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SPATIAL DIMENSIONS OF EXPENDITURE
INEQUALITY IN A DECENTRALIZING INDONESIA

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**Abstract**

This study analyzes spatial dimensions of inequality under decentralization in Indonesia from 1996–2010 using the hierarchical decomposition method. It uses household expenditures rather than regional accounts and tries to investigate the contributions of spatial inequalities to overall expenditure inequality. We find that urban–rural disparity constitutes 15%–25% of overall expenditure inequality. A large difference exists between urban and rural areas in the magnitude of inequality among districts. After controlling for the urban–rural difference, inequality among districts accounts for 15%–25% of overall inequality. While disparity between five major island regions is almost negligible, inequalities between districts within provinces appear to have played an increasingly important role in both urban and rural areas. Given unequal geographic distributions of resource endowments, public infrastructure, and economic activities, some spatial inequalities are inevitable. Nevertheless, sustained efforts are necessary to reduce spatial inequalities to facilitate national unity, cohesion, and stability. The government needs to accelerate infrastructure development.

**Keywords:** spatial dimensions of inequality, hierarchical decomposition of inequality, Theil index, decentralization, Indonesia

**JEL Classification:** D63, O1

# **Contents**

# 1. INTRODUCTION

A number of studies have been conducted to analyze regional development dynamics and the evolution of interregional income inequalities in Indonesia, as large differences in socioeconomic indicators persist among its regions and provinces due largely to unequal distributions of resource endowments, public infrastructure, and economic activities. The capital province of Jakarta, for example, has the largest per capita GDP, but it is followed by the resource-rich provinces of East Kalimantan, Riau, and Papua. Meanwhile, conflict-ridden North Maluku registers the smallest and the ratio of the largest to smallest per capita GDP is 18. With respect to the incidence of poverty, West Nusa Tenggara is the poorest province with the poverty headcount ratio at 20%, which is more than six times larger than the smallest.

In order to mitigate interregional inequalities and to cope with periodic secessionist movements (e.g., the Free Aceh Movement and the Free Papua Movement), Indonesia embarked on the so-called "Big Bang" decentralization in 2001 (World Bank 2003; Fitrani, Hofman, and Keiser 2005).[1] Under decentralization, the central government is responsible for religious affairs, national defense and security, the judicial system, fiscal and monetary policy, foreign affairs, and other specially designated functions such as macroeconomic planning and national standards, while authority over and responsibilities for most other functions, including education, health management, and public works, are devolved to regional governments, particularly district (*kabupaten* and *kota*) governments (Brodjonegoro and Asanuma 2000; Alm, Aten, and Bahl 2001). Decentralization is expected to make the government closer to the people, thereby ensuring the effective and efficient provision of public services in line with local needs and costs (Oates 1999). However, its effects on interregional inequalities remain uncertain. As the world's largest archipelagic country consisting of more than 13,000 islands with approximately 350 ethnic groups, whether administrative and fiscal decentralization increases or decreases interregional inequalities is one of the most important policy issues that have attracted many researchers.

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[1] Two decentralization laws, Law 22 in 1999 on Regional Government and Law 25 in 1999 on the Fiscal Balance between the Central Government and the Regions, were promulgated in 1999 in the aftermath of the 1997/1998 financial crisis and the subsequent fall of the Suharto regime. They were implemented in 2001. Under Law 22/1999, the hierarchical governance system linking district (*kabupaten* and *kota*) governments to the central government was replaced by the system where district governments are granted considerably greater autonomy (Brodjonegoro and Asanuma 2000; Silver, Azis, and Schroeder 2001). Under Law 25/1999, autonomous region subsidy (SDO: Subsidi Daerah Otonom) and presidential instruction development grants (Inpres: *Instruksi Presiden*) were abolished and replaced by intergovernment transfers including general allocation grants (DAU: *Dana Alokasi Umum*), special allocation grants (DAK: *Dana Alokasi Khusus*), and shared revenues from natural resources and taxes (DBH: *Dana Bagi Hasil*) (Lewis 2001; Silver, Azis, and Schroeder 2001). Currently, revenues of regional governments consist mainly of these intergovernment transfers, own source revenues (PAD: *Pendapatan Asli Daerah*), and regional government borrowings.

