2005) identifies forced replacement as Aceh tsunami IDPs were confined to government-built barracks while Kälin (2005) focuses on the human rights issue of tsunami's IDPs in Aceh. He lists specific issues to watch in regard to IDPs' rights at the wake of the 2004 tsunami such as women and children rights and trafficking issues. Hudspeth (2005) found three main barriers facing the international NGOs and donors in accessing IDPs in Aceh: physical, informational and 'social'.

Several studies look at program implementation and evaluation involving Aceh tsunami IDPs as direct or indirect beneficiaries. Despite a general preference of the local community for reconstruction based on community development principles, Kenny (2007) finds that local people in Aceh have been marginalized in the reconstruction process. He notes that the responses of the Acehnese for immediate international relief efforts have been favorable. Nevertheless, the Acehnese have been wary about the spending designated for the relief and reconstruction programs.

Oxfam's briefing note on 25 June 2005[56] warned of a possible discriminatory intervention due to pre-existing social structures and inequalities such as gender, age and income levels.

Doocy (2006) *et al.* reports experiences and lessons learned from a cash for work (CFW) program and assesses some key recommendations for future implementation. They note that the program empowers the IDPs, giving them incentives to return to their original settlement. The program also has indirect benefits as it provides productive activities, hence creating opportunities for community cooperation. Although there is a popular discourse in Aceh that CFW has destroyed *gotong royong* (self-helped, community work-together),[57] this study has shown that CFW is beneficial at least in the short term to help people access cash. Oxfam has also advocated and implemented CFW for immediate or pre-livelihood intervention claiming it is "an appropriate approach to take after disasters such as the tsunami, where food by and large remained available, but where many people had lost their means of earning the money to buy it."[58]

3.3.1 General Theory of Migration

As mentioned earlier, while there is a recently growing qualitative literature on IDPs (IDPs of disaster in particular), only a small portion is devoted to a quantitative approach. To build the model to study decision making among women tsunami IDPs in Aceh, therefore, necessitates alternative threads of literature. Stecklov *et al* (2005) summarizes theories of migration pattern into two major views:

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[56] Targeting Poor People: Rebuilding lives after the tsunami (25 June 2005) http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/bn_tsunami_6months.pdf

[57] Based on author field interviews

[58] Back to work**:** How people are recovering their livelihoods 12 months after the tsunami (20 December 2005) http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/bp84_tsunami_livelihoods.pdf

(1) Neoclassical models of migration based on *individual maximizing utility* as postulated by Harris and Todaro (1970), Sjaastad (1962) and Todaro (1969). These models consider the migration decision in a cost-benefit framework in which potential migrants compare expected utility of income at the point of origin to expected net income at possible destinations. Expected net income from any location would depend on characteristics of the individual such as age, skill level, and asset position.

(2) "New economics of migration" is based on the key insight that migration decisions are not made in isolation by individuals but by **larger units of people**[59], particularly households as postulated by Connell *et al* (1976) and Massey *et al* (1993). These models of *household maximizing utility* consider the decision to migrate a result of a joint household decision, in which a household shares the costs and benefits of migration with the migrants through an explicit or implicit sharing rule.

Stecklov *et al* (2005) found that migration networks strongly influence migration decisions. This is in line with the findings of prior studies showing the important role of social networks and economic incentives in migration decisions. Boyd (1989) highlighted the importance of network theory of migration in influencing decisions to migrate, either directly or indirectly. Furthermore, Massey, Goldring, and Durand (1994) stated that migrant networks can be viewed as a migration-specific form of **social capital**[60] that influences a decision to migrate in two ways: by providing direct assistance such as food, housing, transportation, or cash; and by providing indirect assistance such as information about jobs.

[59] Emphasized by author
[60] Emphasized by author

Bigsten (1996) and Agesa and Kim (2001) noted that households might follow two alternative patterns of migration: family migration and split migration. In the family migration, the entire household will move to the urban area while in the split migration one of the household members will first move to the urban area, usually the household head, while the rest of the household members will stay behind but might reunite later. The decision to migrate might be influenced by various household characteristics such as age and work experience of the household head (Goss and Paul 1986) and family size (Odland and Ellis 1988). Furthermore, Root and de Jong (1991) use various measures for social structures and socioeconomic resources and show that family size, family ties, family pressure and family mobility experiences constitute a significant impact on the decision to migrate.

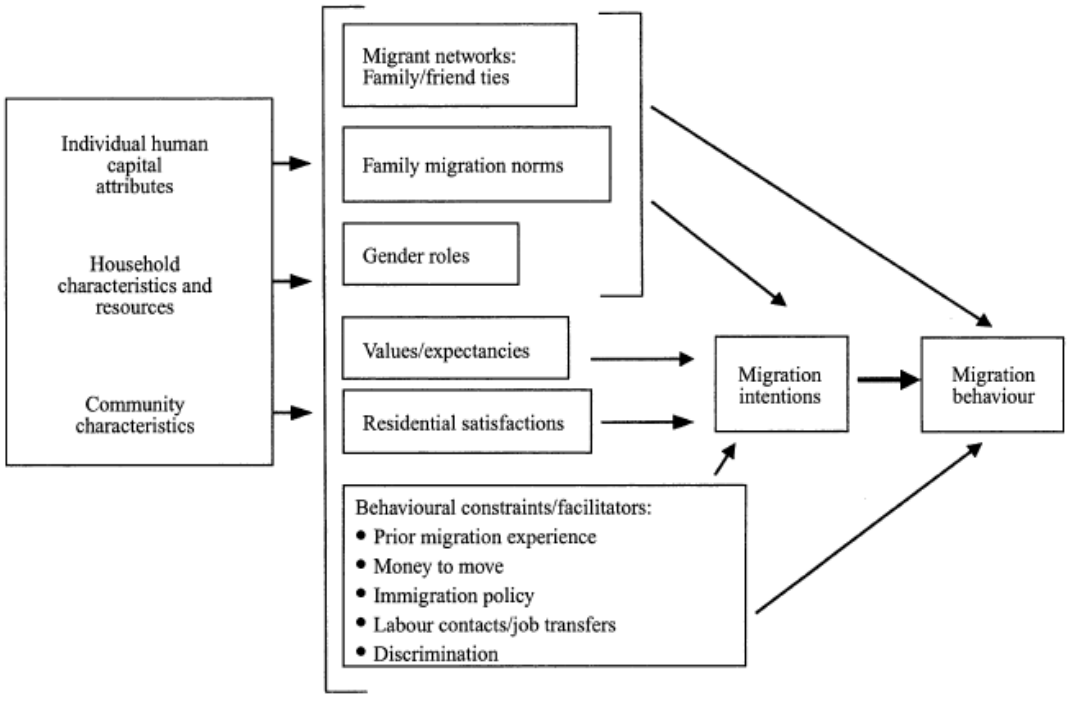

Figure 3.1
General model of migration decision making (de Jong 2000)

De Jong (2000), Pedraza (1991) and Sandell (1977) look at the role of women in migration. De Jong examines the role of expectations, gender and norms on the intention to migrate in Thailand. De Jong includes individual, household and community characteristics in determining migration intentions and behavior, whether directly or not. In general, he postulates a "general model for migration decision making" as shown by Figure 1

Disparities, usually economic, between two locations might induce rural-urban migration (Agesa and Kim, 2001). Lower rural wages, frequently close to subsistence levels, induce rural households to migrate to urban areas which provide a higher wage (Williamson, 1988).

Additionally, the leaving-parental-home literature provides some empirical studies analyzing individual characteristics in the decision to leave the parental house. Aassve et al. (2001) examine the relationship between income and employment status and the decision to leave home for Italian young adults while Aassve et al. (2002) examine how marriage probability determines the leaving home decision for young Americans.

Whittington and Peter (1996) research the impact of children's and parents' economic variables on the decision to leave the parental house. Avery et al. (1992) investigate the impact of parental income on the probability of making an independent living, while de Jong et al. (1991) examine parents' material resources impact on the decision to leave parental houses.

Chau (1997) examines the role of migrant networks in determining patterns of out migration from sending region to receiving region. She finds that migration cost varies inversely with the number of previous migrants. The relation of migration networks and education at a host country is studied by McKenzie and Rapoport (2007) and Miranda (2007). The first finds that the probability of migration from Mexico to

the US is increasing with education in communities with low migrant networks, but decreasing with education in communities with high migrant networks. The later examines how family and community migration experience affect the probability of high school graduation in urban Mexico.

3.3.2 Social Capital and IDPs Movement in Aceh

Bourdieu notes that "social capital is the sum of resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition." Coleman defined "social capital" as "a useful resource available to an actor through his or her social relationship." Putnam (1993a) linked "the civic community" to the tradition of "civic humanism" which he specifies through four theoretical dimensions: (1) civic engagement, (2) political equality, (3) solidarity, trust, and tolerance; and (4) the social structure of cooperation. Putnam found in his study that northern regions in Italy performed better than southern ones as "social capital" was flourishing in the former.

