UNDERSTANDING INTRA-HOUSEHOLD EXPENDITURE DISTRIBUTION IN INDONESIA

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Abstract

Decentralisation provides regional government with greater authority to deliver various public services. It is expected that decentralisation will improve people welfare due to proximity. This study is aimed to investigate whether there is improvement in welfare, as represented by converging household expenditure, during pre and post decentralisation. It is tested employing Indonesian Family Life Surve (IFLS) database and nonparametric approaches. The findings suggest a converging household expenditure, decreasing gap between the poor and rich, and higher probability of the poor to move to higher expenditure groups, particularly for those who live in urban areas.

Keywords: fiscal decentralisation, expenditure convergence, Indonesia
JEL Classification number: H77, D31, O53

Abstrak

Desentralisasi memberikan pemerintah daerah berbagai kewenangan yang lebih besar untuk memberikan layanan publik. Diharapkan desentralisasi yang akan meningkatkan kesejahteraan masyarakat karena pertimbangan kedekatan. Penelitian ini bertujuan untuk mengetahui apakah terdapat peningkatan kesejahteraan, yang diwakili oleh konvergensi pengeluaran rumah tangga, selama pra dan pasca desentralisasi. Hal ini diuji menggunakan basis data Indonesian Family Life Surve (IFLS) dan pendekatan nonparametrik. Makalah ini menemukan bahwa pengeluaran rumah tangga adalah konvergen, berkurangnya kesenjangan antara probabilitas miskin dan kaya, dan lebih tingginya kemungkinan dari orang miskin untuk berpindah ke kelompok pengeluaran yang lebih tinggi, terutama bagi mereka yang tinggal di daerah perkotaan.

Keywords: decentralisasi fiskal, konvergensi belanja, Indonesia
JEL Classification number: H77, D31, O53

INTRODUCTION

One of the significant policy measures that Indonesia introduced following the financial crisis in 1997 was the introduction of decentralisation, both administrative and fiscal. Under the decentralisation laws, regional governments became accountable and were allocated more responsibility and authority for implementing economic, political, and budgetary policies. It has some specific features that are worthy of note. *First*, it turns Indonesia from a highly centralised country to one that is highly decentralised (Balisacan et al., 2003). *Second*, decentralisation policy in Indonesia is relatively extensive because it is operational at district (*kabupaten*) and municipality (*kota*) levels rather than at provincial government levels. Nonetheless, it is argued to be politically motivated in order to lessen the threat of secession and to keep control over the regions via a “divide and rule” strategy (Fitrani et al., 2005). *Third*, it is to correct the past policy which made no distinction in revenue sharing between resource-rich and resource-poor regions (Hofman and Kaiser, 2002).

Despite the above arguments in favour of the implementation of fiscal decentralisation in Indonesia, some concerns have emerged regarding the potential drawbacks of this policy. Brodjonegoro and Asanuma (2000) argue that fiscal decentralisation may have created mismanagement in the economy due to lack of administrative, managerial, and planning capabilities at district and municipality levels; because of an increasing horizontal imbalance associated with revenue sharing schemes; and because of the added burden upon the for national budget linked to large-scale transfers to the regions. In addition, insufficient preparation and planning has resulted in inconsistent and ambiguous legislation that has led to multi-interpretations and confusion for the local governments (Resosudarmo, 2004). Moreover, revenue sharing schemes under fiscal decentralisation laws (Law No. 25 of 1999, now Law No. 33 of 2004) favour resource-rich regions causing inequality to increase between regions and, in turn, households.

Increasing inequality consequently results in a divergence of income rather than convergence. While there is voluminous literature on income convergence, particularly the β-convergence and σ-convergence derived from growth accounting at the regional level, little has been done to examine income convergence at the household level. One of the reasons may be associated with the difficulty of conducting surveys for the same household across years (panel data at household level). Furthermore, although β-convergence and σ-convergence can explain whether the catching-up process exists, they cannot describe the intra-household expenditure distribution mobility. The current study is an attempt to fill this gap in the existing literature, particularly in the case of Indonesia.

The study is structured as follows. Section 2 reviews the existing literatures on convergence, both in cross-country and Indonesian studies that mostly rely on national account (Gross Domestic Product, GDP) . Section 3 discusses the nonparametric approaches employed in the study and the sources of data. Section 4 presents the empirical results. The final section of the study draws some conclusions and suggestions for further study.

Studies on Income Convergence

There are growing interests in studying income convergence employing the nonparametric approach. Pittau and Zelli (2006) employed Nomenclature of the Territorial Units for Statistics (NUTS) and their respective GDP at 1990 constant prices to convert into Purchasing Power Standards (PPS) across 12 countries in the European Union (EU) regions for the period 1977-1996. They found that the multimodality of cross-sectional distribution was disappearing. In addition, the ergodic distribution suggested a twin-peaks structure of the middle income and very high-income regions.

Studies on China's convergence show the bimodal structure of per capita income distribution during the period of 1952-2003 (Sakamoto and Islam 2008). In doing so, Sakamoto and Islam (2008) divided relative per capita income across China's provinces into five and seven state discretisation and applied the Markov chain to estimate the probability of a particular group to stay or move to another level of income. Further analysis based on pre- and post-reform periods however, shows a different ergodic distribution pattern. The pre-reform period (1952–1978) was highlighted by a positively skewed ergodic distribution, while the post-reform period (1978 – 2003) showed a negatively skewed distribution.

The nonparametric approach in studying income convergence in Indonesia was pioneered by Sakamoto (2007). He employed the Markov transition probability matrix using provincial real per capita GDP from 1977 to 2005 as source of data. He found the existence of income convergence in Indonesia despite the result being sensitive toward an inclusion or exclusion of oil and gas in the GRP. Taking into account oil and gas in the GRP, he found the existence of convergence. On the contrary, when oil and gas were excluded in the GRP, the result showed increasing regional divergence.

METHODS

Intra-household expenditure distribution as presented in this study is desirable given the critical implementation of the fiscal decentralisation policy in Indonesia since 2001. This policy provides greater authorities and resources to the regional governments to deliver a variety of public services to people. One of the expected outcomes would be a better income distribution among households. This hypothesis is tested by observing the dynamic of intra-household expenditure prior to the fiscal decentralisation (1993) up to the fiscal decentralisation era (2007) given the data availability.

