Migration, Ageing, and Economic Development in Indonesia[1]

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Three Possible Patterns

Roughly, in 1960s and 1970s fertility had been one of very popular subjects in demographic studies because of the concern on high population growth in developing countries. Then, 1980s see a rising number of studies on mortality and health (particularly reproductive health) as fertility had been declining. The 1990s pay an increasing attention to the last demographic variables—migration. With the increasing globalization and the progress in demographic (including migration) transition, the three demographic variables (fertility, mortality, and migration) have received a different perspective, particularly on the close relationship among them. During 2000s, in an increasing number of countries, the issue on fertility has currently shifted to low fertility and mortality, and the resulting ageing. Furthermore, the relationship between the three demographic variables vary, depending on the stage of economic development.

Ananta and Arifin (2009) described three possible patterns on the relationship. The first pattern is what they called as "slowed ageing process in rich economies". Low fertility and mortality have resulted in high old-dependency ratio and shortage of younger workers. Migrants have entered the economy to fill in the shortage and be attracted by the relatively higher wages in the rich economy. Though the migrants can help to fill in the shortage of workers, they may also produce social and political tensions between locals and migrants. Singapore is an example. The combination of low fertility and mortality rates on one hand and high flow of in-migrants on the other has resulted in the decline of the percentage of Singaporean among the total population of Singapore. In short, in this pattern, in-migration responded to the high economic growth and ageing population. In-migration has lowered the ageing ratio.

The second pattern is the opposite from the first one. It is usually found in poor, rural economies. Rural areas in South Korea are an example. They have low fertility and mortality rates, yet the economy is not attractive enough to bring migrants into the economy. The young workers, who are already in a short supply, leave the rural areas, aggravating the ageing problems in rural areas. The district of Pacitan in the province of East Java, Indonesia, is another example. Ananta and Arifin called this pattern as "accelerated ageing process in poor economies". Here, the poor economy drives people out and out-migration aggravates the ageing population.

The third pattern is "deferred ageing process in rich economies", usually found in relatively advanced urban economies with recent low fertility and mortality rates. The ageing ratio is still relatively low, because of the long-history of in-migration. Brunei Darussalam is an example. The ageing ratio is low, though fertility and mortality have recently been relatively low. Brunei Darussalam has experienced a long history of in-migration because of its high income per capita. Jakarta, the capital of Indonesia, and Kuala Lumpur, the capital of Malaysia, are two other examples of this pattern. However, Jakarta and Kuala Lumpur may soon shift to a different pattern of an accelerated ageing process, if the current trend of migration out of the two cities continue. In the third pattern, in-migrants have often been seen as an important factor of the economic growth of the receiving economies though they are attracted by the economic magnet of the receiving economies. Ageing may not be the pull factor of the migration.

This paper attempts to further examine the relationship among migration, ageing, and economic development, utilizing the availability of 2000 Indonesian population census, with district as the unit of analysis. The census made a breakthrough by conducting the first time 100% enumeration census. This large-scale census has provided a much better reliability of estimation at district level, including the ones on fertility and mortality rates, migration rate, urbanization rate, level of education, ethnicity and religion. Based on the 2000 Population Census, Indonesia had 30 provinces and 340 districts (regency/*kabupaten* and city/*kotamadya*), but these numbers have increased since then and they will keep increasing in the near future. It is also the first time Indonesia collected information on ethnicity, a very important determinant of demographic changes, since 1930 population census.[2] Therefore, for the purpose of this study, this paper focuses on what happened around 2000. The economic variables also refer to the 2000.

In this paper, not only do we conduct an econometric test on the relationships among the three variables, we also examine the possible causality among them. However, because of limitation of space and time, this paper limits the discussion on in-migrants, and therefore it excludes part of the discussion of out-migration in the second pattern. Therefore, this paper focuses on the relationship between in-migration (rather than out-migration), ageing and economic development. Other studies should follow to examine the second pattern and combine the three.

Another feature of this paper lies in the use of ethnicity and religion as two of the determinants of migration in Indonesia, a large country with about 1,000 ethnic and sub-ethnic groups speaking completely different languages. The statistics on these two variables have been made possible, for the first time, by the 2000 population census.

This paper first describes the demographic transitions, economic development, ageing, and migration in Indonesia around 2000, the focus of the examination of the possible relationship among migration, ageing, and economic development in Indonesia. It details their regional variation, especially the variation at the district level, the unit of analysis used in the econometric analysis. The detailed data on ethnicity (percentage of Javanese), religion (percentage of Muslims), education (educational attainment), migration, urbanization, and per capita income at the district level are referred to Ananta, Arifin, and Suryadinata (2004); while that on ageing, Arifin and Ananta (2004).

ECONOMIC DEVELOPMENT

Economic development is a complex, multi-dimensional concept. There is no single variable that can properly indicate economic development. It is not surprising, therefore, that there have been many pros and cons on the concepts and measurements of economic development. The narrowest concept defines economic development simply as economic growth and the pre-occupation with measurement of income, and production, of the region. This concept assumes that high economic growth and high per capita income are the necessary conditions to provide other, broader, aspects of economic development, such as education, health, and population mobility. It also implicitly assumes that without high growth rate, poverty will remain high. With this concept, a high growth rate of the income, for example at 7 or 8% annually, is a prerequisite for eradicating poverty and achieving the aims in the broader aspects.

The broader concept includes changes in the structure of the economy as well as the quality of life of the people. It does not assume that high growth rate is necessarily the condition for more equal income-wealth distribution and declining poverty. A district with high per capita income can have a high poverty rate if the income-wealth accrues to a very small percentage of the population in the district. This concept does not focus on achieving a very high growth rate, but it concentrates directly on achieving the aims of the broader aspects of development, including direct strategy in eliminating poverty. With this concept, the growth of per capita income is still needed, otherwise the country or region does not have anything to provide to the population. Nevertheless, the importance of high growth rate is much less important in this concept. This concept emphasizes on a combination between per capita income and some other indicators.