> Collaboration, mutual assistance, civic obligation, and even trust…were the distinguishing features in the North. The chief virtue in the South, by contrast, was imposition of hierarchy and order on latent anarchy. (p. 130)

Fatimah Castillo (2003, in Siapno, 2007)[61] examines cultural adaptation and social capital aspects of resilience. Castillo argues that, in many cases, the fabric of social life and social capital (friendship, kinship, trust, religious beliefs, indigenous belief

[61] Cited with permission

systems) are more resilient. Therefore, "just because many have died, or that physical infrastructure is destroyed" does not always mean "that the fabric of social life is also destroyed". In this regard, Adger *et al* (2005), for example, finds that there are resilient societies in post-tsunami coastal regions. And these resilient societies possess a robust network of information sharing utilizing their social capital.

Reports on the situation of IDPs have been provided mostly by government agencies and human rights groups.[62] Emphasizing agency, Siapno (2007) concludes that displacement is indeed a mode for resilience and resistance for the Acehnese when seen with subjectivity beyond notions of "the victims," "the oppressed" or merely uninformed "displaced-masses".

When put in subjectivity as the question used by SPAN census, it might be surprising for some that "312,463[63] tsunami/earthquake survivors who once identified themselves as IDPs no longer do". This number is the result of a question "*Apakah Anda pernah mengungsi setelah gempa/tsunami?*" (Have you ever been displaced as a result of the earthquake/tsunami?). But this should not be surprising because many communities decided to return to their original settlements as early as two to three months after the disaster and did so with or without outside help. Many of these returnees, whether early or later, are not recorded while they are actually "still living in tents or ad-hoc structures on their own land." Chris Morris, United Nations Recovery Coordinator for Aceh & Nias, sketched an explanation for these "ex-IDPs":

> There may also be cultural, psychological or linguistic reasons why such a large number of people who once considered themselves IDPs no longer want to identify themselves as such. Two possible

[62] Hedman and Siapno are the only two scholars the author knows to have been working on this issue. Nah and Hyndman have reported on Acehnese diaspora in Malaysia and North America.
[63] When the SPAN is completed, the number of "Ex-IDPs" is somehow lower as seen in Table 1.

> explanations stand out. Firstly, many tsunami/earthquake survivors have gone back to their own lands and now consider themselves as having returned home and therefore no longer IDPs regardless of the living conditions they experience. Secondly, being labeled a "pengungsi" or IDPs in Aceh may carry a negative connotation which many tsunami survivors probably want to avoid.

Going back to one's own land, nevertheless, is not an individual choice for many survivors in Aceh. Even when a survivor has been provided with a house, the decision to return might not be made until at least a number of people from the same original settlement return. Re-organized communities in turn might decide whether to return or not, and if so when, based on other supporting variables like infrastructure (electricity, water and sanitation), livelihood, and social life. Women and children might not feel safe to return when inhabitants are still sparse. Vebry (2006)[64] reported this situation in several places around Banda Aceh and Aceh Besar. In one case, a survivor from Leupung of Aceh Besar admitted that it is difficult for some male survivors to return to their village as there are only four women left for possible re-marriage in the future.[65] For a settlement to be a settlement for Acehnese, a *gampong* both in physical and non-physical notions must be rebuilt; not just a collective or rows of houses, no matter how neat they are, without a thread to one another. People returned to their *gampong*, not merely to their houses. Therefore, if one is to understand determinants of decision to return among IDPs in Aceh, an understanding of social factors constituting a *gampong* is imperative. This can be done by

[64] Vebry, Muamar. (2006). *Rumoh* & *Gampong* (Housing and Gampong), published in "Oase" at www.acehinstitute.org on 1 December 2006 (accessed 5 January 2007)
[65] In Aceh tradition, a man resides in his wife residence/*gampong*.

investigating and gauging the social relationship through its proxies such as acquaintances, friendship, and through property ownership.

Displacement in Aceh is also very fluid, "instead of the static-ness of camp life as is often represented" in official reports. Siapno (2007), therefore, goes "beyond the way this term displacement is often used in particular in human rights reports, i.e. enforced physical and geographic displacement, mostly in repressive and negative sense, to open up possibilities including fluidity and resilience, and ways of dealing courageously with forced displacement."

IDPs' mobility and decisions, including or even more so those of women IDPs, can also be seen as the resultant of multiple group membership. Following the tsunami, an individual seemed to be concerned only with finding her or his own immediate family members. Fathers looked for their wives and children. Wives, although with more limitations, looked for their husbands and children too. Family or the part of it that was spared by the catastrophe, once reunited, tried to secure their family's safety first. Many adult males took their female counterparts, children and the elderly to a safer place, and then returned to affected areas to further search for missing family members or tried to secure relief supplies for the family. While or after securing their own family, many then started to get connected to other community members from the same or neighboring *gampong* with which they were familiar. .

Mahdi (2007) notes the importance of *gampong* (village) as the next social structure after family that IDPs rely on or look after. He documents IDPs mobility in Aceh based on *gampöng* networks, as proxy for social network made possible by better communication and transportation in Aceh. Although these network factors are not a direct cause of migration, they do facilitate it.[66] Furthermore, the *gampong*

[66] Reasons encouraging an individual to migrate were traditionally categorized as "push" or "pull" factors. Free flow of information, improved communication and faster and lower cost transportation has

networks among Acehnese are built on "trust" with specific "norms" and "values" regulating them, fitting a notion of "social capital"[67] as described by Bourdieu and Wacquant (1992), and Coleman (1994), then popularized by Putnam (1993a, 1993b, 1995, 2000). Islamic as well as cultural norms and values play important roles within Acehnese social structure and relations.

Membership in a family and a *gampong* are most important for Acehnese in coping with hardship after the tsunami. Social structure beyond these two layers is likely to be secondary. Members of civil service institutions in Aceh, which collapsed during the war, did not indicate significant loyalties to their post at the wake of the quake and tsunami. This observation is in line with other observations on role conflict in critical situations. With few exceptions (those who are single and community oriented-individuals whose selfless acts made them community heroes), Killian (1952) documented that most people in disaster settings try to help their family first. In the case of 2005 Katrina in the Gulf region of southern regions in the US, "Police officers simply walking away from their jobs, in many cases prioritizing the needs of their own families" (Hartman and Squires, 2006:16). It is within this setting one should see how women IDPs in Aceh decide their future settlement plan, that is, women IDPs as individuals, as parts of a family, a community and, more so, a *gampong* in Aceh.

3.4 Data and Methodology

This paper is based on data from a survey on women IDPs' situation which was conducted by the United Nations Development Fund for Women (UNIFEM) with The Aceh Institute, a local research center as implementer. The survey was executed during 5-23 August 2005. It was geographically and thematically comprehensive in

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introduced another set of reason: "networks", which are not a direct cause of migration but do help facilitate it.

[67] See Field (2003), for example of "key ideas" summary of on Social Capital

coverage. Some 6,468 women were included in the sample from more than 200,000 women IDPs. The sample was first proportionally calculated based on the data of women IDPs in each district available then. The sample was also proportionally calculated based on shelter type to ensure it included the three main types of shelter: host families, barracks, and tents.

Respondents were interviewed based on a questionnaire by 129 enumerators in 17 districts throughout Aceh. The respondents were randomly selected based on snowball-sampling. Enumerators in each district visited host families, barracks, and tents based on available information, then randomly chose an IDP she/he first met. The enumerators collected 6,360 questioners (less 108 data unit than survey designed). After data cleaning, 6,111 entries were entered into a database for further analysis. The analysis in this paper, however, is based on 5,869 IDPs responses, dropping respondents under 15 years old.

Data on distance from temporary shelter (TLC) are processed based on village potential statistics (PODES) published by BPS, a travel journal, and author estimates. The distance is calculated from sub-district of origin to sub-district where TLC is located.

3.5 Empirical Models

The decision to leave or not to leave one place is gauged by future costs and benefits in comparison to another place. Assuming that this decision involves a rational decision, agents follow utility maximization process based on which agents will choose an alternative that provides greater expected benefits between the two places. In this study of the decision to leave TLC among women IDPs in Aceh, the utility maximizing behavior is assumed to be conducted by individual women respondents of the survey. This assumption does not undermine the influence by

"larger units of people" on the decision to move as implied by de Jong's model. Moreover, some 21.6 percent of the total 5869 respondents are self-declared (women) "head of household".

This paper investigates determinants associated with women IDPs' future plan, especially on the decision to return or not to return to their original settlement (village). For that reason, the dependent variable is set to be a binary or dichotomous variable of "to return" or "not to return" to the original settlement. Logistic regression analysis is then used to explore possible independent (explanatory) variables that might explain the dependent variable. According to Kleinbaum *et al* (1998:656) logistic regression analysis is the most popular regression technique available for modeling dichotomous dependent variable.

The binary choice models essentially describe the probability that $y_i = 1$ directly, although they are often derived from an underlying latent variable model (Verbeek, 2004:191). In general,

$$P\{y_i = 1 \,|\, x_i\} = G(x_i, \beta) \qquad \textbf{(3.1)}$$

for some function $G(.)$ which means that the probability of having $y_i = 1$ ("to leave") depends on the vector x_i containing individual characteristics. The model for women IDP intention "to leave" or "not to leave" in this chapter is based on this general model without underlying behavioral assumptions.

Although not necessary, it is possible to derive a binary choice model from underlying behavioral assumptions (Verbeek, 2004:192, Greene 1997:880). "This leads to a latent variable representation of the model, which is in common use even when such behavioral assumptions are not made."