**Figure 1: Hierarchical Spatial Structure**
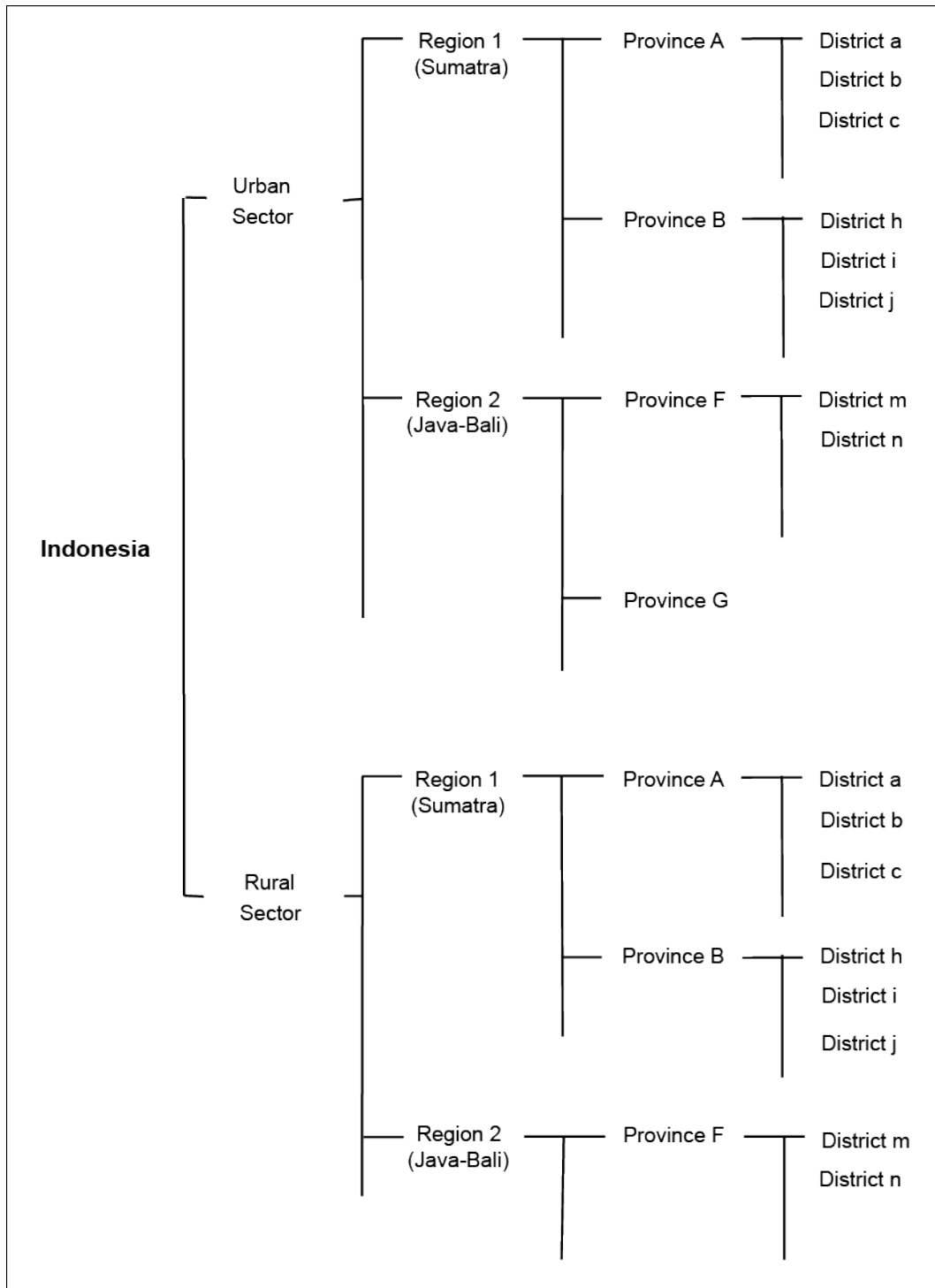
Most previous studies on interregional inequalities in Indonesia were based on regional accounts data, such as gross regional domestic product (GRDP) and gross regional domestic expenditure (GRDE), either at the provincial or district level.[2] However, even under fiscal decentralization, much of the revenues generated from oil and natural gas and certain proportions of revenues from other natural resources have still accrued to the central government, and thus GRDP and GRDE are not good indicators of regional welfare levels. The main objective of our study is to analyze spatial dimensions of inequality under decentralization in Indonesia from 1996 to 2010. Unlike most previous studies, however, our study employs household expenditure data rather than regional accounts data. By applying the hierarchical inequality decomposition method of the Theil indexes, developed by Akita (2003) and extended by Akita and Miyata (2013), to household expenditure data from the National Socio-economic Survey (*Susenas*), it examines the contributions of inequalities between spatial units to overall expenditure inequality among households in two hierarchical spatial frameworks, i.e., urban or rural sector–district and region–province–district frameworks (Figure 1).[3] It does not explore the cause-and-effect relationship between decentralization and spatial inequalities; it tries to investigate the magnitudes and patterns of spatial inequalities under decentralization.

Among the questions that are addressed in this study are the following. First, to what extent is urban–rural disparity responsible for overall expenditure inequality? Have there been any changes in its contribution to overall inequality in the 1996–2010 period? Second, is there any difference between the urban and rural sectors in the magnitude of inequality among districts (*kabupatens* and *kotas*)? To what extent does inequality among districts contribute to overall expenditure inequality, after controlling for the urban–rural difference? Have there been any changes in its contribution to overall expenditure inequality? Third, what are possible factors of the changes in overall expenditure inequality? Fourth, among interregional, interprovincial and interdistrict inequalities, which spatial inequality contributes most to urban and rural expenditure inequalities? Here, interprovincial and interdistrict inequalities are defined, respectively, as a weighted average of interprovincial inequalities within regions and a weighted average of interdistrict inequalities within provinces.