The current study applies the same method as Sakamoto (2007) by discussing convergence based on the Markov transition probability matrix. It is, however, supplemented by the stochastic kernel density estimates. In addition to the Markov chain and stochastic kernels, other nonparametric approaches, namely the kernel density and the Tukey boxplot, were tested. It is worth noting that this study is different from previous studies because in that it employs the household level data in investigating income convergence. This analysis is achievable, thanks to the available longitudinal survey in Indonesia, namely the Indonesia Family Life Survey (IFLS).

The Kernel Density

The kernel smoothing density is employed in this study to obtain the graphical shape of the relative real per capita household expenditure. This method is recently popular as it helps to visualise the modality of data. The kernel smoothing density can be applied under various conditions, its properties are understandable, and it is compatible with other density estimations (Tortosa-Ausina et al., 2005). The critical point in kernel density, however, is the choice of bandwidth (h), rather than the kernel itself. An excessively small bandwidth may result in a large number of peaks, whereas a very large bandwidth may hide the important peaks as indicators of modality. As a result, the true shape of the distribution fails to be observed (Canarella and Pollard, 2006).

The Tukey Boxplot

In addition to the kernel density, the evolution of the relative real per capita household expenditure over time can also be examined using the Tukey boxplot. The box shape of the Tukey boxplot is constructed by lines that connect the upper and lower quartiles. Therefore, it contains 50 percent of the data distribution. The smaller box suggests a higher concentration of data around their mean value, while the taller box suggests that relative real per capita expenditure is more spread-out.

The Markov Transition Probability Matrix

The Markov transition probability matrix is used in the study to capture distribution mobility over time. The Markov transition probability matrix enables analysis of the intra-distribution dynamic, which leads to an ergodic distribution. It contains the probabilities of countries either remaining at their present level or shifting upwards or downwards in the distribution scale.

The Markov chain shows the probability of the element being in state i at the beginning period t and transition probability $m_{ij}(t)$ of being in state j at the end of period $t + n$. This study employs the first-order Markov chain under assumption that the transition probabilities matrix is time invariant. Thus the probability of a region being in a certain state depends on its state in time t only, and not in its previous period. Consequently, $m_{ij}(t) = m(ij)$ for all t (Carluer, 2005). In addition, the sum of each row of the transition probability matrix is unity.

Employing the Markov chain and assuming that the transition probability matrix does not change, the ergodic distribution can be obtained as:

$$p(t+1) = p(t)M = p(0)M^{t} \quad (1)$$

where $p(t)$ is the row vector of the i probabilities of the states at time t, M is i x i transition matrix, and M^t is the product of t identical M matrices. As t tends to infinity, an ergodic probability distribution π is $\pi = \pi M$.

By observing the probability of each state, the Markov transition probability matrix can reveal the dynamic of household expenditure distribution over time and whether they will converge toward certain means assuming the dynamic is held. Nonetheless, if probabilities are polarised toward the bottom and top distributions these may indicate divergence.

The Stochastic Kernel

It has been acknowledged that the transition probability matrix in the intra-distribution dynamics is sensitive to the discretisation choice of the state spaces. The stochastic kernel can be interpreted as follows. Stand at any point on period t axis and extend a straight line parallel to period $t+7$ axis, the stochastic kernel is the probability density that is always positive everywhere and totals one. The 45-degree diagonal line represents the persistence of probability of elements in the distribution remaining in their initial condition over time. In the case where the mass is concentrated below the diagonal line, the intra-distribution mixing is greater (Blyde, 2006) and, thus, suggests greater probability of mobility.

Data Description

Most studies on income convergence employ GDP at national or regional levels in order to examine whether the poorer regions can catch up to the rich ones. The current study differentiates from others by employing household level data. It is expected that by employing household level data as the unit of analysis, more informative results on intra-household expenditure distribution mobility can be investigated.

This study employs the IFLS published by the RAND. There are advantages when using the IFLS data for the current study, as outlined by Frankenberg et al. (1999). *First*, it is longitudinal data that enables investigation of an evolution of the household sample prior to, and post-the commencement of the fiscal decentralisation policy in 2001. However, care should be taken in generalising the results since IFLS did not cover all provinces in Indonesia. *Second*, IFLS has relatively low attrition because it successfully tracks and follows the movers (Thomas et al., 2001). It is confirmed by relatively high respondent recontacted rates as high as 86.5 percent over fourteen years of the IFLS (1993-2007) (Thomas et al., 2010). *Third*, IFLS collected data on the various aspects of households, individuals, and communities. Thus, it provides informative analysis and better understanding of the various socio-economic aspects of Indonesia. *Fourth*, this dataset can be downloaded at no charge from the RAND website.[1]

There were four waves of IFLS: IFLS1 was in 1993, IFLS2 and *ILFS2+* were in 1997 and 1998, IFLS3 was in 2000, and IFLS4 was in 2007. The present study employs IFLS1, IFLS3, and IFLS4 to consistently maintain the seven years interval between surveys. This is mainly guided by the method employed in the present study, namely the Markov transition probability matrix that requires same time intervals and

[1] http://www.rand.org/labor/FLS/IFLS.html.

balanced panel data to estimate the ergodic distribution. Furthermore, the seven years interval can be considered as a relatively representable time duration to capture expenditure mobility within households.

It should be noted that this study employed real per capita household expenditure in order to test the existence of convergence amongst households in Indonesia. It is obtained by deflating the per capita household expenditure into 1996 prices for each province by taking into account differences in urban-rural inflation. It is argued that the inflation rate in rural areas is 5 percent higher than that in urban areas (Frankenberg et al., 1999). Transformation from nominal value into real value aims to neutralise the inflation effect and other economic shocks that may influence household expenditure. As a result, changes in real per capita household expenditure may be interpreted as a net improvement or deterioration of their wealth.