In the case of women tsunami IDPs in Aceh, there will be a utility difference between returning and not returning to original villages. Assuming these individual women are maximizing behavior, the utility can be written as

$$y_i^* = x_i'\beta + \varepsilon_i \qquad \textbf{(3.2)}$$

where y_i^* is unobservable, thus referred to as a latent variable (Verbeek 2004) or index function (Greene 1997). Hence, for each woman IDP i the utility y_i^* is a function of observed characteristics x_i and unobserved characteristics ε_i. The ε_i s are independent of all x_i .

As only the outcomes of the maximization behavior can be observed (the decision to return or to stay), the latent variable (y_i^*) and the observed binary variable (y_i) is linked through the following measurement equation:

$$\begin{aligned} y_i &= 1 \text{ if } y_i^* > \tau \qquad \textbf{(3.3)} \\ &= 0 \text{ if } y_i^* \le \tau \end{aligned}$$

where τ denotes the threshold or cut point (Long 1997). If y_i^* exceeds the threshold τ then y = 1 while if $y_i^* \le \tau$, then y = 0. Since the latent variable is unobserved, this equation cannot be estimated using the ordinary least square method. This implies that the estimation technique should employ Maximum Likelihood (ML) estimation which requires assumptions about the errors distribution. Assuming that the error (ε_i) in equation (2) is normally distributed, the equation will result in a probit model. If ε_i follows a standard logistic distribution, it becomes a logit model. Major statistical software applications are equipped with features for the ML estimation.

The analysis of the decision to leave TLC, however, is complicated by the presence of sample selection bias. There were some IDPs who never stayed in any TLC. Ignoring this fact "will create a problem of left hand censoring in which

households who have never become IDPs are excluded in non-random fashion" (Irhamni 2006). An extension of Tobit II model known as Heckit procedure can help remedy the problem. The Heckit procedure involves a probit model for the selection equation and OLS regression in the selected sample for the main equation (Greene 1997). However, one can also follow a procedure proposed by Van den Ven and Van den Praag (1981) which employs two probit for the sample selection model. In this chapter, the behavioral model based on this procedure is used to empirically test for the robustness of the general model above which is developed by logit model.

Following Hosmer and Lemeshow (2000), the variable selection process in logit model is started with a careful univariate analysis of each variable, modeling a single independent variable with the said dependent variable. Upon completion of the univariate analyses, variables for the multivariate are considered based on *p*-value < .25. After fitting the multivariate model, the importance of each variable included in the model is verified by (a) Wald statistic for each variable, and, (b) a comparison of each estimated coefficient with the coefficient from the univariate model containing only that variable. The new model is then compared to the old model through the likelihood ratio test.

3.6 Estimation Results and Model Selection

The logit model will focus on explanatory variables that are related to, or otherwise, implying respondent association to other individuals (networks, proxy of social capital). That is, determining social capital as determinants to women IDPS' decision to return or not to return. Independent variables considered in this analysis include demographics (age, age group, marital status, and distance of TLC from original village) as well as TLC types, TLC size, number of acquaintances from the original village in TLC, whether a woman has a piece of land in the affected area, and

whether a woman has new friends in the shelter. The significance of approximate real distance (in km) from TLC to original village is also tested.

As explained before, in a communal society in Aceh, besides “acquaintance” and “friends” as direct indicators of social network, “marital status”, “TLC types”, and “land ownership” might also be considered as proxy to the network.

To test for robustness of the logit model, two probit models procedure is applied using “land ownership” as dependent variables in the sample selection model.

(1) Dependent variable: to-return or not-to-return

When the women IDPs were asked where they “think” they will be in 1-2 years from the time of interview, some 2726 (46.4%) women said that they would still be in the same shelter they were staying. On the other hand, some 1,804 (30.7%) women said they would return to their original settlement. There were 18.27% who said they “do not know” or “not sure” where they would be. The remaining 4.5% said they would be in another settlement. The distribution of this “future plan” for settlement is shown in Figure 3.2.

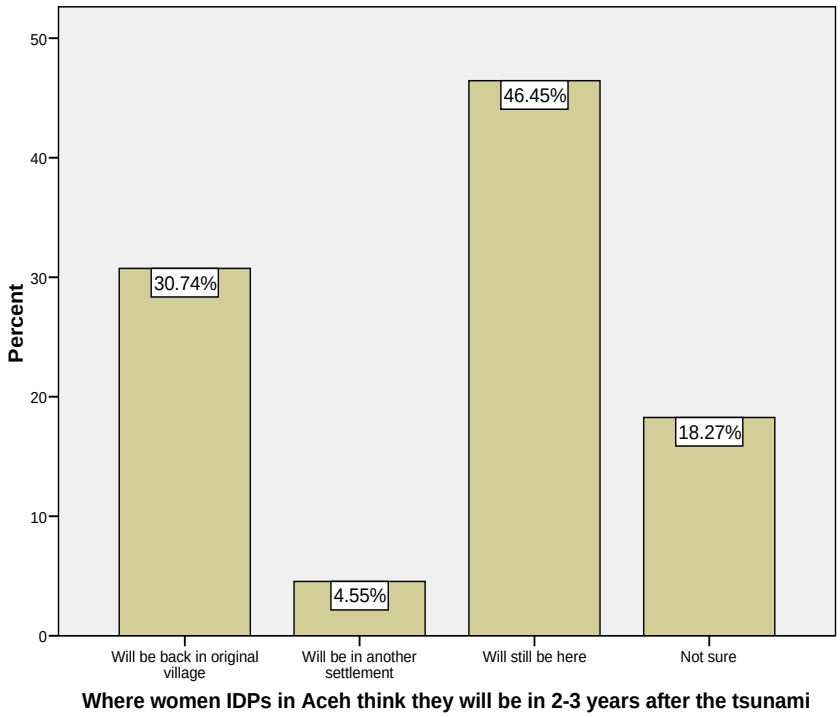

Figure 3.2
Distribution of where women IDPs in Aceh thought they would be in 2-3 years after the tsunami (processed)

Interestingly enough, these figures are somewhat in a similar pattern with the census (SPAN) result where 49% of the IDPs (both men and women) wanted to stay where they were when the census was done and 33% wanted to return to their original settlement before tsunami. Both number of SPAN are only about 3% higher than the women survey. This result offers great confidence for further analysis using this database.

To make a dichotomous dependent variable, the last three responses were combined into a new variable "not-to-returned" contrasting the first indicating the wish "to-return" among women IDPs. That is, there were 4,065 (69.3%) women IDPs who can be categorized under "No" and 1,804 (30.7%) under "Yes" to return. This is of course somewhat conservative as IDPs under "Will be in another settlement" and "Not sure" are not all going to end up not returning to their original village.

(2) Independent variables

A univariate logistic regression analysis reveals that age, age group, post-tsunami marital status, head of household status, all do not associate with the decision to-return or not to-return among the IDPs with all *p*-value > .25. On the other hand, distance, pre-tsunami marital status, shelter type, shelter size, family loss, land ownership, involvement in community activities, number of acquaintances from original village and whether a woman IDP has friends in the shelter do associate with the decision. Therefore, only those which are univariately significant are presented here (Table 3.2). A complete summary of all variables is provided in Appendix 3.A.

Table 3.2
Statistically significant independent variables in univariate logistics regression

Variables	Category	Frequency	Percent
Distance between temporary shelter and original village (in km)	up to 1 km	886	15.1
	between 1 to 5	664	11.3
	between 5 to 10	1844	31.4
	between 10 to 25	1123	19.1
	between 25 to 100	598	10.2
	between 100 to 250	471	8.0
	between 250 to 500	246	4.2
	more than 500	37	.6
Pre-Tsunami Marital Status	Single	1266	20.0
	Married	3777	58.5
	Widowed-by-death	722	19.3
	Widowed-by-divorce	104	2.2
Whether any family member lost to tsunami (or conflict)	No	3554	60.6
	Yes	2315	39.4
Type of temporary shelter when interviewed	Host Family	2658	45.3
	Barrack	2035	34.7
	Tent/makeshift structure	1176	20.0
Temporary shelter size (397 missing)	<20 m2	2032	34.6
	21-40 m2	1949	33.2
	41-80 m2	1109	18.9
	>80 m2	382	6.5
Whether respondent own a land in tsunami affected area	No	1918	32.7
	Yes	3951	67.3
Number of acquaintances from original village in temporary shelter	Very few	333	5.7
	Few	581	9.9
	Fair	706	12.0
	Many	2703	46.1
	Very many	1546	26.3
Whether respondent has friend(s) in new settlement	No	1142	19.5
	Yes	4727	80.5
Whether respondent involve in community decision making after tsunami	No	2387	40.7
	Yes	3482	59.3
Whether respondent attend community meeting after tsunami	No	2714	46.2
	Yes	3155	53.8

Intuitively, except for distance, all significant variables indeed indicate individual association of the women IDPs to their family and community. As a strong communal society, specifically by the fact that women in Aceh are the *po rumoh*, temporary shelter and land ownership are also both directly and indirectly related to IDPs decision to return. A thorough observation of each variable follows.

Distance, is the approximate distance in kilometers between a shelter (TLC) and original village. Used as continuous data, this variable is not statistically significant in the univariate model. However, when considered as categorial data, distance does influence the decision to return made by the women IDP as shown in Table 3.3.