Though there have been many critics in the use of per capita income as an indicator of economic development, per capita income is still the most widely used indicator of economic development, and a wise use of the information on per capita income may still help better understand the development, including the regional development at the district level in Indonesia. Therefore, this paper still utilizes per capita income as an indicator of economic development. The data used in this study refer to the 1998, estimated by the BPS, as cited from BPS, Bappenas, and UNDP (2001). We use the data for 1998 because the data on migration, as discussed later, refer to the period of 1995-2000.[3]

Variation in economic performances throughout Indonesia has been relatively large. In 1998, there are some resource-rich provinces, with East Kalimantan as the province having the highest per capita income, more than four times the national per capita income. Other resource-rich provinces were Riau, Papua, and Aceh. Jakarta, without natural resources but the capital of Indonesia, was the second richest province in Indonesia, having more than three times the national per capita income. Bali, endowed with tourism, followed Aceh, with per capita income slightly above the national figure.

On the other hand, some provinces were very poor. East Nusa Tenggara was the poorest, having less than half of the national per capita income. It was followed by West Nusa Tenggara, Southeast Sulawesi, Lampung, and Central Sulawesi. It is worth noted that all of these richest and poorest provinces were located in the Outer Islands (outside the

Island of Java), except the province of Jakarta. More specifically, two rich provinces (Papua and Bali) and all (except Lampung) poorest provinces were located in eastern Indonesia.

Most of the districts, either regency or city, in the Island of Java also had per capita income smaller than the average of per capita income of the districts in whole Indonesia. However, some cities in the Island of Java had per capita income larger than the national figure. For example, the city of Salatiga is a special city as it has enjoyed its autonomy since thousand years ago, or in 750 when the Bhanu King (Raja Bhanu) was in charge at that time. Manufacturing industries were one of the sources of income especially garment industries and also food processing. Trade, hotels and restaurants as well as services were other sources (Kirana, 2003). It is not surprising that this city had attracted people to come and stay. The data shows that the migrants to this city surpassed two digits, precisely 10.9%, in the 1995-2000, bringing Salatiga as the most interesting place for migrants in the province of Central Java.

Magelang was a city in Central Java having more than 10% of the population as migrants. Magelang is well-known among the Armed Forces as Sekolah Akademi Militer is located. This city is strategically located in the route of the main transportation linking Semarang, the capital city of the province, and Yogyakarta. Therefore, transportation and communication is the second source of its GDP after services (Setyowati, 2003).

The palace, *batik* and Klewer market are the three icons for the city of Surakarta. Tertiary sectors such as trade, hotel and restaurants, transportation and communication, and also services account for nearly 60% of its GDP (Gianie, 2003). The city of Surakarta is the fourth destination for the migrants after the city of Semarang.

On the other hand, the three poorest districts in the whole Indonesia were found in the poorest province of East Nusatenggara. They were regencies of South Central Timor, West Sumba, and Manggarai. Interestingly, the fourth poorest district in Indonesia was the regency of Jayawijaya, located in the third richest province of Papua. The fifth poorest district is regency of Grobogan in the non-poor province of Central Java. At the other extreme, the regency of Fakfak was the richest district in Indonesia, located in the third richest province of Papua. Fakfak obtained its enormous wealth from the mining and it was a district of an extreme outlier. The per capita income in Fakfak was more than double the per capita income of the Indonesian second richest district, the city of Kediri in the non-rich province of East Java. Kediri is often identical with the municipality of cigarette, because of the overwhelming dominance of the Gudang Garam cigarette factory on Kediri's economy.

DEMOGRAPHIC TRANSITIONS

Indonesian population is the fourth largest in the world, after China, India, and the United States of America. The number was 205.8 million in 2000, more than three times as that in 1930.

The success of the national family planning program has resulted in a relatively fast decline in fertility in Indonesia. TFR (total fertility rate) has declined from 5.6 in the late 1960s to around 2.2 in the period of 2000-2005.[4] Four provinces namely Jakarta, Yogyakarta, East Java and Bali have reached below replacement level even earlier, reaching TFR below 2.1 in the period of 1996-1999. Central Java has almost reached replacement

level. Therefore, except West Java, all provinces in Java-Bali region have been categorised as low fertility provinces. On the other hand, most provinces in the Outer Java-Bali region still have relatively high TFR, above 2.5. It should be noted that there are exceptions. North Sulawesi has reached replacement level, and South Kalimantan had TFR of 2.33. The baby boom generations, born in the 1950s and 1960s, will transform into the elderly boom in the 2020. The population structure is changing toward an old structure, marked by a decline in the proportion of the young population and an increase in the proportion of the older population.

The declining fertility and ageing process in Indonesia have been accompanied by rising population mobility. The rapid decline in fertility and increase in expectancy of life, in addition to the improvement in information and means of transportation, have contributed to the rising population mobility. Furthermore, as argued by Hugo (1997), the overall propensity of Indonesians to move has increased and the pattern of movement has become increasingly more complex. The increasingly mobile Indonesians may also indicate a widening geography of the Indonesian labour market and a rising level of exposure to the external world--national and international markets. This mobility has been accompanied by a range of socio-economic changes such as in values of children and family, income, education, information, transportation and communication.

One of the important changes in the type of population mobility is the rising migration from rural to urban areas accompanying economic growth. Consequently, migration from rural to urban areas has contributed to the growth of urban population.[5] Indeed, the urban population in Indonesia had grown from 4.6% annually in the period of 1971-1980 to 5.4% in the period of 1980-1990 (Firman, 1997) but declined to 4.3% in the period of 1990-2000. The growth rate of the urban population is clearly faster than that of the population as whole, from 2.37% in the period of 1971-1980 to 1.96% in the period of 1980-1990 and 1.37% in the period of 1990-2000.[6] As a result, urbanization rate (defined as the proportion between the number of population living in an urban area and the number of total population in the area) has increased rapidly from 17.1% in 1971 to 30.9% in 1990 and 42.4% in 2000.