## 2.  LITERATURE REVIEW

When measuring spatial inequality, we should distinguish three approaches (Kanbur and Venables 2005; Milanovic 2005). The first approach concerns unweighted variation in per capita GDP across regions. It compares regions in terms of their per capita GDP, but ignoring their population sizes. Regional convergence analysis advanced by Barro and Sala-i-Martin (1992, 1995), which examines regional differences in per capita GDP (sigma-convergence) and per capita GDP growth rates (beta-convergence), is an example of the first approach. In Indonesia, Garcia-Garcia and Soelistianingsih (1998), Shankar and Shah (2003), Resosudarmo and Vidyattama (2006), Hill, Resosudarmo,

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[2]  See, for example, Esmara (1975), Uppal and Budiono (1986), Akita (1988), Hill (1992), Akita and Lukman (1995), Garcia-Garcia and Soelistianingsih (1998), Tadjoeddin, Suharyo, and Mishra (2001), Akita and Alisjahbana (2002), Akita (2003), Resosudarmo and Vidyattama (2006), Hill (2008), Hill, Resosudarmo, and Vidyattama (2008), Akita, Kurniawan, and Miyata (2011), Vidyattama (2013), and Hill and Vidyattama (2014).

[3]  In this study, Indonesia is divided into five regions: Sumatra, Java-Bali, Kalimantan, Sulawesi, and Eastern Indonesia, where Eastern Indonesia includes the provinces of East Nusa Tenggara, West Nusa Tenggara, Maluku, North Maluku, Papua, and West Papua. Provinces in each of these five regions are made up of districts (*kabupatens* and *kotas*). Provinces and districts have their own local governments and parliamentary bodies.

and Vidyattama (2008), and Vidyattama (2010, 2013) conducted a regional convergence analysis using provincial and/or district-level per capita GDP data and thus belong to this category. In contrast, the second approach concerns population-weighted variation in per capita GDP across regions. An analysis based on the population-weighted coefficient of variation introduced by Williamson (1965) is an example of the second approach. In Indonesia, studies using the population-weighted coefficient of variation include Esmara (1975), Uppal and Budiono (1986), Akita (1988), Akita and Lukman (1995), Tadjoeddin, Suharyo, and Mishra (2001), Shankar and Shah (2003), Akita, Pudji, and Miyata (2011), Vidyattama (2013), and Hill and Vidyattama (2014).

The third approach uses individuals or households as the unit of analysis. By using additively decomposable inequality measures, it assesses the contribution of income variation across spatial units, such as urban and rural locations, regions, provinces and districts, to income variation among all individuals or households. It is usually referred to as spatial decomposition of income inequality, where overall inequality is decomposed additively into the between-group and within-group inequality components. Shorrocks and Wan (2005) presented basic theoretical properties of spatial decomposition of income inequality. It also provided a review of empirical literature on spatial decomposition. One of the major findings from their study is that the magnitude of the between-group component tends to increase with the number of identified spatial units; however, it is very sensitive to how spatial units are defined; an urban–rural division, for example, appears to be more significant than an east–west or north–south division.

Our study follows the third approach, but it extends the approach and analyzes spatial dimensions of expenditure inequality in the two hierarchical spatial frameworks mentioned above. Some of the studies that employed the third approach in Indonesia are Akita and Lukman (1999), Skoufias (2001), Tadjoeddin, Suharyo, and Mishra (2001), Akita and Miyata (2008), Yusuf, Sumner, and Rum (2014), and Hayashi, Kataoka, and Akita (2014). Akita and Lukman (1999) used household expenditure data for 1987–1993 from *Susenas* to assess the contribution of interprovincial inequality to overall expenditure inequality among households as measured by the Theil indexes. Tadjoeddin, Suharyo, and Mishra (2001) conducted similar research based on updated *Susenas* data. According to these studies, interprovincial inequality accounted for around 15%–20% of overall expenditure inequality in the 1990s.

Akita and Lukman (1999) also conducted an inequality decomposition analysis by urban and rural areas and found that the contribution of the urban and rural disparity to overall expenditure inequality was around 20%–25% for 1987–1993. Akita and Miyata (2008) and Hayashi, Kataoka, and Akita (2014) did an updated analysis, respectively, for 1996–2002 and 2008–2010. Using the Theil *T* index, these studies observed that the disparity between urban and rural areas accounted for 15%–20% of overall expenditure inequality.[4] Hayashi, Kataoka, and Akita (2014) also conducted a decomposition analysis by five regions: Sumatra, Java-Bali, Kalimantan, Sulawesi, and Eastern Indonesia. It was found that the between-region inequality was insignificant by constituting merely 1% of overall inequality. This implies that much of the inequality among households is due to within-region inequalities. However, with its high within-region inequality and large population share, Java-Bali's within-region

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[4] We should note that according to an alternative approach introduced by Elbers and others (2008), the disparity between urban and rural areas becomes more significant where the disparity is assessed against the maximum between-group inequality attainable given the number and relative sizes of the groups rather than overall inequality that is used in the conventional approach (Hayashi, Kataoka and Akita 2014).

inequality was responsible for 65% of overall expenditure inequality. According to Yusuf, Sumner, and Rum (2014), the contributions of interprovincial inequality and urban–rural disparity to overall expenditure inequality appear to have been declining over the last 2 decades, though there are some fluctuations.