RESULTS

This section discusses the intra-household expenditure distribution based on static and dynamic nonparametric approaches. As mentioned earlier, five tools were employed for this purpose, namely the kernel density estimator, the Tukey boxplot, the Markov transition probability matrix, the stochastic kernel, and the contour plot. The kernel density and the boxplot are used to provide some preliminary evidence on the convergence of real per capita household expenditure. The Markov transition probability matrix, the stochastic kernel, and the contour plot are presented to discuss the evolution of intra-household expenditure distribution and their long-term tendencies.

The real per capita household expenditure at 1996 prices for each wave of IFLS has been normalised by dividing real per capita household expenditure by its respective annual national mean so as to obtain the relative real per capita household expenditure. Used as a tool to analyse a transition probability, the relative real per capita household expenditure is classified into five states, ranging from the lowest to the highest. They share equal length of the relative real per capita household expenditure.

The Kernel Density Estimates of Indonesian Relative Real per Capita Household Expenditure, 1999-2008

Figure 1 shows the estimated probability density function of the relative real per capita household expenditure for the three waves of IFLS (1993, 2000, and 2007), respectively. The Gaussian kernel density function is employed. The horizontal axis is a relative per capita household expenditure and the vertical axis is a density.

As Figure 1 shows, people are concentrating more around the average level. This suggests the existence of expenditure convergence. In 1993, the distribution of relative real per capita expenditure is clearly uni-modal at 0.79 times real per capita expenditure. In 2000, it seems that the density has changed to become slightly bi-modal. The first mode is at 0.72 and the second is at 1.19 times real per capita expenditure. However, in 2007, the probability density shows the existence of unimodality again at 1.03 times real per capita expenditure. This suggests increasing relative expenditure by the poor households. On the opposite, relative per capita expenditure of the richest tends to decrease from 65.66 times in 1993 to 29.5 times in 2007. Therefore, it can be concluded that the real per capita expenditure tended to converge between 1993 – 2007.

The Tukey Boxplot of IFLS 1993, 2000, and 2007

The intra-household expenditure distribution can also be investigated employing the Tukey boxplot. The horizontal axis represents time while the vertical axis shows the relative real per capita household expenditure value. The boxplot is preferable in discussing the intra-expenditure changes since it represents the main statistical features of the dataset. It allows an examination of the specific features of relative real per capita household expenditures, for example, the existence of outliers, the dispersion or concentration of the data, and symmetry or asymmetry of a distribution (Tortosa-Ausina et al., 2005). Figure 2 shows the boxplots of relative real per capita household expenditure in 1993, 2000, and 2007. It is supplemented by Table 1 for further clarification of the respective statistics in Figure 2.

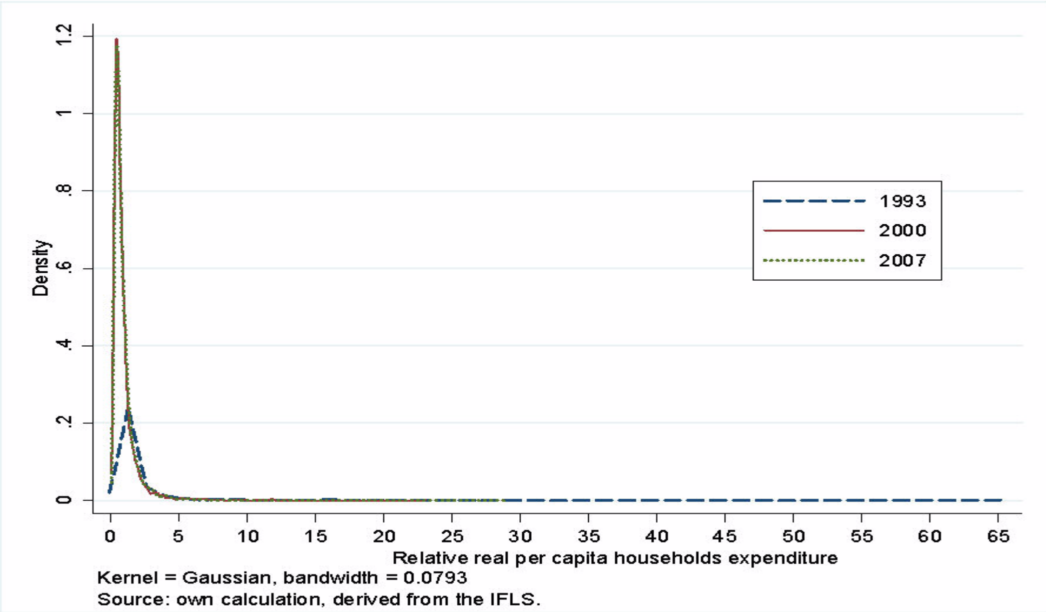
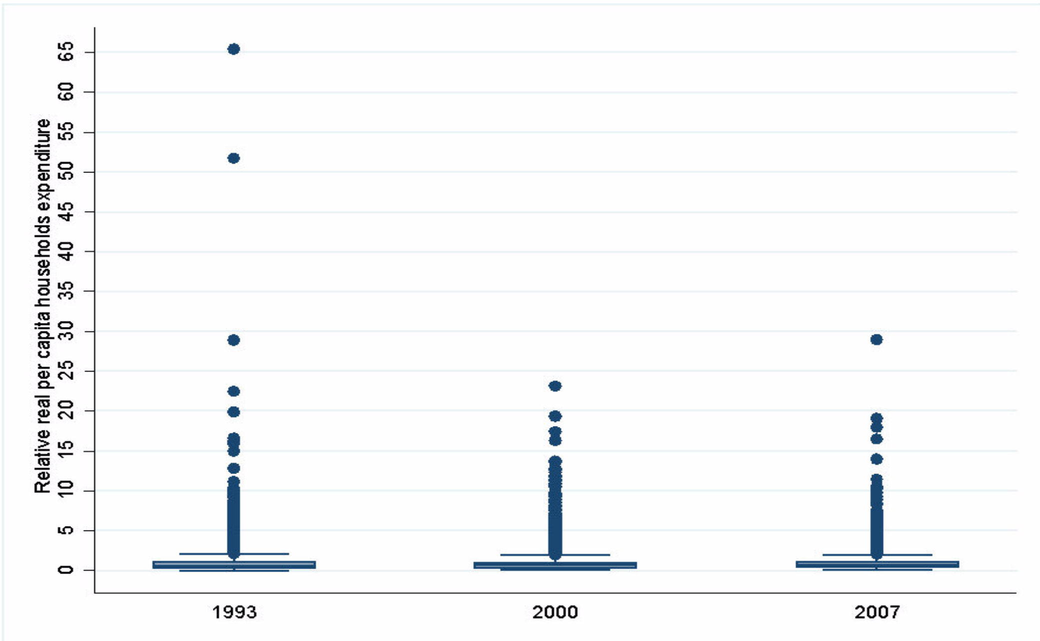


Figure 1: Kernel Density of the Relative Real Per Capita Household Expenditure



Source: Estimated by the author using data of IFLS.