Table 3.3
Logistic regression of TLC's distance from original village and decision to return among women IDPs in Aceh

Distance (in km)	B	S.E (B)	Exp(B)	95.0% C.I.for EXP(B)		*P*
				Lower	Upper	
up to 1 km						.000
Between 1 to 5	.630	.116	1.878	1.497	2.355	.000
Between 5 to 10	.615	.095	1.849	1.534	2.228	.000
Between 10 to 25	.562	.103	1.755	1.433	2.149	.000
Between 25 to 100	.337	.122	1.401	1.102	1.780	.006
Between 100 to 250	.384	.130	1.467	1.137	1.894	.003
Between 250 to 500	.573	.158	1.774	1.301	2.420	.000
more than 500	.292	.379	1.339	.637	2.814	.442
Constant	-1.285	.082	.277			.000

-2 log-likelihood = 7188.030

The significance, nevertheless, is somehow not in the negative direction as expected. A farther distance does not deter women IDPs from returning. IDPs living in TLC at 1-5 kms from original village have 1.878 (87.8% higher) the odds of returning than those living in the distance up to 1 km. The odds decrease until the distance reaches 100-250 kms, but increase again for the distance of 250-500 kms before another decrease in the odds of 1.339. The type of TLC might explain this abrupt

behavior. There seems to be more TLC in the form of "barracks" within 25 kms from original settlements, of which IDPs show higher intention to return. However, a cross-tabulation between "type of shelters" and "distance" does not show significant support for such correlation.

The unpredictable behavior might also be due to the eight classes of distance chosen in the above table and that other control variables are controlled for. Collapsing the classes into two, one for distance up to 25 kms and the other for distance above 25 kms, the model does fit with the expected negative sign. With *p-value*=.147 , IDPs living more than 25 kms from original village are .906 less likely to return to their original village than those living less than 25 kms, as shown in Table 3.4. But again, the lesser intention to return from those IDPs living more than 25 kms away might as well be influenced by the type of shelter. That is, IDPs taking refuge farther than 25 kms away from original settlements are more likely to stay with a "host family," to live a more secure life, hence, deterring from the intention to return.

Table 3.4
Logistic regression of TLC's distance from original village and decision to return among women IDPs in Aceh (using 25 kms as cut-off)

	B	S.E (B)	Exp(B)	95.0% C.I.for EXP(B)		*p*
				Lower	Upper	
Distance more than 25 kms	-.098	.068	.906	.793	1.035	.147
Constant	-.790	.032	.454			.000

-2 log-likelihood = 7240.071

Model in Table 3.4, however, as indicated by its -2 log-likelihood, gives less information than the model in Table 3.3.

Pre-tsunami marital status, is a categorial variable of marital status of the IDPs before tsunami: single, married, widowed-by-death, widowed-by-divorce. Using status 'single' as reference, all but 'widowed-by-divorced' category of pre-tsunami marital

status is statistically significant in determining decision to return among women IDPs in Aceh. A univariate logistic regression analysis on this relation is shown in Table 3.5.

Table 3.5
Logistic regression analysis between pre-tsunami marital status and decision to return among women IDPs in Aceh

Pre-tsunami marital status	B	SE(B)	Exp(B)	95%CI		*P*
				Lower	Upper	
Single						.003
Married	.143	.071	1.154	1.004	1.326	.043
Widowed-by-death	-.174	.105	.840	.684	1.033	.098
Widowed-by-divorce	-.066	.227	.936	.600	1.462	.772

-2 log-likelihood = 7227.580

The analysis demonstrated that women IDPs who were married before the tsunami have 1.154 odds in returning to their original settlement, 15.4% greater than those of single women. Women IDPs both with widowed-by-death and –by-divorce status indicate less determination to return, although the later is not statistically significant (p = 0.772). Women IDPs who are widowed-by-death before the tsunami are .840 times or 16% less likely to return than those of single IDPs. This might as well be a reasonable case as widows might have less personal attachment to their original settlement, directly or indirectly through association to other individuals like family member.

Family lost, is a categorial variable indicating whether the respondent had lost any family member(s) to the tsunami and or conflict. Latest data from SPAN shows that 32.23% of 203,817 who are still in IDPs status lost one or more family member. The UNIFEM database used in this analysis, however, showed that some 2,315 (39.4%) of the women IDPs surveyed had lost family members, while 3,554 (60.6%) had not (See Table 2). Unfortunately, there is no clear classification in the database to really differentiate between the loss to the tsunami and the conflict. It is believed,

however, that most losses are due to the tsunami. Women IDPs who lost family member(s) to the tsunami and or conflict, interestingly, have 1.268 times (26.8% higher) the odds of returning to those who did not lose any family member. The coefficient for this variable is highly statistically significant at p-value < .001, with (1.133, 1.419) 95% confidence interval. The -2 log-likelihood is 7225.190, only slightly better than that of pre-tsunami marital status.

Shelter type, is a categorial variable of temporary shelter type the IDPs staying in at the time of interview: host family, barrack, and tent/makeshift structure. The majority IDPs, including women IDPs, stayed or used to stay with host families. As Mahdi (2007) noted, the fact that most IDPs stayed with their family, relatives, or fellow villagers indicates the existence of social capital in communities in Aceh despite the prolonged war and unfathomable natural disaster. As shown in Table 3.6, all types of the shelter IDPs staying have highly significant association with decision to return.

Table 3.6

Logistic regression analysis between temporary shelter types and decision to return among women IDPs in Aceh

Shelter type	B	SE(B)	Exp(B)	95%CI		*p*
				Lower	Upper	
Host family						.000
Barrack	1.284	.067	3.613	3.170	4.117	.000
Tent/makeshift structure	.721	.080	2.057	1.760	2.406	.000

-2 log-likelihood = 6850.254

Host families must have provided more comfort to the IDPs than barracks and tents as temporary shelters. Barracks are infamous for providing dismal living

condition without any gender sensitivity.[68] Therefore, it is not surprising that women IDPs staying in barracks wanted to return at 3.613 times (261.3% higher) the aspiration of those staying with host families. Moreover, IDPs living in tents have 2.057 times stronger wish to return than those living with host families. It might be the case that living conditions in the barracks were so bad that even people staying in the tents/makeshift structures had less determination to return than those staying in the barracks.

Shelter size, is the size of temporary shelter the IDPs stayed in when interviewed, categorized into groups: less than 21 square meters, 21-40 m2 and so forth, as shown in Table 3.7. All size categories are highly significant in association with return decision with expected negative sign. That is, the bigger a shelter size relates to the less intention to return.

Table 3.7
Logistic regression analysis between temporary shelter size and decision to return among women IDPs in Aceh

Shelter Size	B	SE(B)	Exp(B)	95%CI		*p*
				Lower	Upper	
<21 m2						.000
21-40 m2	-.489	.047	.613	.560	.672	.000
41-80 m2	-1.484	.077	.227	.195	.264	.000
>80 m2	-1.443	.130	.236	.183	.305	.000

-2 log-likelihood = 6840.224

As expected, those IDPs staying in a smaller size temporary shelter were wishing to return more badly than those living in bigger size shelter, *vice versa*. IDPs living in a TLC of about four times bigger than 20 square meters have .236 times smaller odd to return. IDPs living in 41-80 m2 shelters and 21-40 m2 shelters have

[68] Reports show that barracks were not SPHERE compliance. Reports from women advocacy groups are especially critical to daunting living condition in the barracks. See also Hedman (2005) and Lukman (2005)

respectively .227 and .613 less aspiration to return than those living in 21 m2 or smaller shelters.

Land ownership is a dichotomous variable of whether a woman owns a piece of land in the tsunami affected area. With a coefficient .738 and standard error .065, women IDPs who own land have 2.092 times, 109.2% higher than, the odds of those who do not own land to return to original settlement. It is a highly significant variable (p-value < .001) with a 95% confidence interval of (1.841, 2.378). With -2 log likelihood of 7105.959, land ownership provides more information in the decision making than pre-tsunami marital status or family loss. This means than land ownership is very important within Acehnese society as it proved to be a determinant to decision to return among the IDPs.

Number of acquaintances is an ordinal-categorial variable of number of acquaintances from original village a women IDP has in the shelter they were staying when interviewed. The five different levels are subjective to the IDPs in that they did not specify precisely how many is very few, few, fair, many or very many.

Table 3.8
Logistic regression analysis between number of acquaintances and decision to return among women IDPs in Aceh

Number of acquaintances from original village	B	S.E. (B)	Exp(B)	95.0% C.I.for EXP(B)		*p*
				Lower	Upper	
Very few						.000
Few	.093	.145	1.097	.825	1.459	.524
Fair	.173	.140	1.189	.903	1.565	.217
Many	-.169	.124	.845	.663	1.077	.173
Very many	-.234	.130	.791	.614	1.020	.071
Constant	-.707	.117	.493			.000

-2 log-likelihood = 7216.329

Logistic regression analysis in Table 3.8 shows that, in general, fewer acquaintances IDPs knows within a temporary shelter tend to increase the aspiration to return. IDPs who know a fair or less number of acquaintances have a positive and

higher intention to return than those who have "many" or "very many" acquaintances. This might be due to the concept of personal safety and security in relation to community cohesiveness among the IDPs, where a certain number of acquaintances might form a comfort zone for staying or leaving the shelter. Women IDPs who are surrounding by family members or other relatives, for example, might feel safer to stay than to return to the original village at that time. However, having acquaintances from the original village, no matter how few, seems to increase the odds of returning as also shown by variable new "friends" below.