It should be noted that Akita (2003) and Akita and Alisjahbana (2002) conducted a hierarchical inequality decomposition analysis using the Theil indexes. However, these studies were based on district-level GDP data and assessed the contributions of interregional and interprovincial inequalities to inequality among districts in per capita GDP. Our study, on the other hand, uses household expenditure data to analyze the contributions of inequalities between spatial units, such as urban and rural locations, regions, provinces, and districts, to overall expenditure inequality among households.

# 3. METHOD AND THE DATA

## 3.1 Method: Hierarchical Decomposition of Expenditure Inequality by the Theil Index *L*

To investigate spatial dimensions of expenditure inequality in Indonesia, we perform hierarchical inequality decomposition analyses based on household expenditure data from *Susenas*. The analyses are done using the Theil index *L* (i.e., the mean logarithmic deviation) in two hierarchical spatial frameworks: urban or rural sector–district and region–province–district frameworks.[5] The Theil index *L* belongs to the generalized entropy class of inequality measures and satisfies several desirable properties as an inequality measure, such as anonymity, population homogeneity, income homogeneity, and the Pigue-Dalton principle (Anand 1983). In addition, it is additively decomposable by population subgroups as described below (Bourguignon 1979; Shorrocks 1980).

### 1.1.1 Hierarchical Inequality Decomposition Analysis: Urban or Rural Sector–District Framework

We consider a population of *N* households. In a hierarchical inequality decomposition analysis performed in the urban or rural sector–district framework, all households are first classified into the urban and rural sectors (sectors 1 and 2, respectively), where there are, respectively, $N_1$ and $N_2$ households. Households in each of the urban and rural sectors are then grouped into collectively exhaustive districts (*kabupatens* and *kotas*) according to their residential locations, where there are, respectively, $m_1$ and $m_2$ districts. We should note that $m_1$ is not equal to $m_2$, since in some districts there are no rural households (e.g., districts in Jakarta) and in some other districts there are no urban households. In 2010, there are 451 and 438 districts in the urban and rural sectors, respectively, while in Indonesia as a whole, there are 474 districts.

In order to obtain the hierarchical inequality decomposition equation, we let $y_{sdh}$ and *Y* denote, respectively, the per capita expenditure of household *h* in district *d* in sector *s* and the total per capita expenditure of all households. Overall inequality in per capita expenditure (hereafter, referred to as expenditure inequality) is then measured by the Theil index *L* as follows:

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[5] A decomposition analysis is conducted also using the Theil index *T*. But the results are similar to the ones by the Theil index *L* qualitatively, thus only the Theil *L* results are presented and discussed in this paper.

$$L = \sum_s \sum_d \sum_h \left( \frac{1}{N} \right) \log \left( \frac{1/N}{y_{sdh}/Y} \right). \tag{1}$$

The Theil index $L$ in equation (1) can be decomposed hierarchically into the between-sector inequality component ($L_{BS}$), the within-sector between-district inequality component ($L_{WSBD}$), and the within-sector within-district inequality component ($L_{WSWD}$) as follows (for details, see Akita and Miyata 2013):

$$\begin{aligned} L &= L_{BS} + \sum_s \left( \frac{N_s}{N} \right) L_s \\ &= L_{BS} + \sum_s \left( \frac{N_s}{N} \right) L_{BDs} + \sum_s \sum_d \left( \frac{N_{sd}}{N} \right) L_{sd} \\ &= L_{BS} + L_{WSBD} + L_{WSWD}. \end{aligned} \tag{2}$$

where $N_{sd}$, $L_s$, $L_{BDs}$ and $L_{sd}$ are, respectively, the number of households in district $d$ in sector $s$, expenditure inequality within sector $s$, expenditure inequality among districts in sector $s$, and expenditure inequality within district $d$ in sector $s$. Equation (2) presents the hierarchical inequality decomposition equation in the urban or rural sector–district framework.

In this decomposition framework, the order of decomposition can be reversed, i.e., first by districts and then by urban and rural sectors. In other words, overall inequality can be decomposed hierarchically into the between-district component ($L_{BD}$), the within-district between-sector component ($L_{WDBS}$), and the within-district within-sector component ($L_{WDWS}$) as follows:

$$\begin{aligned} L &= L_{BD} + \sum_d \left( \frac{N_d}{N} \right) L_d \\ &= L_{BD} + \sum_d \left( \frac{N_d}{N} \right) L_{BSd} + \sum_d \sum_s \left( \frac{N_{ds}}{N} \right) L_{ds} \\ &= L_{BD} + L_{WDBS} + L_{WDWS} \end{aligned} \tag{3}$$

where $N_d$, $L_d$, $L_{BSd}$ and $L_{ds}$ are, respectively, the number of households in district $d$, expenditure inequality within district $d$, expenditure inequality between sectors in district $d$, and expenditure inequality within sector $s$ in district $d$. It should be noted that $L_{WDWS}$ in equation (3) is the same as $L_{WSWD}$ in equation (2).

In connection with this multivariate decomposition method, Tang and Petrie (2009) suggested an alternative multivariate decomposition framework, called the non-hierarchical decomposition method, which, in the context of urban or rural sector and district, is given by:

$$L = L_{BS} + L_{BD} + L_{ISD} + L_{WSWD} \tag{4}$$

where $L_{ISD}$ is the sector–district interaction term. Since $L_{WSBD} = L_{BD} + L_{ISD}$ from equations (2) and (4), the interaction term is given by $L_{ISD} = L_{WSBD} - L_{BD}$, which could be negative if expenditure inequality among districts is due in part to the disparity between the urban

and rural sectors. The non-hierarchical method is, however, unable to examine the difference between the urban and rural sectors in the magnitude of inequality among districts, even though it could indicate the extent of the sector–district interaction. In contrast, the hierarchical decomposition method is able to analyze this urban–rural difference by conducting a one-stage decomposition analysis by district for each sector.