Figure 2: The Tukey Boxplot of the Selected Household in IFLS 1993, 2000, and 2007

As Figure 2 and Table 1 show, the boxplots had a tendency to become narrower in 2007 compared to 1993. Comparing the boxplots of 1993 and 2000, it seems that the relative per capita expenditure became less spread-out by 2000. The main contribution was associated by the increasing the 25th percentile and decreasing the 75th percentile. As Table 1 shows, the relative real per capita expenditure of the 25th percentile grew by 19.5 percent while the 75th percentile was 2.8 percent. As a result, the inter-quartile range decreased from 0.68 in 1993 to 0.6 in 2000.

Table 1 also illustrates that the median of the relative real per capita expenditure increased from about 0.6 times the national average in 1993 to 0.64 times the national average in 2000, and then 0.66 times in 2007. The boxplot shrank in 2000, but in 2007, it was slightly spread out as the 75th percentile grew slightly higher than the 25th percentile. Overall, it can be said that during 1993-2007, the relative real per capita household expenditure tended to converge. This confirms previous findings with respect to the real per capita households' expenditure convergence as derived from the kernel density.

Table 1: Descriptive Statistics of the Selected Households in the IFLS 1, 3, and 4

Statistics	1993	2000	2007
Minimum	0.000	0.047	0.044
Maximum	65.428	23.115	28.956
Mean	0.955	0.920	0.931
Interquartile range	0.675	0.599	0.630
25th percentile	0.357	0.422	0.431
75th percentile	1.032	1.020	1.061
50th percentile (median)	0.597	0.640	0.660
Standard deviation	1.872	1.100	1.051
Lower adjacent value	0.000	0.047	0.044
Upper adjacent value	2.216	2.096	2.233

Source: Estimated by the author using data of IFLS.

It may also be useful to observe both the lower and upper parts of per capita expenditure distribution (the adjacent values and the outliers). As Figure 2 and Table 1 show, there are no relative real per capita household expenditure values that were less than the lower adjacent values. On the other hand, as the inter-quartile range increased during 1993 and 2007, so did the upper adjacent value. Increasing upper adjacent values were, however, accompanied by a decreasing number of households that had a relative real per capita expenditure greater than the upper adjacent values. There were 474 households in 1993 that had relative per capita expenditure greater than the upper adjacent value; in 2007, this had decreased to 419 households. Despite the increasing inter-quartile range, the standard deviation decreased. This suggests that the relative real per capita expenditure gap among households was narrowed during 1993-2007.

Markov Transition Probability Analysis in Indonesia

This section discusses the Markov transition probability matrix as a tool to examine the probability of household mobility into other groups of expenditure (states). It is a first-order, stationary transition probability for the whole dataset. There are 5,968 households for each of the wave results in the 17,904 observations for the three waves of the IFLS.

The critical issue in the Markov transition probability analysis is determining the grid values that divide the distribution into several groups (states). There are five states, which represent all groups of the relative per capita household expenditure for each wave of the IFLS. In the first analysis that discusses Markov transition probability at the national level, the grid values are arbitrarily chosen in order to make the overall distribution among states relatively uniform (Quah 1996). Moreover, the length of relative real per capita household expenditure for each state is maintained to be equal.

The grid values of relative real per capita expenditure are defined as follows:

below 0.384 (State 1), between 0.384 and 0.572 (State 2), between 0.572 and 0.823 (State 3), between 0.823 and 1.298 (State 4), and above 1.298 (State 5). It means, for example, households that belong to State 4 with a grid value 0.8-1.3 have real per capita expenditure between 0.8 and 1.3 times the national average. These grid values are maintained for subsequent analyses, as the numbers of observations are relatively large. This is also designed to maintain comparability among various decomposition analyses based on distinct geographical characteristics, for example, by urban-rural areas, by degree of fiscal decentralisation, and by province where households are located, (whether this is in provinces, where per capita GRP is higher or lower than per capita GDP).

It should be noted that the diagonal values of the Markov transition probability matrix represents the likelihood of people staying in their current state, while the off-diagonal values represent the probability of people moving between states. The starting distribution represents the probability of the latest data as a starting point to estimate the ergodic distribution that indicates a long-term unconditional probability of persons falling into a certain group of relative per capita expenditure, irrespective of their initial state (Wang, 2004).

Markov Transition Probability at National Level

Table 2 shows that the chosen grid values result in a relatively uniform observation of the entire sample. The diagonal of the Markov transition probability matrix shows that there is more than a 26 percent probability that people remain in their current state. The poorest, as represented by State 1, have a relatively high probability of remaining poor, that is, 40.5 percent. On the other hand the richest, as represented by State 5, have the highest probability of remaining rich. They have more than 51 percent to remain rich, with a probability of downgrade to the State 4 at 25.5 percent.

As Table 2 shows, the sum of upper off-diagonal elements is higher than that of the lower ones. This suggests more upward movement rather than downward movement. In other words, there is a higher probability of the poor to move to a higher expenditure group. This is confirmed by the ergodic distribution that is slightly skewed rightward, and hence shows a higher probability for the poor to move to the higher relative per capita expenditure group.