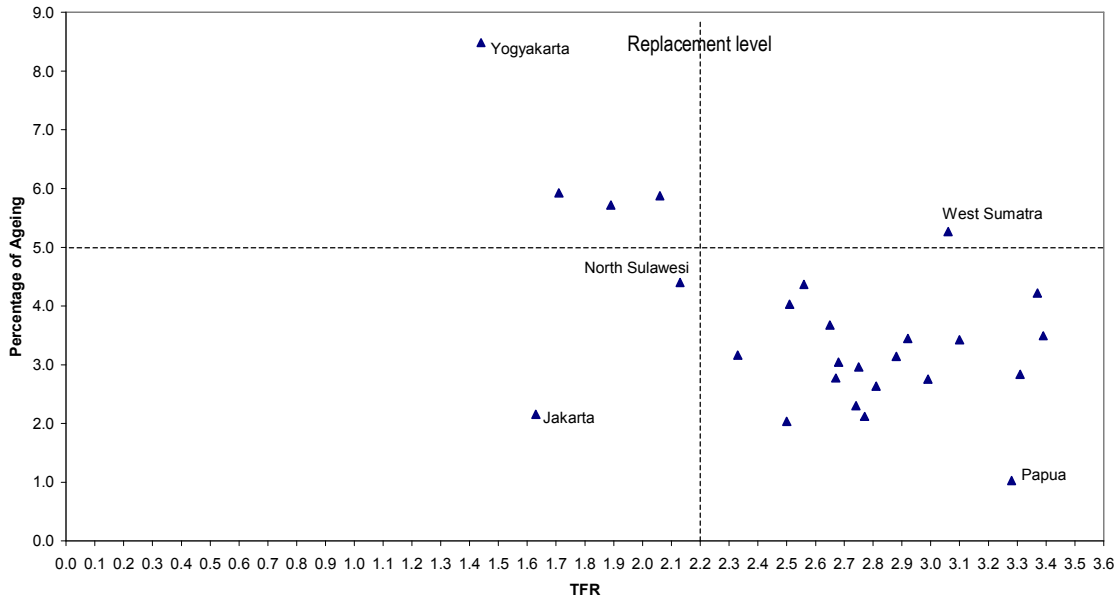
As a result, the relatively fast demographic changes in Indonesia, the rising income and education of the population, and the introduction of regional autonomy in 1999[7] have resulted in the rising importance of ageing and population mobility in Indonesian regional economic development, especially at the district level.

AGEING

Roughly, a population is classified as a young population when ageing proportion is less than 5.00%, an intermediate population when ageing proportion is between 5.00% and 10.00%, or an old population when ageing proportion is more than 10.00%. Ageing proportion is here defined as the percentage of population aged 65 years old and above to the total population. With this classification, Indonesian population was still considered as a young population until the year 2000, though the proportion has risen from a very low 2.05% in 1971 to 4.41% in 2000.[8]

Figure 1 shows that most provinces in 2000 were still young population. None was old population. Only five provinces were intermediate population, with four provinces (Central Java, Yogyakarta, East Java, and Bali) in the Islands of Java-Bali. Yogyakarta, East Java, and Bali have already been below replacement level and Central Java was almost entering the below replacement level. West Sumatra was the only province in the Outer Java-Bali with intermediate population—the famous *merantau (*tradition of out-migration) in this province may contribute to this relatively high ageing proportion in this province, while the fertility in this province was still relatively high, at TFR = 3.06.

Figure 1. Ageing Proportion and TFR based on 2000 Population Census



Source: Arifin and Ananta (2004)

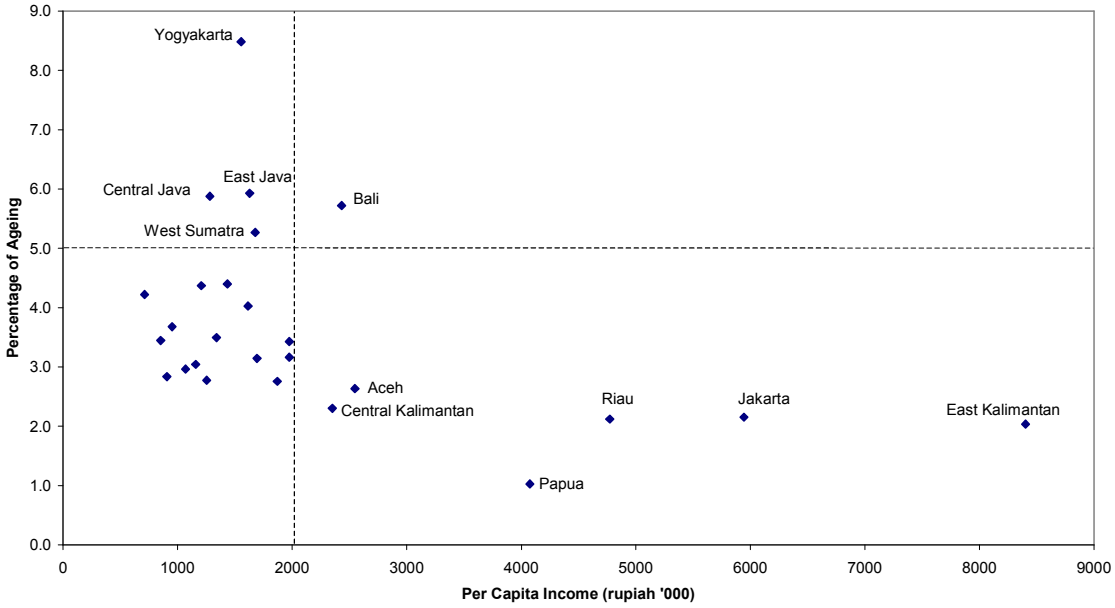
The oldest province was Yogyakarta (8.48%), in Java-Bali, and the youngest was Papua (1.03%), in the Outer Java-Bali. In general, the ageing issue seems to have emerged more in the Java-Bali, than in Outer Java-Bali.

The province of Jakarta has also reached below replacement level, at even a very low TFR of 1.63, and yet the ageing proportion was still very low, at 2.15%. The long history of migration to Jakarta may have explained this relatively young population of Jakarta despite the very low fertility in the province.

Bali was the only province with intermediate population having a relatively high per capita provincial income, while other intermediate population such as East Java, Central Java, Yogyakarta and West Sumatra had lower per capita provincial income. Figure 2 shows that East Kalimantan and Papua were rich provinces with low ageing proportion.

The highest ageing proportion, in the province of Yogyakarta, may be attributable to a combination of the relatively low fertility rate and out-migration from the province of Yogyakarta. The ageing proportion in the regency of Gunung Kidul, in this province, was very high, 10.49% and hence Gunung Kidul was already an ageing population—this regency is famous for its out-migration. In contrast, the city of Yogyakarta, where many students from other cities or provinces come to the city, had a smaller ageing proportion, at 6.0%.