### 1.1.2  Hierarchical Inequality Decomposition Analysis: Region–Province–District Framework

Indonesia, as the world's largest archipelagic country, can be divided into the following five regions in accordance with its main islands: Sumatra, Java-Bali, Kalimantan, Sulawesi, and Eastern Indonesia. In a hierarchical decomposition analysis in the region–province–district framework, households in each of these five regions are grouped hierarchically into provinces and then districts (*kabupatens* and *kotas*) according to their residential locations. In contrast to the urban or rural sector–district decomposition framework, there is a natural hierarchical order, i.e., each region includes a distinct set of provinces and each province contains a distinct set of districts; thus, the order of decomposition cannot be reversed. Since there are differences in expenditure inequality between the urban and rural sectors, we perform this hierarchical decomposition analysis for the urban and rural sectors separately.[6] This enables us to analyze the structural differences between these two sectors with respect to the spatial dimensions of expenditure inequality.

We let $y_{rpdh}$ denote the per capita expenditure of household *h* in district *d* in province *p* of region *r*. Overall expenditure inequality is then measured by the Theil index *L* as follows:

$$L = \sum_r \sum_p \sum_d \sum_h \left(\frac{1}{N}\right) \log\left(\frac{1/N}{y_{rpdh}/Y}\right) \tag{5}$$

The Theil index *L* in equation (5) can be decomposed hierarchically into the four inequality components: the between-region ($L_{BR}$), between-province ($L_{BP}$), between-district ($L_{BD}$), and within-district ($L_{WD}$) components as follows (for details, see Akita 2003 and Paredes, Iturra, and Marcelo 2016):

$$
\begin{aligned}
L &= L_{BR} + \sum_r \left(\frac{N_r}{N}\right) L_r \\
&= L_{BR} + \sum_r \left(\frac{N_r}{N}\right) L_{B\Pr} + \sum_r \sum_p \left(\frac{N_{rp}}{N}\right) L_{rp} \\
&= L_{BR} + \sum_r \left(\frac{N_r}{N}\right) L_{B\Pr} + \sum_r \sum_p \left(\frac{N_{rp}}{N}\right) L_{BDrp} + \sum_r \sum_p \sum_d \left(\frac{N_{rpd}}{N}\right) L_{rpd} \\
&= L_{BR} + L_{BP} + L_{BD} + L_{WD}
\end{aligned}
\tag{6}
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[6] Urban inequality is usually higher than rural inequality since the urban sector offers a much wider variety of jobs than the rural sector (see Eastwood and Lipton 2004). In Indonesia, urban expenditure inequality has been much larger than rural inequality.

where $L_r$, $L_{rp}$, $L_{rpd}$, $L_{BPr}$ and $L_{BDrp}$ are, respectively, inequality within region $r$, inequality within province $p$ of region $r$, inequality within district $d$ in province $p$ of region $r$, inequality between provinces in region $r$, and inequality among districts in province $p$ of region $r$. Equation (6) presents the three-stage hierarchical decomposition equation in the region–province–district framework. It should be noted that the between-province $(L_{BP})$ and between-district $(L_{BD})$ components should be called, more precisely, the "within-region between-province" and "within-province between-district" components, respectively. But, for simplicity, the terms "between-province" and "between-district" components are used hereafter.

## 3.2  The Data

To investigate the spatial dimensions of expenditure inequality, this study employs monthly household expenditure data from 1996 to 2010, which are obtained from the National Socio-Economic Survey (*Susenas*) conducted by the Central Bureau of Statistics (CBS). Since 2011, *Susenas* has been conducted quarterly; therefore, our study does not include data from 2011 to avoid the comparability problem. We should note that *Susenas* has covered the whole country in the study period, but the province of Aceh is excluded from our data set due to missing data in some years.[7]

When Aceh is excluded, *Susenas* had 194,997 households in 1996, of which 62,426 and 132,571 were respectively, in urban and rural areas. The sample size has increased since then, and in 2010, *Susenas* included 282,321 households, of which 126,785 and 155,536 were respectively, in urban and rural areas. However, the *Susenas* sample constitutes a constant proportion of the population of all households in Indonesia. According to the estimated number of households obtained using household sampling weights, urbanization has proceeded rapidly over the study period; in 1996, the urban sector constituted 36% of all households, but its share has risen prominently and in 2010 reached 50%. On the other hand, the shares of the five regions, i.e., Sumatra, Java-Bali, Kalimantan, Sulawesi, and Eastern Indonesia, have remained almost constant over the study period; Java-Bali has the largest share at 63%–65%, which is followed by Sumatra (17%–19%), Sulawesi (6%–7%), Eastern Indonesia (5%–6%), and Kalimantan (5%–6%).