Table 2: Markov Transition Probability at National Level

State	Number of observations	1	2	3	4	5
		Upper limits				
		0.384	0.572	0.823	1.298	∞
1	3581	0.405	0.287	0.178	0.088	0.042
2	3581	0.216	0.299	0.236	0.176	0.073
3	3581	0.128	0.217	0.266	0.243	0.145
4	3580	0.066	0.151	0.228	0.305	0.250
5	3581	0.036	0.064	0.135	0.255	0.511
Starting distribution		0.166	0.203	0.205	0.219	0.207
Ergodic distribution		0.154	0.196	0.210	0.222	0.218

Notes:

1. Transition probability and its respective ergodic distribution is based on the seven-years transitions: 1993, 2000, 2007.
2. The grid values are chosen to yield a relatively equal number of observations among the states.

Source: Estimated by the author using data from the IFLS 1, 3, and 4.

Markov Transition Probability Matrix by Location (Urban-rural)

Table 3 shows the Markov transition probability matrix by location (urban-rural areas). This type of analysis is motivated by relatively noticeable differences between urban and rural areas in Indonesia. *First*, urban areas are usually characterised by modern sectors and a concentration of a higher educated and skilled labour force. *Second*, despite the more advanced features of urban areas, they usually experience higher income inequality. Rural areas, on the contrary, represent the traditional sector, with agricultural related activities as the main source of income. They also experience a lower income inequality compared to the urban areas. *Third*, despite the fast growing urban areas, about 56 percent of Indonesians were still living in the rural areas during 1999 to 2008.

As previously discussed, the grid values were maintained to retain comparability between analyses. As Table 3 shows, there is at least a 30.7 percent probability of the poor in urban areas remaining in their current state. In contrast, the richest in the urban areas have a 60 percent chance of remaining rich, with about a 24.3 percent probability of becoming poorer. The ergodic distribution shows that the rich in urban areas have the highest probability to stay in their current state in the longer term.

Table 3: Markov Transition Probability by the Location (Urban-rural Areas)

State	Number of observations	1	2	3	4	5
		Upper limit				
		0.384	0.572	0.823	1.298	∞
Urban						
1	807	0.307	0.325	0.225	0.104	0.039
2	1167	0.161	0.275	0.257	0.214	0.093
3	1491	0.103	0.181	0.263	0.274	0.179
4	1860	0.036	0.119	0.206	0.333	0.307
5	2433	0.017	0.033	0.107	0.242	0.600
Starting distribution		0.084	0.149	0.187	0.261	0.320
Ergodic distribution		0.083	0.143	0.194	0.256	0.325
Rural						
1	2774	0.437	0.279	0.162	0.081	0.041
2	2414	0.245	0.313	0.224	0.156	0.062
3	2090	0.151	0.245	0.265	0.220	0.120
4	1720	0.102	0.180	0.250	0.281	0.187
5	1148	0.078	0.124	0.199	0.268	0.330
Starting distribution		0.229	0.245	0.219	0.187	0.121
Ergodic distribution		0.217	0.241	0.221	0.192	0.129

Notes:

1. Transition matrices and their respective ergodic distribution are based on seven-year transitions: 1993, 2000, and 2007.
2. The grid values are chosen to yield a relatively equal number of observations among states.
3. Regions were classified into two groups (urban and rural areas).

Source: Estimated by the author using data from IFLS 1, 3, and 4.

The pattern of Markov transition probability for those who live in the rural areas show a quite different pattern compared to that of the urban. As shown in the lower panel of Table 3, the poorest in rural areas tend to have a higher probability of remaining poor compared to their peers in urban areas. There is a 43.7 percent chance that they will stay poor and a 27.9 percent chance of them moving to State 2. The richest in rural areas, however, seem to have a relatively lower probability of remaining rich compared to their peers in urban areas. The rural richest has a 33.1 percent probability of staying rich, about half of the urban richest probability to remain rich. Furthermore, the ergodic distribution for rural people shows higher probability for the poorest to remain poor rather than the richest to remain rich.

Combining the upper and lower panels of Table 3, some distinct features of the Markov transition matrix in the urban and rural areas can be observed. In urban areas, the real per capita expenditure distribution is skewed upward, suggesting a higher probability for the lower expenditure group to move to the higher. On the contrary, rural poor people groups tend to remain in their current state, as represented by a high transition probability in the Markov matrix. This may be one of the reasons for high urbanisation in Indonesia.

Markov Transition Probability Matrix by Fiscal Decentralisation Index

Discussion on the expenditure dynamic has been extended to encompass a fiscal decentralisation era. There are various comments regarding the impact of fiscal decentralisation on inequality. It is argued that fiscal decentralisation may worsen inequality as unequal economic development and scattered natural endowments persist. Resource rich regions, for example *Aceh*, *Riau*, *Kalimantan Timur*, and *Papua* have benefited most due to the revenue sharing arrangements (Lewis, 2005). This may hinder the advantage of fiscal decentralisation policy in improving public services efficiency and accountability of regional governments. In order to estimate whether there has been convergence in terms of per capita expenditure during the fiscal decentralisation era, the Markov transition probability matrix based on the index of fiscal decentralisation has been estimated.

The enhanced fiscal decentralisation index (*EFDI*) is constructed following Vo's (2008). The *EFDI* is estimated by taking into account the intergovernmental transfers from various levels of government and their respective nature, whether conditional or unconditional transfers. Fiscal decentralisation in Indonesia mainly consists of the general allocation fund (*DAU*), revenue sharing (*DBH*), and the specific purpose fund (*DAK*) There are also additional funds available for *Aceh* and *Papua* due to their status as specific autonomous regions. The share of transfer to regions from the national budget has increased gradually and at present almost 30 percent of the national budget has been allocated to regional governments. It might be noted that some of the regions depend heavily on the balance funds to operate, due to limited access to their own-source revenue (Hofman et al. 2006).

Estimating the Markov transition probability matrix by the degree of fiscal decentralisation, households are classified following the level of *EFDI* of the province where they live. Provinces with *EFDI* below the average are classified into the "Below average *EFDI*" group, while those with *EFDI* above the average are classified into the "Above average *EFDI*" group. Moreover, like earlier analyses, the grid values are maintained for comparability purposes. Applying this method to classify provinces in the IFLS, there are four provinces that fall into the "Below average *EFDI*" group and nine provinces belonging to the "Above average *EFDI*" in IFLS 1993 and 2000. In IFLS 2007, the number of provinces that belong to the "Below average *EFDI*" group increased to six provinces whereas those belonging to the "Above average EFDI" decreased to seven provinces. Table 4 shows the result of the Markov transition probability by degree of fiscal decentralisation.