Figure 2. Per Capita Income and Percentage of Ageing



Source: Arifin and Ananta (2004)

In addition to the regency of Gunung Kidul, there were two other regencies—regencies of Pacitan and Magetan—with old population. These two were located in the province of East Java and well known for their out-migration. There was no old-population district in Outer Java-Bali.

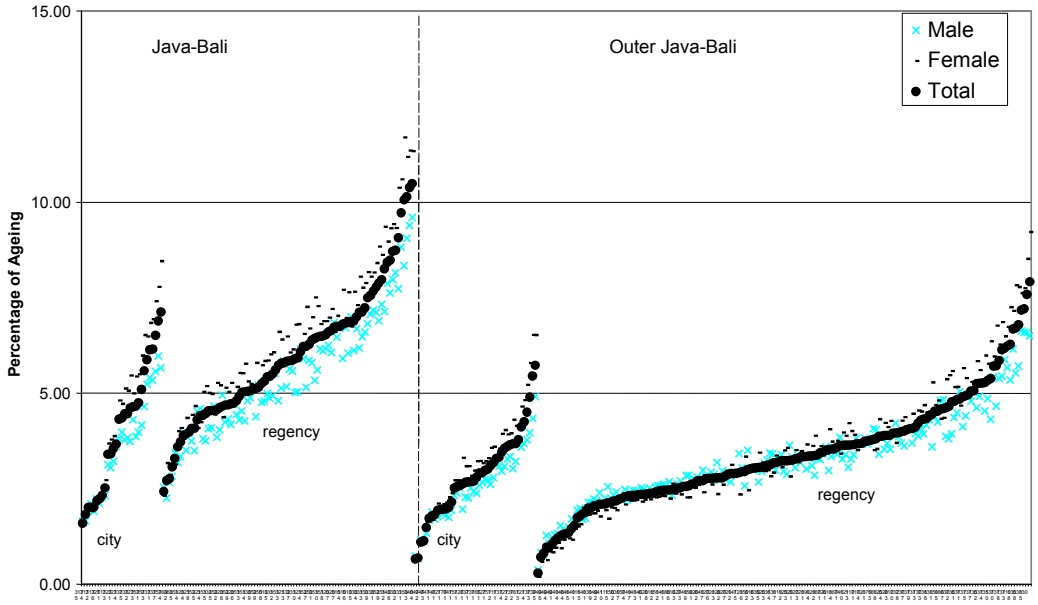
Java-Bali had a larger number of intermediate-population districts than the Outer Java-Bali did. Though the number of cities was larger in Outer Java-Bali[9], there were only two cities (Sawahlunto and Padang Panjang, both in West Sumatra, well-known for their strong tradition of out-migration) in the Outer Java-Bali having intermediate population. As shown in Figure 3, no cities, in both Java-Bali and Outer Java-Bali, had old population. In-migration may have diferred the ageing process in these cities.

At the district level, the lowest ageing proportion in Java-Bali was 1.60%, in the city of North Jakarta within the second richest province of Jakarta. The city of North Jakarta had been rich before they became old. On the other hand, the lowest one in Outer Java-Bali was 0.29%, in the regency of Jayawijaya, the poorest district in the province of Papua and the whole Indonesia—while the province of Papua was the fourth richest province in Indonesia. In addition to the regency of Jayawijaya, there were 12 other districts with ageing proportion less than 1.5%. Among them, ten regencies were also located in the province of Papua, while the remaining two were the cities of Dumai (in the province of Riau) and Bontang (in

the province of East Kalimantan). Dumai and Bontang are oil-rich cities with heavy in-migration—the population might have become rich before they get old.

In Outer Java-Bali, districts with the highest ageing proportion (about 7%) were the regencies of Sawahlunto and Padang Pariaman, the province of West Sumatra, the regency of Soppeng, South Sulawesi, and the regency of Lembata in the province of Nusa Tenggara. The regencies of Sawah Lunto and Padang Pariaman are well known for its out-migration tradition; while regencies of Soppeng and Lembata are traditional sources of out-migration, particularly the overseas migrants. All of these regencies had per capita income below the average per capita income of all districts in Indonesia-- and hence all of them could be considered as having low income. They may have become old before they get rich. Out-migration from these low income districts may have contributed to the ageing process in these districts.

Figure 3. Ageing Proportion in Java-Bali and Outer Java-Bali Regions by Sex and Type of Districts: Indonesia, 2000



Source: Arifin and Ananta (2004)

In both Java-Bali and Outer Java-Bali, the regencies were more likely to have older population than the cities. If cities were more likely to have lower fertility, migration from regencies to cities may have explained the tendency of having older population in regencies than in cities.

The rural areas were more likely to be older than those in urban areas in both regencies and cities, regardless whether they were located in Java-Bali or Outer Java-Bali. Five rural regencies, all in Java-Bali, were already considered as old population. They were regencies of Wonogiri (10.01%) in Central Java, regencies of Gunung Kidul (10.65%) and Kulon Progo (10.46%) in Yogyakarta, regencies of Pacitan (10.31%) and Magetan (10.13%) in East Java.

MIGRATION

In this paper we use the 2000 Indonesian population census data set, which at the first time provides a rich and reliable data set on migration with district as the unit of analysis. [10] Previous data sets on migration in Indonesia were limited to migration from one province to another, with an exception in the 1995 intercensal population survey, which asked question on inter-district migration. Because this is only a survey, its ability to capture a nationwide analysis is questionable. Therefore, the migration analyses at the national level missed important information on migration within a province, from one district to another.

A migrant is defined as a person who moved to the district of destination and lived there for at least six months or a person who moved to the district of destination and lived there for less than six months but the person intended to stay permanently. There are three types of migrants in Indonesian censuses and intercensal population surveys, namely, lifetime, return and recent migrants. A lifetime migrant is defined as a person who is not living in the place of birth at the time of census or survey. A return migrant is defined as a person who had migrated from area A, for example, to area B and then returned permanently to area A. Lastly, a recent migrant is defined as a person who is recently living in a different place. It is usually measured by comparing current place of residence and place of residence five years earlier.