Friends, is a dichotomous variable depicting whether an IDP has new friend(s) in the temporary shelter or not. About 80% of the women IDPS surveyed said that they have new friend(s) in the temporary shelter. Logistic regression analysis shows that having friend(s) has high significant association to decision to return (p-value < .001). A woman IDPs who has friend(s) in a temporary shelter is more than twice (2.243) as likely to return than those who does not. A 95% CI of (1.909, 2.635) indicates that those who have friends have odds to return as much as 2.64 times higher. The -2 log-likelihood for this model is 7134.335.

Although the questionnaire differentiates between "acquaintances" and "friends", the former being "acquaintances from original village" while "friends" refers to "new friends found in the TLC", there might have been confusion, hence, overlapped on these two terms. Therefore, a robustness test is performed to select whether both, or otherwise only one of the variables needed to be included in the multivariate model.

Involvement is a dichotomous variable of whether a woman IDP is involved in community decision making after the tsunami. This variable is only statistically significant at p-value < .25 but not at < .20 with 95% CI of (.957, 1.200) which includes zero. Women who are involved in community decision making have only

1.071 times (7.1% higher) the odds of returning of those who did not. The upper bound, however, indicates that a woman IDP involved in community decision making can have odds of returning as much as 1.2 times (20% higher) those who did not.

Attendance is a dichotomous variable of whether a woman IDP attends any community meeting hold while she is in a temporary shelter. This variable is only statistically significant at p-value < .20 with coefficient of 1.081 and 95% CI of (.967, 1.209). This means that women who attended community meetings are 1.081 (8.1% higher) likely to return than those who did not attend any community meeting.

(3) Multivariate logistic regression model

Taking all the variables with p-value < .25 from the univariate analysis above, a multivariate model was then developed by simultaneously including the variables in the model. The objective is to get the simplest model, i.e. fewest explanatory variables, that provides the most information to explain variability within the dependent variable. Wald statistics are used to decide which explanatory variables should be included in the model. That is, the bigger contribution of an explanatory variable, the more likely it will be included in the model. Table 3.9 shows a possible final result considered "the best" model from this analysis.

All variables in consideration are statistically significant at p-value < 0.05 except two shelter size levels, 41-80 m2 and > 80 m2 and two acquaintances category of "few" and "fair". The Hosmer-Lemeshow test indicates that the overall model adequately fits the data (p-value = .369). This model predicts at least 71.0% of data correctly into "Yes" or "No" of the plan to return among the IDPs based on observed and predicted classification table. Furthermore, "shelter type" is the "most important" explanatory variable in the model as it gives the highest contribution in explaining the

dependent variables. This is indicated by the relatively higher Wald statistics for "shelter type" compared to other variables.

Table 3.9

Logistic regression analysis of decision to return to original settlement (village) among women IDPS in Aceh based on "social capital" explanatory variables

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Shelter type:								
Host Family			180.843	2	.000			
Barrack	1.157	.087	178.302	1	.000	3.182	2.685	3.771
Tents/makeshift structure	.752	.107	49.137	1	.000	2.120	1.718	2.616
Shelter size								
<21 m2			31.396	3	.000			
21-40 m2	.386	.077	25.475	1	.000	1.472	1.267	1.710
41-80 m2	.059	.117	.256	1	.613	1.061	.844	1.334
>80 m2	.029	.157	.034	1	.854	1.029	.757	1.399
Number of acquaintances								
Very few			38.064	4	.000			
Few	-.015	.159	.009	1	.926	.985	.722	1.345
Fair	-.119	.154	.592	1	.441	.888	.656	1.202
Many	-.382	.136	7.877	1	.005	.683	.523	.891
Very many	-.558	.143	15.262	1	.000	.572	.432	.757
Land ownership (Yes)	.596	.070	71.741	1	.000	1.816	1.582	2.084
Having friend(s) (Yes)	.617	.089	48.162	1	.000	1.854	1.557	2.206
Constant	-1.486	.148	101.110	1	.000	.226		

-2 log-likelihood = 6221.240

In the model in Table 3.9, the reference is based on an IDP who lives in a "host family" of the size "less than 21 m2", having "very few acquaintances", with "no land" in the original settlement and "no new friends" in the TLC. Thus, the following analysis is comparing possible alternative models to this reference model.

Other variables held constant, women IDPs living in barrack and tents have consecutively 3.182 and 2.120 times the odds of those living with host families to aspire to return to their original settlement. This is consistent with the findings in the univariate analysis for shelter type as shown in Table 3.6. Higher aspiration to return

among IDPs living in barracks might well indicate grim living condition in the barracks. This aspiration is even higher than those of women IDPs living in tents or other makeshift structures. All in all, this can also mean that tsunami IDPs feel much more comfortable living with host families of relatives, kinship, or other fellow villagers based on *gampong* relation. It is, therefore, also indicative that Acehnese have and have utilized "social capital" for survival after the catastrophe.

Based on shelter size, the model somehow is inconsistent with the univariate analysis in that the signs are all positive instead of negative. But the trend is similar, that is, the bigger the size of a TLC tends to decrease the intention to return. This model indicates that women IDPs living in a shelter of size 21-40 square meters are 1.472 times more likely to return to the original settlement than those who live in a shelter of size 21 square meters or smaller. But, as the TLC size becomes bigger, the odd of returning become smaller, albeit not statistically significant. This might relate to the shelter type where shelters of 21-40 square meters are most probably in the type of "barracks", which indeed show aspiration to return higher than those living in both "tents" and "host families". Though it needs further investigation, in general "host families" can be said to offer larger size for temporary shelters than those living in barracks or tents. Even when the host families might not have a large size physical structure, the Acehnese are familiar with the saying that "what is more important is to have 'large heart', "*hati yang lapang*" to accept their acquaintances in their residence during the hardship".

The more acquaintances from the original village before tsunami a woman IDP has seems to decrease the odd of returning. Other variables held constant, the odd to return decreases as the number of acquaintances increase from "few" to "very many", that is, from .985 to .572 times the odd of those who has "very few" acquaintances.

The negative direction is consistent with the expected outcome and the finding in the univariate analysis.

Although the odds associated with land ownership in the multivariate model is less than the odds in univariate model, it is still a significant determinant in the multivariate model. The odds of returning for those who have land in the tsunami affected areas is 1.816 times (81.6% higher than) those who do not have land, other variables held constant. Land ownership can double (2.084) the aspiration to return compared to those without land ownership. In some cases of this study, the odds of returning based on land ownership can be as much as twice the of those who do not own land. Lastly, a woman IDP who has new friend(s) in the temporary shelter is 1.854 more likely (85.4% higher) to return to their original settlements.

To test for whether "friends" and "acquaintances" are correlated, variable "friends" was first dropped from the model. The result is a model that poorly fits the data. Based of the Hosmer and Lemeshow test, the Chi-square statistics is 38.855 and p-value < 0.05. Similarly, if we drop "acquaintances" from the model, we also find a poorly fit model with Chi-square statistics of 16.698 and p-value < 0.05. Therefore, the model in Table 3.9 seems to be the "best" model to fit the data available in this analysis.

(4) Robustness of the model

For two probit model, the selection model is developed using "having land" as the dependent variable as presented in Appendix 3.B. The independent variables chosen for the selection model are age category, pre-tsunami marital status, whether the IDP is a head of household, and whether the respondent lost any family member. All coefficients in the selection model are statistically significant. Similarly, the second probit model which is based on censored samples screened by the first model

(the selection model) indicates the robustness of the logit model in Table 3.9. All the coefficients included in logit model are also statistically significant in the probit model.

The same data are used to estimate a multinomial logit model with four original categories of "where the IDPs think they would be in two years after the tsunami", using "will still be here" as reference, as shown in Appendix 3.C. Again, the coefficients of the variables confirm the significance found in the logit model on Table 3.9. That said, however, logit models are preferable as they enable straight forward interpretations.

3.7 Concluding Remarks

There is a strong indication that women IDPs in Aceh use social capital in determining their decision to return or not to return to their original settlement prior to the quake and tsunami. In general, women IDPs with more social capital are more likely to return than those who have no or limited social capital. Association to friendship and acquaintances, for instance, are important determinants in decision making among IDPs. IDPs with friend(s) in a temporary settlement are 1.854 times (85.4%) more likely to return than those who do not have one(s). Having acquaintances from the original village on the other hand, has a significant but negative relation to the immediate aspiration to return. The more acquaintances from an original village a woman IDP has at a TLC, the more likely she will be staying at the TLC. In contrast, the fewer the acquaintances, the more likely a woman IDP wants to return to her original settlement. This phenomenon is understandable as one might choose to stay wherever one feels more secure with the presence of acquaintances.