As Table 4 shows, the poorest in the "Below average *EFDI*" group have a relatively high probability of remaining poor. On the other hand, there is a slightly higher probability for the richest in the "Below average *EFDI*" group to remain rich. The ergodic distribution for this group tends to slightly skews rightward, suggesting a high probability for those who belong to this group to move to a higher state.

Similar to the "Below average *EFDI*" group, the "Above average *EFDI*" group is also characterised by a relatively higher probability for the poorest and the richest groups to remain at their current state. The poorest in the "Above average *EFDI*" group have a 39.7 percent probability of remaining at their current state, with a 29.0 percent chance to move to a higher state (State 2). However, the richest in this group have a higher probability to remain in their current state, but with a lower probability of falling into the lower state compared to those belonging to the "Below average *EFDI*" group. This suggests that people in the higher *EFDI* provinces are more diverse in terms of per capita expenditure than those in the lower *EFDI* provinces. The ergodic distribution in the "Above average *EFDI*" group, however, suggests higher probability for the poorest to move to a higher expenditure group.

Table 2: Markov Transition Probability by Degree of Fiscal Decentralisation (*EFDI*)

State	Number of observations	1	2	3	4	5
		Upper limit				
		0.384	0.572	0.823	1.298	∞
Below average EFDI						
1	922	0.443	0.282	0.154	0.088	0.032
2	974	0.236	0.303	0.253	0.156	0.051
3	925	0.135	0.254	0.278	0.197	0.135
4	844	0.079	0.207	0.224	0.245	0.245
5	798	0.030	0.063	0.144	0.295	0.469
Starting distribution		0.164	0.207	0.211	0.222	0.197
Ergodic distribution		0.186	0.227	0.215	0.194	0.177
Above average EFDI						
1	2659	0.397	0.290	0.183	0.088	0.042
2	2607	0.213	0.304	0.227	0.179	0.078
3	2656	0.132	0.209	0.263	0.250	0.146
4	2736	0.065	0.142	0.232	0.315	0.247
5	2783	0.037	0.067	0.132	0.244	0.519
Starting distribution		0.168	0.202	0.202	0.217	0.211
Ergodic distribution		0.152	0.193	0.208	0.225	0.223

Notes:
1. Transition matrices and their respective ergodic distribution are based on seven-years transitions: 1993, 2000, 2007.
2. The grid values are chosen to yield a relatively equal number of observations among states.
3. The EFDI represents the enhanced fiscal decentralisation index.

Source: Estimated by the author using data from IFLS 1, 3, and 4.

Markov Transition Probability of Per Capita Household Expenditure by the Level of Per Capita Gross Regional Product (GRP)

Following previous discussions on the categorisation based on *EFDI*, the current section discusses the Markov transition probability based on real per capita GRP. In doing so, households are categorised into two groups based on the real per capita GRP of a province relative to the real per capita GDP at which they are living. Provinces with real per capita GRP below real per capita GDP belong to the "Below per capita GDP" group, while those with the real per capita GRP higher than the real per capita GDP are categorised into the "Above per capita GDP" group. The aim of this analysis is to examine whether there are differences in transition probability among those who live in the "Above per capita GDP" and "Below per capita GDP". For a reference, Table 5 shows the average of the real per capita GRP and GDP during 1999-2008.

As Table 5 shows, almost all provinces (12 provinces) within IFLS samples have average real per capita GRP lower than average real per capita GDP. *DKI Jakarta* is the only province that has real per capita GRP above the real per capita GDP. As is found in Table 6, the poorest people in the "Below per capita GDP" group have a lower chance of moving to a higher expenditure group than those in the "Above per capita GDP" group.

Table 3: The Average of Real Per Capita GRP, 1999-2008

Code	Province	GRP per capita (Rp)
Below average GDP per capita		
12	Sumatera Utara	6,749,600
13	Sumatera Barat	6,169,309
16	Sumatera Selatan	6,858,618
18	Lampung	3,893,245
32	Jawa Barat	6,168,517
33	Jawa Tengah	4,238,285
34	DI Yogyakarta	4,901,118
35	Jawa Timur	6,790,300
51	Bali	6,086,704
52	Nusa Tenggara Barat	6,086,704
63	Kalimantan Selatan	6,760,917
73	Sulawesi Selatan	4,406,476
Above average GDP per capita		
31	DKI Jakarta	31,600,000

Notes: GRP and GDP per capita are in real terms (2000=100), and they are averaged for the period of 1999-2008. Average of the real GDP per capita (1999-2008) is Rp7,640,368.5.

Source: BPS.

Table 6: Markov Transition Probability by the Real Per Capita GRP

State	Number of observations	1	2	3	4	5
		Upper limit				
		0.384	0.572	0.823	1.298	∞
Below GDP per capita						
1	3495	0.410	0.287	0.176	0.085	0.041
2	3463	0.221	0.302	0.235	0.171	0.070
3	3332	0.135	0.225	0.265	0.240	0.135
4	3138	0.069	0.164	0.237	0.300	0.231
5	2846	0.039	0.077	0.148	0.263	0.472
Starting distribution		0.178	0.216	0.211	0.212	0.184
Ergodic distribution		0.166	0.210	0.215	0.217	0.191
Above GDP per capita						
1	86	0.103	0.241	0.241	0.276	0.138
2	118	0.119	0.167	0.190	0.357	0.167
3	249	0.055	0.102	0.313	0.297	0.234
4	442	0.026	0.062	0.163	0.379	0.370
5	735	0.026	0.015	0.079	0.220	0.660
Starting distribution		0.027	0.052	0.134	0.300	0.488
Ergodic distribution		0.039	0.059	0.151	0.288	0.463

Notes:

1. Transition matrices and their respective ergodic distribution are based on seven-years transitions: 1993, 2000, 2007.
2. The grid values are chosen to yield a relatively equal number of observations among states.
3. Regions were classified into two groups (below and above GDP) based on the average real per capita GRP during 1999-2008.