For the benefit of the statistical analysis which focuses on the district later in this paper, the discussion in this section is limited to that at the district level and refers to the recent in-migrants.[11] A migrant in district A is here defined as an individual who lived in district A in 2000 but did not live in district A in 1995. Therefore, the data we discuss here is the number of migrants in a district, comprising of both inter-provincial and inter-district migrants. We also discuss the contribution of migrants to the population at both the provinces and districts. The rate of migration is defined as the percentage of total migrants to the total population aged 5 years old and over in a district.

Indonesians are on the move as the number of recent inter-provincial migrant increased from 3.7 million in the period of 1975-80 to 5.5 million in the period of 1995-2000. If we add up inter-provincial and intra-provincial migrants within a province, presented in Table 1, the number of migrants in the 1995-2000 was 10.7 million. The difference of 5.2 million shows a big number of intra-provincial migrants, migration within a province. This indicates the existence of high short distance mobility.

Though the maximum contribution of migrants to the population at the provincial level is only 20% (in the case of Riau), the contribution to the population at the district level can be as high as 54.8% in the city of Dumai in the province of Riau. In other words, migrants constituted more than half of the population aged 5 years and over in Dumai. Dumai is the place of oil industry, which used to belong to the regency of Bengkalis. Per capita income of Bengkalis was nearly 10 million rupiah in 1999, categorized as rich. On the other extreme, the contribution of migrants to the population in the regency of Bondowoso, East Java, was negligible, only 0.5%. Bondowoso had a very low per capita income, of only about 0.7 million rupiah in the same year

Table 1
Types of Recent Migrants by Province:
Indonesia, 1995-2000

	Number of Migrants			Percentage		
Province	*Inter province*	*Intra-provincial*	*Total Migrants*	*Inter province*	*Intra-provincial*	*Total Migrants*
(1)	(3)	(3)	(3)	(3)	(3)	(3)
Nanggroe Aceh Darussalam	15,369	47,741	63,110	24.35	75.65	100.00
North Sumatra	139,887	388,329	528,216	26.48	73.52	100.00
West Sumatra	109,016	103,800	212,816	51.23	48.77	100.00
Riau	526,711	333,001	859,712	61.27	38.73	100.00
Jambi	109,534	74,510	184,044	59.52	40.48	100.00
South Sumatra	163,250	136,807	300,057	54.41	45.59	100.00
Bengkulu	68,832	27,568	96,400	71.40	28.60	100.00
Lampung	149,013	278,907	427,920	34.82	65.18	100.00
Bangka Belitung	36,536	5,938	42,474	86.02	13.98	100.00
Jakarta	702,202	173,924	876,126	80.15	19.85	100.00
West Java	1,097,021	979,997	2,077,018	52.82	47.18	100.00
Central Java	354,204	673,355	1,027,559	34.47	65.53	100.00
Yogyakarta	196,586	67,019	263,605	74.58	25.42	100.00
East Java	185,966	597,411	783,377	23.74	76.26	100.00
Banten	620,299	89,513	709,812	87.39	12.61	100.00
Bali	87,225	96,957	184,182	47.36	52.64	100.00
West Nusa Tenggara	59,964	56,858	116,822	51.33	48.67	100.00
East Nusa Tenggara	69,910	77,656	147,566	47.38	52.62	100.00
West Kalimantan	49,202	106,428	155,630	31.61	68.39	100.00
Central Kalimantan	124,387	24,855	149,242	83.35	16.65	100.00
South Kalimantan	89,320	93,576	182,896	48.84	51.16	100.00
East Kalimantan	155,498	92,382	247,880	62.73	37.27	100.00
North Sulawesi	54,504	43,602	98,106	55.56	44.44	100.00
Central Sulawesi	75,328	87,028	162,356	46.40	53.60	100.00
South Sulawesi	79,757	297,675	377,432	21.13	78.87	100.00
Southeast Sulawesi	110,289	30,852	141,141	78.14	21.86	100.00
Gorontalo	9,257	61,557	70,814	13.07	86.93	100.00
Maluku	18,657	37,094	55,751	33.46	66.54	100.00
North Maluku	14,764	42,871	57,635	25.62	74.38	100.00
Papua	63,829	39,501	103,330	61.77	38.23	100.00
TOTAL	5,536,317	5,166,712	10,703,029	51.73	48.27	100.00

Source: Ananta, Arifin and Suryadinata, 2004.

Including Dumai, there were 13 districts where the migrants constituted more than 20% of the population in the districts. The second largest contribution was seen in the city of Batam, with 43.64% of its population was migrant, and followed by the regency of Siak, with 37.36%. Dumai, Batam and Siak are located in the province of Riau, which is geographically very close to the Republic of Singapore. Like Dumai, Siak used to be part of regency of Bengkalis. All these areas had high per capita income.

Districts consisting 30.0% - 40% of its population as migrants include: regencies of Boalemo (35.13%) in Gorontalo, Bireuen (34.39%) in Nanggroe Aceh Darussalam, Morowali (30.60%) in Central Sulawesi, and Pelalawan (30.37%) in Riau, and also in city of Ternate (32.80%) in North Maluku. All these districts with at least 30.0% of its population as migrants are located in the Outer Islands.

Five districts consisting of 20-30% migrants were Regencies of Rokan Hilir (28.22%) in the Province of Riau, and Banjar Baru (25.05%) in South Kalimantan, Cities of Depok (26.25%) and Bekasi (22.18) in West Java, and also Berau (22.60%) in East Kalimantan.

In short, five out of the above mentioned 13 districts were located in the province of Riau, a rich province. Only three out of 15 districts in Riau had percentage of in-migrants below 10% of the population, namely, Regencies of Kuantan Sengingi, Bengkalis and Natuna.

In East Kalimantan, four out of 12 districts had migrants constituting below 10%. The four regencies were Kutai, Malinau, Bulungan and Nunukan. Yet, Kutai was the district with the fourth highest per capita income.[12] Malinau, Bulungan and Nunukan used to be parts of the regency of Bulungan with per capita income more than twice the average per capita income of the districts in Indonesia. This Bulungan earned their income mostly from forestry, oil, and gas. These were the districts with high per capita income and low percentage of migrants.

In addition to the regency of Bondowoso, many districts have low percentages of migrants. Some of them are the poor regencies of Pacitan (0.90%), Jember (0.92%), Tuban (1.09%) and Situbondo (1.11%); all located in the province of East Java, with provincial per capita income below the average of the per capita income of the districts. Furthermore, the per capita income of these regencies were only around half of that in the province.