IDPs' temporary shelter type and size somewhat mirror social relationships within communities in Aceh. The fact most IDPs, almost 70% at one point, live in

with “host families” indicates the existence of social capital in Acehnese society. Somehow confirming previous reports on the grim living situation in government-provided “barracks”, IDPs have stronger aspirations to leave barracks, three times higher than host families, to return to their original settlement. Their aspiration is even higher compared to IDPs living in tents/makeshift structures. IDPs living under tents/makeshift structures are more than twice as likely to return than those living in host families. This might be also a good indication of independent-minded or resilient communities within Acehnese society. That is, people prefer living free under tent/makeshift structures than living in confined barracks. Indeed, many IDPs soon returned to their land and erected a tent or put up a makeshift structure on the land after being granted permission by the government to return.

IDPs association to community and its behavior is also evidenced through shelter size and land ownership. IDPs living in smaller temporary shelters are more likely to return to original villages than those who live in bigger ones. In some cases, the likelihood can be as much as twice higher.

Although further investigation is needed, the findings from this survey are as expected. Acehnese, for example, are culturally sensitive to the matter of residence size. Women are specifically sensitive to kitchen size in which women not only cook but also socialize (Nurasiah *et al.* 2007). Multiple families living in the same house or other type of shelter can cause reasonable discomfort. Women in Aceh who usually socialize from their kitchens are especially sensitive to sharing their “territory.” In many cases, when multiple families share a kitchen, Acehnese tend to take turns rather than using it simultaneously. Therefore, no matter how welcoming a host family is, for example, in accepting IDPs, people usually have a sense of limit due to their pride and independent-minded behavior. Additionally, as land is culturally and socially very important to families in Aceh, it is very reasonable that women also decide to return or

not based on land ownership. Women IDPs with land ownership in the affected areas are 1.816 times (81.6% higher) more likely to return than those without land ownership.

If anything can be learned from the women IDPs and the displacement condition they have to endure, at least two lessons stand out: (1) amid the catastrophe, women in Aceh did find ways to survive utilizing social capital within their communities. In general, one can expect to see strong individual women survivors and, more so, collective communities in Aceh; (2) humanitarian and relief aid, unless culturally sensitive, can undermine the social relationships within communities in Aceh. Worse, culturally insensitive interventions can limit the achievement of rehabilitation and reconstruction processes in post-tsunami Aceh. Imposition of barrack provision by the government, for instance, has wasted resources otherwise more useful for speedy return of the IDPs to their original settlement. Barracks have been seen as the worst shelter by women IDPs in Aceh.

3.8 Limitation

The UNIFEM survey result lacks several variables traditionally related to migration decision. Although the questionnaires asked to list the family member residing in the TLC of an interviewee, including age and education, the data failed to include these important demographic indicators. The income and occupation data were also not included because there was no sufficient information in the survey that covered these aspects.

APPENDIX 3.A

Summary statistics of women IDPs response in UNIFEM survey

A. Continuous Variable

Table 1 Descriptive statistics of age and total distance

	N	Minimum	Maximum	Mean	Std. Deviation
Respondent Age	5869	15	92	35.51	13.68
Distance from TLC to original village (in km)	5869	1	969	42.76	97.38
Valid N (listwise)	5869				

B. Categorical Variable

Table 2 Respondent Age category

	Frequency	Percent	Cumulative Percent
Under 18	377	6.4	6.4
18-25	1315	22.4	28.8
26-30	846	14.4	43.2
31-40	1276	21.7	65.0
41-50	1295	22.1	87.1
51-60	541	9.2	96.3
Above 60	219	3.7	100.0
Total	5869	100.0	

Table 3 Grouped distance of TLC from original village (in km)

	Frequency	Percent	Cumulative Percent
up to 1 km	886	15.1	15.1
between 1 to 5 kms	664	11.3	26.4
between 5 to 10 kms	1844	31.4	57.8
between 10 to 25 kms	1123	19.1	77.0
between 25 to 100 kms	598	10.2	87.2
between 100 to 250 kms	471	8.0	95.2
between 250 to 500 kms	246	4.2	99.4
more than 500 kms	37	.6	100.0
Total	5869	100.0	

Table 4 Grouped distance of TLC from original village (in km)

	Frequency	Percent	Cumulative Percent
Distance up to 25 kms	4517	77.0	77.0
Distance up to more than 25 kms	1352	23.0	100.0

	Frequency	Percent	Cumulative Percent
Distance up to 25 kms	4517	77.0	77.0
Distance up to more than 25 kms	1352	23.0	100.0
Total	5869	100.0	

Table 5 Respondent pre-tsunami marital status

	Frequency	Percent	Cumulative Percent
Single	1266	21.6	21.6
Married	3777	64.4	85.9
Widowed-by-death	722	12.3	98.2
Widowed-by-divorce	104	1.8	100.0
Total	5869	100.0	

Table 6 Respondent post-tsunami marital status

	Frequency	Percent	Cumulative Percent
Single	1175	20.0	20.0
Married	3435	58.5	78.5
Widowed-by-death	1131	19.3	97.8
Widowed-by-divorce	128	2.2	100.0
Total	5869	100.0	

Table 7 Respondent's district of origin

	Frequency	Percent	Cumulative Percent
Simeulue	212	3.6	3.6
Aceh Singkil	104	1.8	5.4
South Aceh	119	2.0	7.4
East Aceh	140	2.4	9.8
West Aceh	808	13.8	23.6
Aceh Besar	836	14.2	37.8
Pidie	802	13.7	51.5
Bireuen	577	9.8	61.3
North Aceh	176	3.0	64.3
Nagan Raya	136	2.3	66.6
Aceh Jaya	618	10.5	77.2
Banda Aceh	1238	21.1	98.2
Sabang	47	.8	99.0
Lhokseumawe	56	1.0	100.0
Total	5869	100.0	

Table 8 Respondent's district of temporary shelter (when interviewed)

	Frequency	Percent	Cumulative Percent
Simeulue	200	3.4	3.4
Aceh Singkil	109	1.9	5.3
South Aceh	189	3.2	8.5
East Aceh	144	2.5	10.9
Central Aceh	65	1.1	12.0
West Aceh	792	13.5	25.5
Aceh Besar	1148	19.6	45.1
Pidie	974	16.6	61.7
Bireuen	603	10.3	72.0
North Aceh	191	3.3	75.2
Aceh Tamiang	37	.6	75.9
Nagan Raya	195	3.3	79.2
Aceh Jaya	473	8.1	87.2
Banda Aceh	607	10.3	97.6
Sabang	44	.7	98.3
Langsa	66	1.1	99.5
Lhokseumawe	32	.5	100.0
Total	5869	100.0	

Table 9 Type of temporary shelter (TLC)

	Frequency	Percent	Cumulative Percent
Host Family	2658	45.3	45.3
Barrack	2035	34.7	80.0
Tent	1176	20.0	100.0
Total	5869	100.0	

Table 10 Temporary shelter (TLC) size

	Frequency	Percent	Cumulative Percent
<20m2	2032	34.6	37.1
21-40m2	1949	33.2	72.8
41-80m2	1109	18.9	93.0
>80m2	382	6.5	100.0
Total	5472	93.2	
No answer	397	6.8	

	Frequency	Percent	Cumulative Percent
<20m2	2032	34.6	37.1
21-40m2	1949	33.2	72.8
41-80m2	1109	18.9	93.0
>80m2	382	6.5	100.0
Total	5472	93.2	
No answer	397	6.8	
Total	5869	100.0	

Table 11 Whether respondent a head of household

	Frequency	Percent
No	4600	78.4
Yes	1269	21.6
Total	5869	100.0

Table 12 Whether any family member lost to tsunami or conflict

	Frequency	Percent
No	3554	60.6
Yes	2315	39.4
Total	5869	100.0

Table 13 Whether respondent are happy staying in the shelter

	Frequency	Percent	Cumulative Percent
Definitely not happy	225	3.8	3.8
Not happy	832	14.2	18.0
Fair	1600	27.3	45.3
Happy	2293	39.1	84.3
Very happy	919	15.7	100.0
Total	5869	100.0	

Table 14 Number of acquaintances from original village

	Frequency	Percent	Cumulative Percent
Very few	333	5.7	5.7
Few	581	9.9	15.6
Fair	706	12.0	27.6
Many	2703	46.1	73.7
Very many	1546	26.3	100.0
Total	5869	100.0	

Table 15. Whether respondent owns land in tsunami affected area

	Frequency	Percent
No	1918	32.7
Yes	3951	67.3
Total	5869	100.0

Table 16 Whether respondent has friends in a new settlement

	Frequency	Percent
No	1142	19.5
Yes	4727	80.5
Total	5869	100.0

Table 17 Where respondent thinks she will be in the next 1-2 years

	Frequency	Percent	Cumulative Percent
Back in original village	1804	30.7	30.7
Will be in another settlement	267	4.5	35.3
Will still be here	2726	46.4	81.7
Don't know/not sure	1072	18.3	100.0
Total	5869	100.0	

Table 18 Whether respondents are hoping to return back to original back

		Frequency	Percent	Cumulative Percent
Valid	No	4065	69.3	69.3
	Yes	1804	30.7	100.0
	Total	5869	100.0	

APPENDIX 3.B

Probit Sample Selection Model

Probit model with sample selection

Number of obs	= 5843
Censored obs	= 1997
Uncensored obs	= 3846
Wald chi2(5)	= 142.92
Log pseudolikelihood = -6085.883	Prob > chi2 = 0.0000