Before 1999, Indonesia had 26 provinces including Aceh, but the number of provinces has increased gradually since the two decentralization laws were promulgated in 1999. In 1999, North Maluku was established by splitting Maluku. Subsequently in 2000, Bangka-Belitung Islands, Banten, and Gorontalo were created, respectively, by splitting South Sumatra, West Java, and North Sulawesi. Furthermore, between 2002 and 2004, Riau Islands, West Papua, and West Sulawesi were established by partitioning Riau, Papua, and South Sulawesi, respectively.[8] Finally, in 2012, North Kalimantan was established by splitting East Kalimantan. As a result, Indonesia has now 34 provinces. In this study, however, these new provinces are merged back into the provinces that they used to belong to; thus, a hierarchical inequality decomposition analysis based on equation (6) is performed with 25 provinces excluding Aceh.

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[7]  *Susenas* was not conducted in Aceh due to political and security reasons for some years.

[8]  Papua was formerly called Irian Jaya.

When Aceh is excluded, *Susenas* provided expenditure data for 283 districts (*kabupatens* and *kotas*) before 1999. However, the number of districts has risen significantly since the two decentralization laws were promulgated in 1999. In 2010 there were 474 in the dataset (Figure 2).[9] Before 1999, the Java-Bali region had the largest number of districts at 116, which was followed by Sumatra, Sulawesi, Eastern Indonesia, and Kalimantan, respectively, at 63, 40, 35, and 29 districts. Between 1999 and 2010, 191 districts were newly established by splitting existing districts, but much of the increase has occurred in non-Java-Bali regions. Particularly in Sumatra and Eastern Indonesia, the number of districts has increased substantially, and in 2010, Sumatra had the largest number of districts at 128, which was followed by Java-Bali, Eastern Indonesia, Sulawesi, and Kalimantan, respectively, at 127, 91, 73, and 55 districts.[10] We should note that only 11 new districts were established in Java-Bali between 1999 and 2010, while the other 4 regions have created 180 in total.[11] This suggests that the decentralization has had much larger effects on non-Java-Bali regions with respect to the establishment of new districts.[12]

## Figure 2: Number of Districts by Region
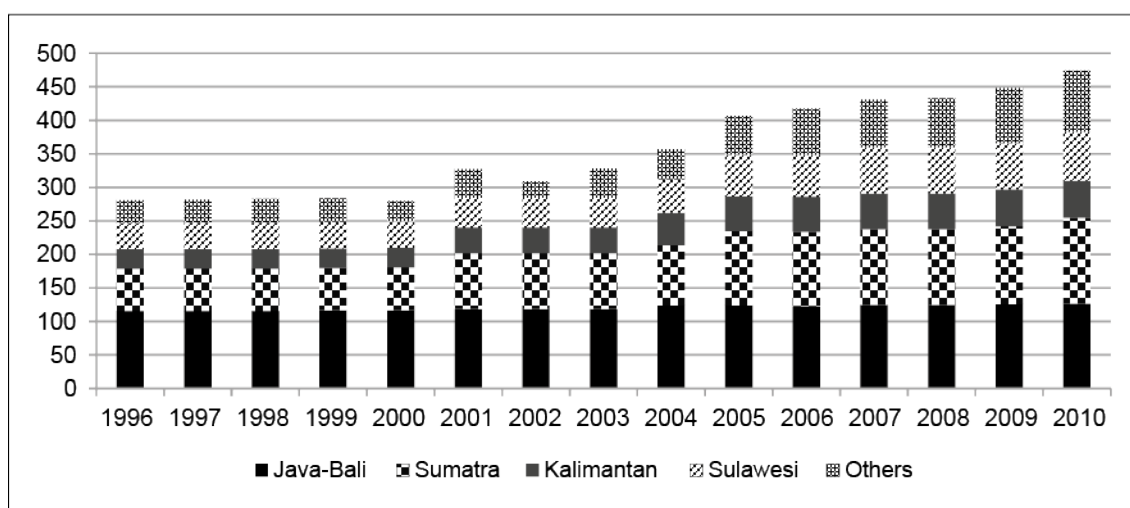


In this study, newly established districts are not merged back into the districts from which they were separated. Therefore, some care should be taken in interpreting the result for the between-district inequality component in equation (6). Given the distribution of household expenditures, the between-district inequality component, as measured by the Theil index *L*, depends on both the number of districts and differences in district expenditure means (Shorrocks and Wan 2005). It rises monotonically with the

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[9] In 2000 and 2002, the number of districts in the *Susenas* dataset fell slightly from the preceding year, but this is due mainly to missing observations for some districts in Maluku, North Maluku, and Papua.

[10] In Eastern Indonesia, much of the increase had occurred in Papua.

[11] According to Firman (2009, 2013), actually 164 *kabupatens* and 34 *kotas* had been newly established between 1999 and 2009 including the special province of Aceh, while general allocation funds (DAU) for districts had increased by 12% per year between 2001 and 2009. He argued that territorial splits have not only reinforced spatial fragmentation and local selfishness but also exerted an additional burden on the national budget and suggested a need to make mergers a more attractive option for the better provision of public services.