HYPOTHESES AND TESTING

Empirical model

Endogenous variables

We examine three main variables—ageing, in-migration, and economic development. Therefore, we have three endogenous variables, which are hypothesized to be affected by other variables in the model. In our model, ageing, migration, and economic development are the endogenous variables since we are interested in the causality among the three variables. Specifically, we have three related equations and hypotheses.

First is that there is a two-way causal relationship between ageing and in-migration. In-migration is expected to have direct, negative, effect on ageing: an increase (decrease) in the rate of in-migration is hypothesized to result in a decrease (increase) in ageing proportion. On the other hand, ageing is expected to have both direct and indirect affect on in-migration. The direct impact is positive: an increase (decrease) in proportion of ageing is hypothesized to bring an increase (decrease) in the rate of in-migration. The indirect effect, through economic development, is likely to be negative: a higher (lower)

ageing proportion may result in a heavier (smaller) financial burden to take care of the older persons, which can result in lower (higher) economic development. The lower (higher) economic development may then result in a smaller (higher) flow of in-migrants.

Second is that migrants are both pushing and being pulled by economic development. That is, economic development can become a pull factor, a magnet for people to in-migrate. Therefore, an increase (decrease) in per capita income is hypothesized to result in an increase (decrease) in in-migration to the district. On the other hand, in-migration functions as an engine of development in the receiving areas. An increase (decrease) in the rate of in-migration is hypothesized to bring an increase (decrease) in per capita income of the district. Furthermore, in-migration can also indirectly affect development through ageing. In-migrants lower ageing proportion, which in turn increases economic development.

Third is a two-way causal relationship between ageing and development. We expect that ageing can have both direct and indirect impact on development. The direct effect is likely to be negative, as ageing population may bring heavier financial burden to the economy. The indirect effect is positive, through in-migration, where ageing brings more in-migration and in-migration contributes to economic development. On the other hand, development is not expected to have direct impact on ageing, but it may indirectly affect ageing through migration. A higher (lower) income per capita may bring more (less) in-migration, particularly the young migrants, which in turn lowers (raises) the ageing proportion.

Exogenous variables

In addition to the three endogenous variables, we have nine exogenous variables as control variables. Exogenous variables are the variables hypothesized not to be affected by other variables in the model. In our model, the exogenous variables are two demographic variables (fertility and mortality), two socio-cultural variables (ethnicity and religion), two geographical variables (living in an urban area and living in the Island of Java), and three socio-economic variables (education, working in formal sector, and working in manufacturing sector).

In other words,

Age = f (**Mig**, region, urban, fertility, mortality) ……. *Ageing Equation*

Mig = g (**Dev**, **Age**, region, urban, religion, ethnicity)…… *Migration Equation*

Dev = h (**Mig, Age**, region, urban, education, formal, manufacturing) *Development Equation*

where Age is ageing, Mig is in-migration, and Dev is economic development. The concepts and measurements of each of these three endogenous variables are discussed earlier in paper.

The two geographical variables are included in all of the three equations, to control for the spatial difference in the geographically large Indonesia. The first is urbanization rate, showing the percentage of population of the district living in urban areas. We expect that urbanization rate affects migration positively, that is a more (less) urbanized district is more (less) likely to attract more migrants to come in. We do not have a priori expectation on the impact of urbanization rate on ageing, after being controlled by migration.

The second is a dummy variable, having value of 1 if living in the Island of Java, and 0 otherwise. We do not have any a priori expectation on the direction of the affect of "Island of Java".

In the Ageing equation, we have two demographic variables as the exogenous variables which are not included in the other two equations. The first is Fertility, measured with Total Fertility Rate (TFR). The other is Mortality, measured with expectancy of life at birth (E_0). Fertility and Expectancy of Life are expected to have negative association with ageing process, where fertility is expected to have the most contribution to the ageing process.

We have two socio-cultural variables (Ethnicity and Religion) as the exogenous variables in the Migration equation but not in the other two equations. Religion is indicated with the percentage of Muslims in the district, while Ethnicity is indicated with the percentage of Javanese in the district. Though there are about 1,000 ethnic and sub-ethnic groups in Indonesia, we only use the percentage of the Javanese as the measurement of Ethnicity. The reason is for simplicity of the analysis and the fact that the Javanese is the dominant ethnic group in Indonesia and they account for a significant portion in many districts. Similarly, we simply utilize the percentage of Muslims to reflect religious difference in Indonesia. Yet, we do not have any a priori hypotheses on whether the areas with higher percentage of Muslims and/ or higher percentage of Javanese attract more migrants to the district.

In the Development equation, we have three socio-economic variables as the exogenous variables which are not included in the other two equations. One is Education, measured with percentage of those completed senior high school or above. Education is supposed to indicate the "quality" of the labour force in a district and it is therefore used as a control variable in the economic equation, but not in the migration equation. We hypothesize that the higher the educational level, the higher is the per capita income.

The other two exogenous variables are Formal, indicating the percentage of labour force working in formal sector, and Manufacturing, showing the percentage of labour force working in manufacturing sector. We expect that Formal and Manufacturing have positive associations with per capita income.

A linear simultaneous equation model

To estimate the above model, we need a non-recursive simultaneous equation model. In particular, we use a two-stage least square simultaneous equation model. Because of space

limitation, in this paper, we only examine linear relationships. Further studies should attempt to examine alternative models.

Therefore, we have

$$\text{Ageing} = a_0 + a_1(\text{in-Mig}) + a_2(E_0) + a_3(\text{TFR}) + a_4(\text{Java Island}) + a_5(\text{Urb}) + \xi^A$$

$$\text{In-Mig} = b_0 + b_1(\text{Ageing}) + b_2(\text{per capita GDP}) + b_3(\text{Muslim}) + b_4(\text{Javanese}) + b_5(\text{Java Island}) + b_6(\text{Urb}) + \xi^M$$

$$\text{per capita GDP} = c_0 + c_1(\text{Ageing}) + c_2(\text{In-Mig}) + c_3(\text{Educ}) + c_4(\text{Formal}) + c_5(\text{Manufacture}) + c_6(\text{Java Island}) + c_7(\text{Urb}) + \xi^D$$

Empirical results

Impact of migration on ageing (Ageing equation)

Relative to the other two demographic variables (mortality and migration), lower fertility has often been mentioned as the most important contribution to a higher ageing proportion. Model 1, 2, and 3 in Table 2 show that an increase in in-migration, an increase in fertility, and a decease in mortality are likely to reduce ageing proportion. In Model 4, where the three demographic variables are put together in the equation, fertility has been shown to have the largest coefficient, followed by migration and, then, mortality. Therefore, the impact of rising in-migration may have offset the impact of lower mortality on ageing proportion. In other words, in-migration may have slowed down or even deferred the ageing process. This result does not change even after we control the equation with the two geographical variables.