Source: Estimated by the author using data from IFLS 1, 3, and 4.

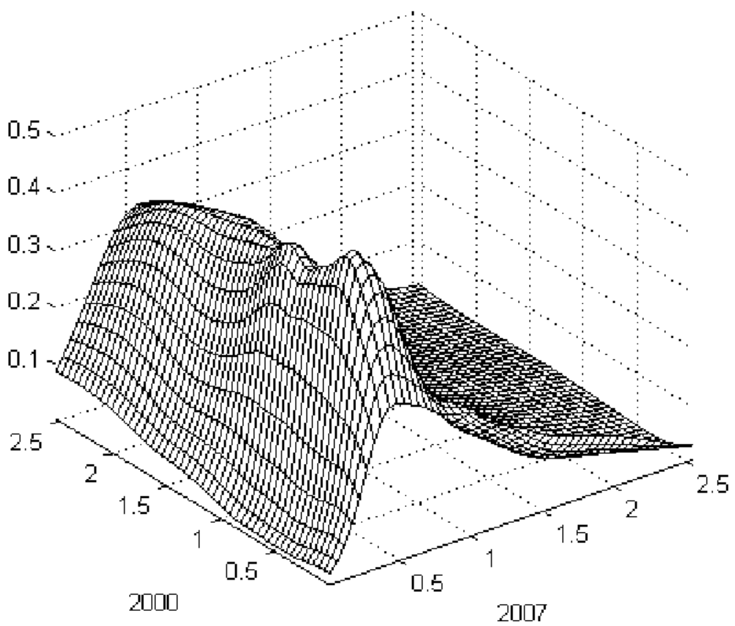
This can be observed by comparing diagonal elements of State 1 and State 2 in Table 6. On the contrary, it seems that the richest (State 5) in the "Above per capita GDP" group has a greater probability of remaining at their current state than those in the "Below average GDP". Relatively higher probability for the poorest to remain at their current state in the "Below per capita GDP" group may happen in the long-term as confirmed by an ergodic distribution. They have a 16.6 percent probability of remaining poor, whereas the poorest in the "Above per capita GDP" group have only a 3.9 percent of staying at their current state.

The Stochastic Kernel Analysis of Relative Real Per Capita Household Expenditure

As discussed earlier, the stochastic kernel analysis is proposed to overcome the arbitrariness of discretisation. Employing stochastic kernel means that the state of per capita expenditure has not been determined, but rather it is a continuous version of the transition probability matrix. Figure 3 shows a three-dimensional plot of the stochastic kernel of the real per capita household expenditure for 2000 and 2007.

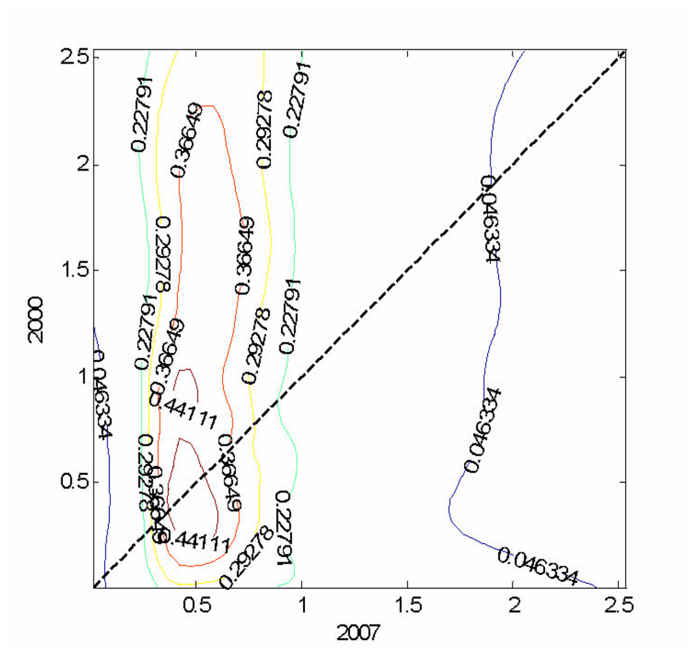
It should be noted however, that Figure 3 represents persons with a relative real per capita expenditure up to 2.5 times the average of national real per capita expenditure, while others are excluded. It is expected that by limiting the data, the shape of the stochastic kernel can be clearly observed, as well as the existence of modality. Employing this method, there remained 94.1 percent of total observations during the three waves of IFLS (16,852 out of 17,904 observations).

One distinct peak in the stochastic kernel appears to be prominent in Figure 3. This suggests that expenditure distribution amongst individuals converge rather than diverge. The result seems to contradict an earlier study by Sakamoto (2007) employing provincial real per capita GDP, that observed the existence of twin-peaks distribution. There are at least two reasons for this difference: first, the source of data. This study employs household level surveys whereas Sakamoto (2007) uses regional accounts to observe the convergence. The second reason is related with the data coverage. Sakamoto (2007) uses the real per capita GRP (2000=100) that covers all provinces from 1977 to 2005. The IFLS, however, covers only 13 provinces out of 26 original provinces in 1999. The corresponding percentage contour plot of Figure 3 is displayed in Figure 4. The latter figure makes it evident that there is one prominent peak of relative real per capita expenditure.
Most of the density mass for values of relative real per capita expenditure below one lies below the 45-degree diagonal as demonstrated in Figure 4. On the contrary, those with values of relative real per capita expenditure greater than one rest above the diagonal line. This suggests convergence as individuals in the lowest range of relative per capita expenditure are more likely move to the higher range, whereas individuals with real per capita expenditure above the average tend to move to the lower state (Juessen, 2009).



Sources: Estimated by the author using data from the IFLS 1993, 2000, and 2007.