[12] Based on a district-level dataset for 1998–2004, Fitrani, Hofman, and Kaise (2005) found that new districts are mostly concentrated in off-Java provinces and typically those with low population densities and limited formal human capital.

number of districts if new districts are created by dividing existing districts. However, the increment would be getting smaller and smaller as the number of districts increases. Since the total number of districts is quite large at 300–500 after 2001, the effect of the increase on the between-district component would be small given the spatial distribution of household expenditures.

# 4.  EMPIRICAL RESULTS

## 4.1  Hierarchical Inequality Decomposition Analysis: Urban or Rural Sector–District Framework

Figure 3 shows the evolution of overall, urban, and rural inequalities and the disparity between the urban and rural sectors (i.e., the between-sector inequality), as measured by the Theil index $L$ (for details, see Table A1 in the Appendix). Like most other Asian countries, rural inequality has been much smaller than urban inequality (Eastwood and Lipton 2004), but except for a few years, its rising and declining trends have been very similar to those of urban inequality. As discussed before, urbanization has proceeded very rapidly over the period. Due mainly to this rising urbanization and relatively high urban inequality, the levels and trends of overall inequality resemble very closely those of urban inequality. Though much smaller in magnitude, the disparity between the urban and rural sectors has a similar trend pattern to overall inequality, and its contribution to overall inequality has been around 15%–25%. Meanwhile, a large difference exists between the urban and rural sectors in the magnitude of inequality among districts (see Table A1 in the Appendix). After controlling for the urban–rural difference, inequality among districts accounts for 15%–25% of overall inequality (see Tables A1 and A2 in the Appendix).

**Figure 3: Expenditure Inequalities by Theil Index L**
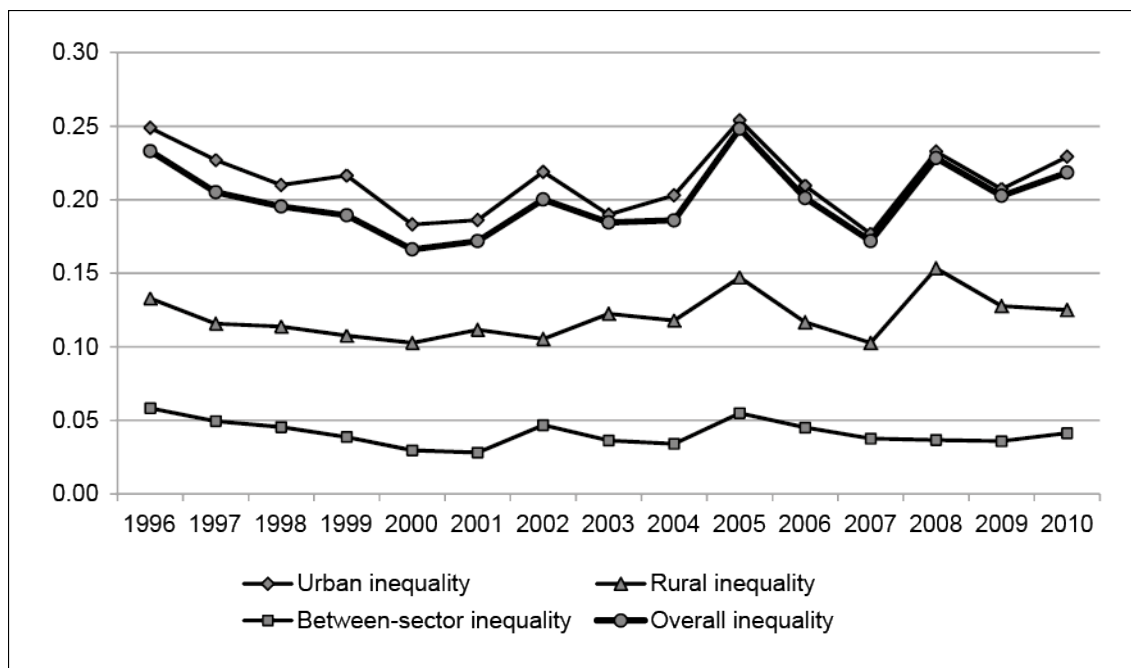
Before the two decentralization laws were implemented, overall expenditure inequality showed a declining trend. However, after reaching the bottom in 2000 at 0.17, it started to rise and attained the peak in 2005 at 0.25. After it decreased to 0.17 in 2007, it started to increase again.[13] According to the result of the hierarchical decomposition analysis in the urban or rural sector–district framework (Figure 4), the main determinant of the decline in overall expenditure inequality until 2000 appears to have been the decrease in the urban–rural expenditure disparity (for details, see Tables A1 and A2 in the Appendix). Its contribution amounted to more than 40% of the decline, despite the fact that the urban–rural expenditure disparity accounted for around 20%–25% of overall inequality in the period. In passing, the urban–rural ratio in mean per capita expenditure was 2.0 in 1996, but fell to 1.6 in 2000. We should note that this period included the 1997/1998 financial crisis. As pointed out by Akita and Alisjahbana (2002), the financial crisis appears to have narrowed the disparity between the urban and rural sectors, particularly between major urban areas and other areas in Sumatra and Java-Bali. This is because the effect of the crisis was borne disproportionately by these major urban areas due to their high reliance on the financial, non-oil and gas manufacturing, and construction sectors, which were hit hardest by the crisis.