We also find that urbanization negatively affects ageing proportion, as shown in Model 5, Table 2. The more (less) urbanized the district, the lower (higher) is the ageing proportion. At the same time, our empirical results in Table 4 show that urbanization has a positive impact on migration, hinting that the young people might have migrated to the urban areas. The young migrants may have much slowed down the ageing process in urban areas. Nevertheless, the finding in Table 2 has been controlled by in-migration. Therefore, the explanation for the negative impact of urbanization on ageing proportion must be found somewhere else, not through migration. Further studies should deal with this issue.

Our empirical results also show that the districts located in the Island of Java had a significantly higher ageing proportion. The much lower fertility and mortality rates in the Island of Java may have explained the finding. However, the finding has been controlled with fertility and mortality. Therefore, other explanations must be found to explain the lower ageing proportions of the districts in the Island of Java.

Table 3
Impact of In-Migration on Ageing:
Results from a Simultaneous Equation Model

Variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.
(Constant)	5.59	0.000	7.62	0.000	-2.09	0.266	-2.61	0.201	-1.59	0.439
in-migrants	-0.22	0.000	-	-	-	-	-0.28	0.000	-0.18	0.000
TFR	-	-	-1.37	0.000	-	-	-0.90	0.000	-0.94	0.000
e0	-	-	-	-	0.09	0.001	0.17	0.000	0.15	0.000
Java Island							-	-	0.76	0.001
Urbanisation							-	-	-0.01	0.001
R2		0.206		0.250		0.031		0.486		0.512

Note: migrants refers to recent migrant

Impact of ageing and development on migration

As shown in Model 4, Table 3, without being controlled by other variables, we find that ageing affects migration negatively, rather than positively as hypothesized. Higher (lower) ageing proportions bring smaller (higher) rate of in-migrations. This finding may be related to the accelerated ageing process in poor economies, where young people leave the ageing and poor population. However, as indicated in Table 4, ageing does not have any direct impact on migration, after being controlled with economic development and two geographical variables. Further studies should examine this issue, particularly putting out-migration in the equations.

Ageing, nevertheless, can affect migration indirectly through development. As shown in Table 5, ageing negatively affects development, when the measurement of income includes oil and gas. A higher (lower) ageing proportion results in lower (higher) income per capita. Furthermore, Table 5 indicates that development positively affects in-migration. Economic development is a magnet for in-migration. Therefore, ageing is likely to have a negative, indirect impact, on migration through economic development.

In total, combining the direct and indirect impacts, ageing may negatively affect migration.

It is also interesting to find that the religion (percentage of Muslims in a district) does not have significant impact on migration, either by being it self or after being controlled by other variables. However, we find that ethnicity (percentage of Javanese) has a significant, and negative, impact of in-migration. A higher percentage of Javanese in a district results in a lower percentage of migrants in the district. However, the impact becomes insignificant when we put some other exogenous variables into the equation. In other words, people migrated into a society not because of ethnic and religious considerations.

As shown in Table 4, in-migration is pulled by economic development and urbanization. In addition, it is also affected by whether the district is in the Island of Java or not.

Table 3
Impact of Ageing and Development on In-Migration:
Results from Simultaneous Equation Model

Variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.
(Constant)	6.60	0.000	7.79	0.000	14.33	0.000	3.17	0.000	2.63	0.000
Muslim (%)	0.01	0.642	-	-	-	-	-	-	-	-
Javanese (%)	-	-	-0.02	0.021	-	-	-	-	-	-
Ageing	-	-	-	-	-1.79	0.000	-	-	-	-
Per cap GDP	-	-	-	-	-	-	0.00	0.000	-	-
Per cap GDP*	-	-	-	-	-	-	-	-	0.00	0.000
R2		0.001		0.016		0.133		0.272		0.214

Note : Per cap GDP* = without Oil and Gas. Migrant refers to recent migrant

Table 4
Impact of Ageing and Development on In-Migration Controlled by Geographical Variables: Results from a Simultaneous Equation Model

Variable	Model 1		Model 2		Model 3		Model 4	
	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.
(Constant)	4.10	0.036	7.52	0.000	0.61	0.783	2.71	0.210
Muslim (%)	0.00	0.902	0.01	0.596	0.01	0.352	0.02	0.161
Javanese (%)	-0.01	0.336	0.01	0.297	-0.01	0.481	0.01	0.314
Ageing	-0.12	0.772	-1.17	0.001	0.54	0.256	-0.20	0.648
Per cap GDP*	-	-	5.70E-07	0.000	-	-	4.98E-07	0.000
Per cap GDP	5.09E-07	0.000	-	-	4.40E-07	0.000	-	-
Java Island	-	-	-	-	-3.47	0.003	-4.13	0.001
Urbanisation	-	-	-	-	0.04	0.001	0.05	0.000
R2		0.278		0.243		0.309		0.286

Impact of migration and ageing on development

Migrants do not seem to have been an engine of economic development. Table 5 shows that in-migration does not have any significant impact on development. Therefore, combining with the earlier results, there is only one-way causal relationship between migration and development—from development to migration, where development has pulled in-migration.

On the other hand, as hypothesized, Ageing had significant and negative impact on Development, when per capita income is measured without oil and gas. Table 5 also indicates that the contribution of oil and gas may have "obscured" the relationship between ageing and development. Therefore, without oil and gas, an ageing society is a burden for

economic development. A district endowed with oil and gas can allocate the oil and gas money to offset the impact of ageing on development.

We also find that percentages of labour force working in formal sector had the hypothesized positive impact on development. However, interestingly, urbanization had a negative impact on development: higher (lower) the urbanization rate in a district results in lower (higher) in the per capita GDP in the district. Education had the expected positive impact when we do not include oil and gas, and it had no significant impact when we include oil and gas.