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
next_settg1						
marstatpost	.0482592	.031164	1.55	0.121	-.0128211	.1093395
shelter	.2092539	.0347559	6.02	0.000	.1411337	.2773742
shelter_sig	-.0524587	.0283945	-1.85	0.065	-.1081109	.0031935
numofaq	-.1150056	.0198174	-5.80	0.000	-.1538469	-.0761643
friend	.4670553	.0573488	8.14	0.000	.3546537	.5794569
_cons	-.8921916	.2194135	-4.07	0.000	-1.322234	-.462149
having_land						
ageg2	.1133903	.0140173	8.09	0.000	.0859169	.1408638
marstatpre	-.102259	.0360567	-2.84	0.005	-.1729289	-.0315891
headhh	-.1120804	.0472962	-2.37	0.018	-.2047793	-.0193816
familylost	.2856455	.0351044	8.14	0.000	.216842	.3544489
_cons	.1119849	.0576111	1.94	0.052	-.0009308	.2249005
/athrho	-.3012862	.2366112	-1.27	0.203	-.7650355	.1624632
rho	-.2924892	.2163691			-.6440334	.1610488

Wald test of indep. eqns. (rho = 0): chi2(1) = 1.91 Prob > chi2 = 0.1675

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APPENDIX 3.C

Multinomial Logit Model

Parameter Estimates

Where respondent thinks she will be in the next 1-2 years[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Back in original village	Intercept	-2.079	.196	112.258	1	.000			
	Friend	1.100	.091	146.942	1	.000	3.005	2.515	3.590
	NumOfAq	-.254	.030	69.432	1	.000	.776	.731	.824
	Shelter	.513	.055	85.996	1	.000	1.670	1.498	1.861
	Shelter_SiG	-.151	.045	11.072	1	.001	.860	.786	.940
	Having_land	.553	.075	54.398	1	.000	1.738	1.500	2.013
Will be in another settlement	Intercept	-3.105	.429	52.491	1	.000			
	Friend	1.391	.235	34.979	1	.000	4.017	2.534	6.369
	NumOfAq	-.306	.060	25.750	1	.000	.737	.655	.829
	Shelter	.471	.111	18.088	1	.000	1.602	1.289	1.990
	Shelter_SiG	-.532	.106	25.001	1	.000	.588	.477	.724
	Having_land	-.030	.146	.042	1	.838	.971	.729	1.293
I don't know	Intercept	-1.746	.225	60.228	1	.000			
	Friend	1.021	.110	86.741	1	.000	2.777	2.240	3.443
	NumOfAq	-.326	.034	91.080	1	.000	.721	.675	.771
	Shelter	.404	.065	38.893	1	.000	1.498	1.319	1.701
	Shelter_SiG	-.140	.053	7.118	1	.008	.869	.784	.963
	Having_land	-.279	.080	12.086	1	.001	.757	.647	.885

a. The reference category is: Will still be here.

REFERENCES

Aassve, A., Billari, F.C., & Ongaro, F. (2001). The impact of income and employment status on leaving home: evidence from the Italian ECHP sample. *Labor,* 15(3), 501-529.

Aassve, A., Burgess, S., Chesher, A. & Propper, C. (2002). Transition from home to marriage among young Americans. *Journal of Applied Econometrics,* 17(1), 1-23.

Adger, W. N., Hughes, T.P., Folke, C., Carpenter, S.R., & Rockström, J. (12 August 2005). Social-ecological resilience to coastal disasters. *Science* 309 (5737), 1036.

Agesa, R.U., & Kim, S. (2001). Rural to urban migration as a household decision: evidence from Kenya. *Review of Development Economics,* 5(1), 60-75.

Amowitz, L.L., Reis, C., Lyons, K.H., Vann, B., Mansaray, B., Akinsulure-Smith, A.M., Taylor, L., & Iacopino, V. (2002). Prevalence of war-related sexual violence and other human rights abuses among internally displaced persons in Sierra Leone**',** *The Journal of the American Medical Association,* 287(4), 513-521.

Aulia, A. R. (2005). Modes of Displacement during Martial Law. In E. E. Hedman (Ed.). *Aceh under Martial Law: Conflict, Violence, and Displacement*. Oxford: University of Oxford RSC Working Paper No. 24, July 2005.

Avery, R., Goldscheider, F. K., & Speare, A. (1992). Feathered nest/gilded cage: parental income and leaving home in the transition to adulthood. *Demography,* 29(3), 375-388.

Bigsten, A. (1996). The circular migration of small-holders in Kenya. *Journal of African Economies,* 5, 1-20.

Blaikie, P., Wisner, B., Cannon, T., & Davis, I. (1994). *At risk: natural hazards, people's vulnerability, and disasters*. New York: Routledge.

Brook, V.T., & Paul, B.P. (2003). Public response to a tornado disaster: The case of Hoisington, Kansas. *Papers of the Applied Geography Conferences,* 26, 343–351.

BRR. (2005). *Aceh and Nias one year after the Tsunami: The recovery effort and way forward*, A Joint Report by BRR and International Partners.

Cannon, T. (1994). Vulnerability analysis and the explanation of 'natural' disasters. In A. Varley (ed.) *Disasters, Development and Environment,* pp. 13–30. New York: John Wiley & Sons, Chichester.

Chandra, V., Pandav, P. & Bhugra, D. **(**2006). Mental health and psychosocial support after the tsunami: observations across affected nations. *International Review of Psychiatry*, 18(3), 205 – 211

Chau, Nancy H. (1997). The pattern of migration with variable migration cost. *Journal of Regional Science,* 37(1), 35-54

Clarke, J. I., Curson, P., Kayastha, S.L., & Nag, P. (1989). *Population and disaster*. Oxford and Cambridge: Basil Blackwell

Connel, J., Dasgupta, B., Laishley, R. , & Lipton, M., (1976). *Migration from rural areas: The evidence from village studies*, Delhi: Oxford University Press

Curson, P. (1989). Introduction. In Clarke, J. I., Curson, P., Kayastha, S.L., & Nag, P. (Eds.). *Population and Disaster*. Oxford and Cambridge: Basil Blackwell

De Jong, G. J., Liefbroer, A. C., & Beekink, E. (1991). The effect of parental resources on patterns of leaving home among young adults in the Netherlands. *European Sociological Review,* 7, 55-71.

De Jong, G.F. (2000). Expectations, gender, and norms in migration decision-making' *Population Studies*, 54(3), 307-319.

Doocy, S., Gabriel, M., Collins, S., Robinson, C., & Stevenson, P. (2006). Implementing cash for work programmes in post-tsunami Aceh: experiences and lessons learned. *Disasters,* 30(3), 277–296

Field, John. (2003). *Social capital: A brief note.* New York: Routledge.

Fukyama, F. (1995). *Trust: The social virtues and the creation of prosperity.* New York: Free Press.

Gardner, R. (1981). Macrolevel influences in the migration decision process. In G. de Jong & Gardner, R.(Eds.). *Migration Decision Making,* pp.58-89. New York: Pergamon Press**.**

Global IDPS Project, *Internal displacement: A global overview of trends and developments in 2003.* Geneva, February 2004.

Goss, E.P., & Paul, C. (1986). Age and work experience in the decision to migrate. *The Journal of Human Resources,* 21(3), 397-405.

Greene, W. H. (1997). *Econometric Analysis*. New York: Macmillan Publishing Company.

Harris, J., & Todaro, M. (1970). Migration, unemployment and development: a two sector analysis. *American Economic Review*, 60, 126-142.

Hartman, C., & Squires, G.D. (2006). Pre Katrina, Post Katrina. In Hartman, C., & Squires, G.D. (Eds.). *There is no such thing as a natural disaster: race, class, and Hurricane Katrina.* New York: Routledge

Hatmadji, S.H. (2006). *UNDP Gender Analisys SPAN Report*. 18 July 2006 available at http://www.humanitarianinfo.org/sumatra/reliefrecovery/ livelihood/ (accessed 10 January 2007)

Heckman, J. (1979). Sample selection bias as a specification error', *Econometrica*, 47:153-161.

Hosmer, D.W., & Lemeshow, S. (2000). *Applied Logistic Regression*. New York: Wiley

HR Watch, New York - http://www. hrw. org/english/docs/2004/04/01/malays8379. htm (accessed 10 Aug 2006)

Hugo, G. (2002). Pengungsi-Indonesia's internally displaced persons". *Asian and Pacific Migration Journal*, 11(3), 297-331.

Hurgronje, Snouck (1906) translated by A.W.S. O'Sullivan with Index by R.J. Wilkinson. *The Achehnese*. Vol I-II. Leyden, late E. J. Brill; London, Luzac & Co.

Hedman, E. E. (2005). Back to the barracks: *Relokasi* pengungsi in post-Tsunami Aceh. *Indonesia* 80 (October 2005), 1-19

Hedman, E.E. (2006). The right to return: IDPs in Aceh. *Forced Migration Review*, 25, 70.

Hudspeth, C. (2005). Accessing IDPs in post-tsunami Aceh. *Forced Migration Review*, Special Issue, 19-21.