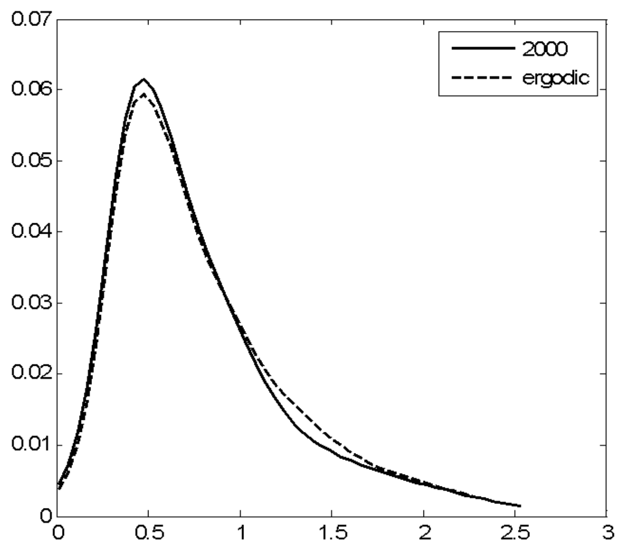
Figure 3: The Stochastic Kernel of Relative Real Per Capita Household Expenditure, 2000-2007



Sources: Estimated by the author using data from the IFLS 1993, 2000, and 2007.

Figure 4: The Percentage Contour Plot of the Relative Per Capita Household Expenditure, 2000-2007

Moreover, it is evident from Figure 4 that there is a peak of the relative real per capita household expenditure at about 0.5 times of the national average. Fugure 5 confirms the existence of per capita expenditure convergence as shown by uni-modality of the ergodic distribution. These findings are different than those of Sakamoto's (2007). Employing the real per capita GRP, he observed the twin-peaks distribution, which suggests the formation of the convergence group between provinces over 1975 to 2005.



Sources: Estimated by the author using data from the IFLS 1993, 2000, and 2007.

Figure 5: Ergodic Distribution of the Relative Real Per Capita Household Expenditure

Further investigation by province shows that, in general, the relative real per capita household expenditures tend to converge in most of the provinces. It is shown by the probability mass that lies roughly along the vertical axis. The convergence for some provinces however, was highlighted by the twin-peaks. It is noticeable, for example, in *Sumatera Barat*, *Lampung*, *Jawa Barat*, *Jawa Tengah*, *Jawa Timur*, *Bali*, *Kalimantan Selatan*. In those provinces, households seem to converge into two groups of states rather than into the single group.

DKI Jakarta, in contrast, shows a single peak. This result is worth noting, given the economic advancement of *DKI Jakarta* relative to other provinces which results in high income inequality (see, for example, Akita et al., 2011). Consequently, one might expect to see the twin peaks distribution among households who live in *DKI Jakarta* with the rich group in a higher peak and the poor in the lower one. Nonetheless, this event seems to be unobserved in this study. This might be due to: *first*, after data cleaning to retain households that were interviewed across the three waves of survey as discussed earlier, there were left relatively small samples for *DKI Jakarta*. The number of households sample left for each wave of IFLS for *DKI Jakarta* employed in this study is 7.5 percent. *Second*, IFLS seems to experience higher attrition rates between surveys from the higher economic status households (Thomas et al., 2001). This consequently might lead to the gap between information gathered from the survey and the daily life experiences in favour of expenditure divergence in the society.

CONCLUSIONS

Following the economic crisis in 1997, Indonesia underwent decentralisation in both administrative and fiscal areas in 1999. Full implementation of this policy in 2001 substantially increased inter-governmental transfers, and since that time about 30 percent of the national budget has been transferred to the regions every year. Given the unequal economic development and scattered natural endowments between regions, fiscal decentralisation has raised scepticism, it being suggested that it may increase inequality among provinces and people. In other words, the poor regions remain poor while the rich ones remain rich with an increasing gap between them.

This study aims to examine the convergence in terms of real per capita household expenditure in Indonesia during the period 1993-2007. Following Pittau and Zelli (2006) and Sakamoto and Islam (2008), this study employs nonparametric approaches, namely kernel density, the Tukey boxplot, the Markov transition probability matrix, the stochastic kernel and its two dimensional contour plot to estimate the relative real per capita expenditure convergence. While Sakamoto (2007) employed real per capita GRP to conduct his study, this study employs Indonesian household expenditure data derived from the longitudinal survey, the IFLS.

The key findings of the study are: *first*, that the real per capita household expenditure had a tendency to converge, forming unimodal distribution. This finding seems to stand out against earlier studies (for example, Sakamoto 2007) that favour the twin peaks shape of income distribution; *second*, the existence of convergence suggests that in the longer term, an expenditure gap between the poor and the rich people decreases. This leads to the *third* conclusion, that there is a relatively high probability for the poor to move from their initial state to other higher expenditure groups, but with some exceptions. The poorest in the rural areas seem to have a higher probability of remaining in their current state compared to those in urban areas. This also applies for the poorest who live on *Nusa Tenggara* islands, which are considered to be the poorest region.

Investigating expenditure convergence by grouping provinces based on their degree of fiscal decentralisation, measured by *EFDI*, the result shows a higher probability of the poorest who live in the "Below average *EFDI*" provinces to remain in their initial condition. This might be partly due to relatively limited resources, (both intergovernmental transfers and own-source revenue) being available for regional governments belonging to the "Below average *EFDI*" group to introduce the pro-income distribution programs.

Further analysis by classifying provinces based on their level of the real per capita GRP shows that the poorest households living in the "Below per capita GDP" provinces have a higher probability to remain poor compared to their peers in the "Above per capita GDP" provinces. In addition to the above- mentioned reason with respect to relatively scarce resources and less economic advancement in the "Below per capita GDP" provinces, it might also be because of elite capture as a certain privileged group enjoys most of the economic advantages.

Finally, despite the merit of using the IFLS dataset to study expenditure convergence at household level, its results need to be cautiously interpreted: *first*, not all provinces were covered by the IFLS, for example, *Aceh* and *Papua* were omitted from the surveys. This was due to the security concerns, cost efficiency, or that they were intentionally omitted. *Second*, in spite of lower attrition rate, the IFLS has relatively lower households compared to, for example, the SUSENAS Consumption Panel dataset. The SUSENAS Panel started in 2003, employing the consumption module questionnaire from the SUSENAS 2002 Module. There are 10,000 households from 65,000 households of the 2002 SUSENAS Consumption Module that are surveyed annually to construct a longitudinal income and consumption dataset. Those limitations might lead to further research for more conclusive result.

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