Table 5
Impact of Ageing and In-Migration on Development: Results from a Simultaneous Equation Model

	Per Capita GDP with Oil and Gas		Per Capita GDP without Oil and Gas	
	Coefficients	Sig.	Coefficients	Sig.
(Constant)	-324233.3	0.960	5560476.3	0.162
in-migrants	804261.2	0.222	-225507.7	0.574
Ageing	-1114961.5	0.384	-1760181.2	0.025
Manufacturing	439455.8	0.055	65088.5	0.640
Formal sector	193245.8	0.188	157084.3	0.080
Education*	282777.5	0.359	626805.2	0.001
Java Island	-304452.7	0.942	2805203.7	0.272
Urbanisation	-185321.7	0.051	-205390.3	0.000
R2		0.135		0.143

CONCLUDING REMARKS

Current Indonesian population issues have been different from those in 1960s and 1970s. It is no longer the issue of high population growth and high mortality. The success of reducing fertility and mortality have brought ageing an emerging issue in Indonesia. At the same time, migration has also become an important issue in Indonesian socio, economic, and political development. Interestingly, recently, fertility issue has again emerged with some political tones. It is therefore, important to see the three demographic variables together, rather than separately as has been done in the past.

This paper attempts to examine causal relationship among the three demographic variables and economic development in Indonesia, utilizing the availability of the 2000 Indonesian population census data set. With a two-stage simultaneous equation model, we carry out an examination to find out the causality of the relationships.

Our study shows that there is one way, rather than two-way relationships among the three endogenous variables. First, higher economic development seems to have attracted in-

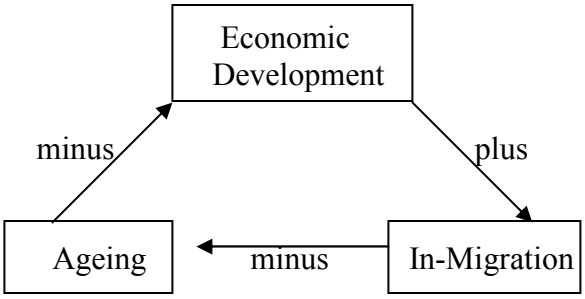
migration, and not vice versa. Migrants were not agents of economic development, rejecting the popular perception that migrants built the economic development of the host regions.

Second, fertility has the most important effect on ageing process. Therefore, the success of fertility decline in Indonesia has been followed by a new issue, the ageing process. The impact of in-migration on the ageing process may have offset the impact of mortality decline on the ageing process, and in-migration seems to have slowed down or even deferred the ageing process. On the other hand, we did not find that the old population structure of a district might have attracted in-migration. In-migration is more attracted by the economic development of the district.

Third, ageing might be a burden for economic development, when we do not include contribution from oil and gas. Districts endowed with oil and gas can allocate the money to help offsetting the negative impact of ageing society on their economic development. Therefore, because ageing is a burden of economic development, migrants can indirectly contribute to the economic development by slowing down the ageing process in the district.

Finally, though there were no direct two-way causal relationship among the three endogenous variables, there has been indirect causal relationship among them. One impact is reinforcing another one through another endogenous variable. For example, economic development affects ageing indirectly through migration. Success in economic development in a district will bring more migrants to the district. In turn, the rising number of migrants will slow down the ageing process in the district. Sequentially , the slower ageing process in the district will reduce the burden in economic development in the district. Therefore, success in economic development will further push for more success in economic development through its impact on in-migration and then ageing process.

In summary, our findings can be put diagrammatically as follows



Further studies should be carried as new data sets are available to find out whether the implementation of regional autonomy since 2001 has any important impact on the inter-relationship among economic development, ageing, and migration. More indicators of economic development should be used. Furthermore, studies should be carried out to examine the role of out-migration.

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End notes

[1] Paper presented at XXVI IUSSP Population Conference. Marrakech, Morocco, 27 September- 2 October 2009.

[2] A rich and detailed discussion on ethnicity and religion by province according to the 2000 Indonesian population is referred to Suryadinata, Arifin, and Ananta (2003).

[3] The names of the provinces used in this paper follow the ones used until 1999. The province of West Java in this chapter is the "old" West Java, including the current province of Banten. The province of South Sumatra is the "old" South Sumatra, including the province of Bangka-Belitung. The province of North Sulawesi is the "old" North Sulawesi, including the province of Gorontalo. And the province of Maluku is the "old" Maluku, including the province of North Maluku. All of the data on per capita income are based on tables in Ananta, Arifin, and Suryadinata (2004).

[4] There have been debates on the levels of TFR around 2000. In this paper we follow Ananta, Arifin, and Bakhtiar (2004).

[5] It should be noted that migration is only one component of the urban growth. Two other factors contributing to urban growth are natural population growth (difference in fertility and mortality) and reclassification of rural to urban areas).

[6] The data are based on Suryadinata, Arifin, and Ananta (2003).

[7] The policy of regional autonomy was introduced under Laws no. 22 and 25/1999 and legally in force since January 2001.

[8] Others used population aged 60 and above as older population. With this definition, Arifin and Ananta (2009) make a classification of population according to the ageing process. They defined a population as very young when the percentage of population aged 60 and above to the total population is less than 6.0 %.; youthful, when between 6.0 and 8.0; transitional, when between 8.0 and 12.0; and old, when above 12.0.

[9] Based on the 2000 Population census, Indonesia was divided into 340 districts—119 in Java Bali and 221 in Outer Java Bali. From this number, 29 in Java-Bali and 44 in the Outer Java-Bali were categorised as municipality (*kotamadya*) and the remaining as regency (*kabupaten*).

[10] With this data set, for the first time, we can decompose migrants into intra-provincial, inter-provincial, and international migrants. Some discussion on this decomposition can be found in Ananta, Arifin, and Suryadinata (2004).

[11] The analysis with the simultaneous equation model, discussed later in this section, was also carried out using life-time migrants. However, the results are similar to those with recent migrants. Therefore, for simplicity of presentation in this paper , we only discuss the results with the recent migrants.

[12] The data on income for Kutai refers to the regency of Kutai in 1998, which included regencies of West Kutai, East Kutai and city of Bontang.