Hyndman, J., & McLean, J. (2006)**.** Settling like a state: Acehnese refugees in Vancouver. *Journal of Refugee Studies.* 19(3), 345-360.

Kalin, W. (2005). Natural disasters and IDPs' rights. *Forced Migration Review*, Special Issue, 10-11.

Kenny, S. (2007). Reconstruction in Aceh: building whose capacity?. *Community Development Journal*, 42 (2), 206-221

Khan, S.B.A.L. (2007). *The jewel affair: The sultanah, her orangkaya and the Dutch foreign envoys*, First International Conference of Aceh and Indian Ocean Studies, Asia Research Institute, National University of Singapore and The Aceh-Nias Rehabilitation and Reconstruction Agency, Banda Aceh, 24-26 February 2007 (cited with permission).

Killian, L.M. (1952). The significance of multiple-group membership in disaster", *The American Journal of Sociology,* 57(4), 309-314.

Kleinbaum, D. G., Kupper, L.L., Muller, K.E., & Nizam, A. (1998). *Applied regression analysis and other multivariate methods.* New York: Duxbury Press.

Lavell, A. (1994). Opening a policy window: The Costa Rican hospital retrofit and seismic insurance programs 1986–1992. *International Journal of Mass Emergencies and Disasters,* 12(1), 95–115.

Lee, VJ., Low, E., Ng, YY., & Teo, C. (2005). Disaster relief and initial response to the earthquake and tsunami in Meulaboh, Indonesia. *Annals Academy of Medicine Singapore,* 34(9), 586-590.

Age, L. (2005). IDPs confined to barracks in Aceh. *Forced Migration Review*, Special Issue (July 2005), 22-23.

Mahdi, S., Muhyiddin, Famelia, C. (2006). *Tracking changes: where Al-Mukarramah neighborhood stands one year after Tsunami.* Banda Aceh: Yayasan Masyarakat Iqra-UN-HABITAT Aceh and Nias Shelter Support Program (ANSSP).

Mahdi, S. (2006). *IDPs and poverty problem: Evidence from Aceh conflict and Tsunami IDPs mobility and its spatial statistics.* Paper presented at The 8th Indonesian Regional Science Association (IRSA) International Conference, 18-19 August 2006, University of Brawijaya, Malang, East Java, Indonesia

Mahdi, S. (2007). *Where do IDPs go? Evidence of social capital from Aceh conflict and Tsunami IDPs.* Paper presented at The First International Conference of Aceh and Indian Ocean Studies (ICAIOS), Asia Research Institute, National University of Singapore and The Aceh-Nias Rehabilitation and Reconstruction Agency, Banda Aceh, 24-26 February 2007

McKenzie, D., & Rapoport, H. (2007). Self-selection patterns in Mexico-U.S. migration: the role of migration networks. *Policy Research Working Paper Series 4118,* The World Bank.

Mooney, E. (2005). The concept of internal displacement and the case for internally displaced persons as a category of concer. *Refugee Survey Quarterly*, 24(3), 9-26.

Nah, A.M. (2005). Ripples of hope: Acehnese refugees in post-Tsunami Malaysia. *Singapore J. of Tropical Geography,* 26(2), 249

Nishikiori, N., Abe, T., Costa, D.G.M., Dharmaratne, S.D., Kunii, O., & Moji, K. (2006). Timing of mortality among internally displaced persons due to the tsunami in Sri Lanka: cross sectional household survey. BMJ 332, doi:10.1136/bmj.332.7537.0-c, from http://www.bmj.com/cgi/content/full/332/7537/0-c.

Nursaniah, C., Wulandari, E., & Setiawan, W. (2007). Identifikasi tingkat kesesuain hunian terhadap karakter penghuni. Research report, Banda Aceh: The Aceh Institute.

Oddland, J., & Ellis, M. (1988). Household organization and the interregional variation of out-migration rates. *Demography,* 25(4), 567-579.

Oxfam Briefing Note "The Asian Tsunami: The challenge after the Jakarta summit" (7 January 2005) from http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/bn_tsunami.pdf (retrieved 3 February 2008)

Oxfam Briefing Note "The Asian Tsunami: three weeks on" (14 January 2005) from http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/bn_tsunami2.pdf (retrieved 3 February 2008)

Oxfam Briefing Note "The tsunami's impact on women" (March 2005) from http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/bn_tsunami_women.pdf (retrieved 3 February 2008)

Oxfam Briefing Note "Making the case for cash: Humanitarian food aid under scrutiny" (8 April 2005) from http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/bn_cash.pdf (retrieved 3 February 2008)

Oxfam Briefing Note "Targeting Poor People: Rebuilding lives after the tsunami" (25 June 2005) from http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/bn_tsunami_6months.pdf (retrieved 3 February 2008)

Oxfam Briefing Note "A place to stay, a place to live: Challenges in providing shelter in India, Indonesia, and Sri Lanka after the tsunami" (14 December 2005) from http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/bn_tsunami_shelter.pdf (retrieved 3 February 2008)

Oxfam Briefing Note **"**Back to work: How people are recovering their livelihoods 12 months after the tsunami" (20 December 2005) from

http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/bp84_tsunami_livelihoods.pdf (retrieved 3 February 2008)

Oxfam Briefing Note "The Tsunami Two Years On: Land Rights in Aceh" (30 November 2006) from http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/bn_tsunami_twoyears.pdf (retrieved 3 February 2008)

Parker, D., Islam, N, & Chan, N.W. (1997). Reducing vulnerability following flood disasters: Issues and practices'. In A. Awotona (ed.). *Reconstruction after disaster: Issues and practices* (pp. 23–44). Aldershot: Ashgate.

Paul, B. K. (2005). Evidence against disaster-induced migration: the 2004 tornado in north-central Bangladesh. *Disaster* 29(4), 370-385.

Pedraza, S. (1991). Women and migration: the social consequences of gender. *Annual Review of Sociology,* 17, 303-325

Putnam, R. D., Leonardi, R., & Nanetti, R. Y. (1993a). *Making democracy work: Civic tradition in modern Italy.* Princeton: Princeton University Press.

Putnam, R.D. (1993b). The prosperous community. *American Prospect,* 13(Spring), 35-42.

Putnam, R. D. (1995). Bowling alone: America's declining social capital. *Journal of Democracy,* 6(1), 65-78.

Putnam, R.D. (2000). *Bowling alone: The collapse and revival of American community.* New York: Simon and Schuster

Rofi, A., Doocy, S., & Robinson, C. (2006). Tsunami mortality and displacement in Aceh Province, Indonesia. *Disasters,* 30(3), 340-350.

Root, B.D. , & de Jong, G.F. (1991). Family migration in a developing country. *Population Studies,* 45(2), 221-233.

Ross, M. L. (2003). *Resources and Rebellion in Aceh, Indonesia.* Prepared paper for The Yale-Word Bank project on The Economics and Political Violence. (Quoted with permission)

Sandell, S.H. (1977). Women and the economics of family migration. *The Review of Economics and Statistics,* 59(4), 406-414.

Siapno, J. A. (2007). Living displacement: everyday politics of gender, silence, and resilience in Aceh. In E. E. Hedman (Ed.). *Conflict, Violence, and Displacement in Southeast Asia.* Ithaca: Cornell University Press.

Smith, K., & Ward, R. (1998). *Floods: physical processes and human Impacts*. New York: John Wiley & Sons.

Stecklov, G., Winters, P., Stampini, M., & Davis, B. (2005). Do conditional cash transfers influence migration? A study using experimental data from the Mexican Progresa Program. *Demography*, 42(4), 769-790.

Sulistyanto, P. (2001). Whither Aceh? *Third World Quarterly*, 22(3), 437-452

Tarrow, S. (1996). Making social science work across space and time: A critical reflection of Robert Putnam's 'Making Democracy Work'". *American Political Science Review,* 90(2), 389-397.

Tripa, S. (2006). *Memahami Budaya dalam Konteks Aceh* (Understanding Culture in The Aceh Context), Opinion on www.acehinstitute.org, 16 May 2006 (accessed 10 December 2006)

Turner, R. H., & Killian, L.M. (1987). *Collective behavior.* Englewood Cliffs, NJ: Prentice-Hall.

Van den Ven, W.P.M.M., & Van den Praag, B.M.S. (1981). The demand for deductibles in private health insurance: a probit model with sample selection. *Journal of Econometrics,* 17, 229-252

Van Klinken, G. (1999). Towards a mapping of 'at risk' ethnic, religious and political groups in Indonesia. *Inside Indonesia* 86. [accessed 10 April 2006]. Available from: http://www.serve.com/inside/digest/dig86.htm.

Vebry, M. (2006). *Rumoh & Gampong* (Housing and Gampong), published in "Oase" at www.acehinstitute.org on 1 December 2006 (accessed 5 January 2007).

Verbeek, M. (2004). *A Guide to Modern Econometrics,* 2nd ed., John Wiley & Sons Ltd. Chichester

Whittington, L. A., & Peters, H. E. (1996). Economic incentives for financial and residential independence. *Demography*, 33, 82-97

Wooldridge, J.M. (2002). *Econometric analysis of cross section and panel data.* Massachusetts: Library of Congress.

World Bank. (2005). *Indonesia: Preliminary Damage and Loss Assessment: The December 26, 2004 Natural Disaster*, A Technical Report