**Figure 4: Hierarchical Decomposition of Overall Expenditure Inequality:
Urban or Rural Sector-District, Theil Index L**
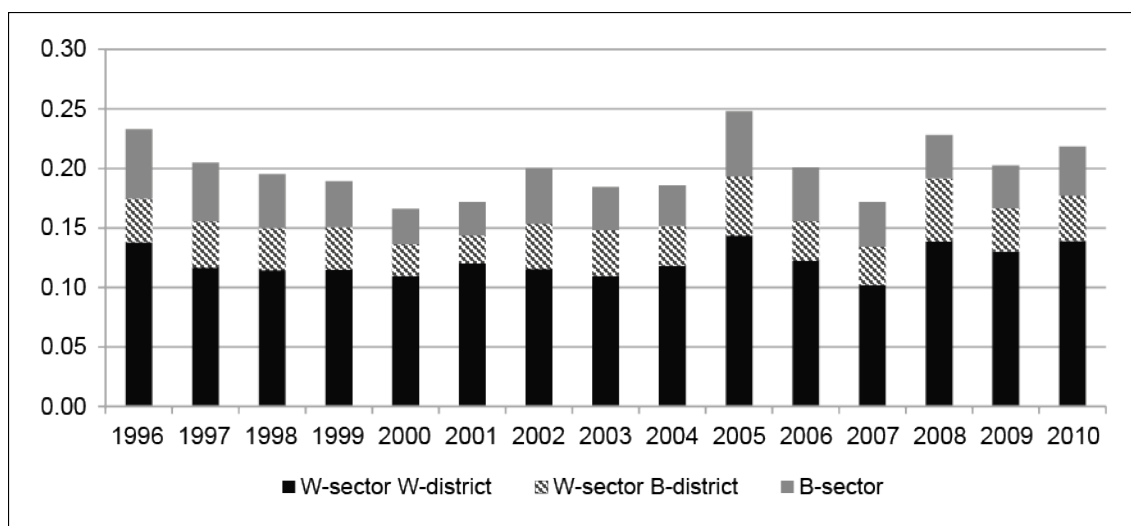


On the other hand, the main determinant of the rise in overall expenditure inequality between 2000 and 2005 seems to have been the increase in the between-district inequality component in both the urban and rural sectors in addition to the rise in the urban–rural disparity (Table A1). Since the two decentralization laws were implemented in 2001, the number of districts has increased conspicuously, particularly in non-Java-Bali regions (Figure 2): while Java-Bali has increased its districts from 117 to 124 between 2000 and 2005, the other four regions have increased their districts notably from 167 to 283. This has raised, to some extent, the between-district inequality component, since as discussed above, the between-district inequality component increases with the number of districts if new districts were established by splitting existing districts. While it is not possible to confirm the causal relationship in our study, one of the possible factors for the rise in inequality among districts would be

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[13] According to standard errors estimated by bootstrapping, the changes in expenditure inequality are all statistically significant.

fiscal decentralization, since the natural resources revenue sharing scheme has made natural-resource-abundant districts richer as compared with resource-poor districts.[14]

It should be noted that besides fiscal decentralization, rising domestic rice prices would be another factor of the rapid rise in overall inequality, particularly from 2004 to 2005, since the price increase would have exerted a more detrimental effect on the poor than the rich (McCulloch 2008; Yusuf, Sumner, and Rum 2014). This is, in fact, indicated by the rise in the within-sector within-district inequality component, i.e., non-spatial component, since the hike in domestic rice prices is less likely to have spatial effects. Between 2004 and 2005, the expenditure share of the richest 20% of households increased significantly, while the share of the poorest 20% decreased in both sectors. Thus, the ratio of the expenditure share of the richest 20% to that of the poorest 20% (Kuznets 20/20 ratio) rose notably, from 3.0 to 4.3 in the rural sector and from 5.5 to 6.7 in the urban sector (Figure 5).

Overall expenditure inequality declined substantially between 2005 and 2007. It seems that three inequality components in equation (2), i.e., the between-sector, within-sector between-district, and within-sector within-district components, are equally responsible for the decrease, since their contributions to overall inequality have remained almost constant over the period (Tables A1 and A2). This period corresponds to the period after the enactment of the two revised decentralization laws (i.e., Law 32/2004 and Law 33/2004).[15] Though the effects of Law 32/2004, which redesigned the intergovernmental governance framework and strengthened the roles of provincial governments, is uncertain, the law might have exerted some effects on the decline in expenditure inequality.[16]

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[14] Under the natural resources revenue sharing scheme introduced by Law 25/1999, regions (provinces and districts) receive 15% and 30% of oil and gas revenues, respectively and 80% of the revenue from other natural resources (i.e., forestry, fishery, and general mining); with a few exceptions, of the amount allocated to the producing regions, 20% goes to the province, 40% goes to the producing districts, and the other 40% is shared equally among the nonproducing districts in the province (Brodjonegoro and Asanuma 2000; Brodjonegoro and Martinez-Vazquez 2004; Bahl and Tumennasan 2004). It should be noted that the special autonomous provinces of Aceh, West Papua and Papua receive much higher shares of their oil and gas revenues (Agustina, Schulze, and Fengler 2012). On the other hand, under the tax revenue sharing scheme introduced also by Law 25/1999, regions (provinces and districts) receive 20% of the revenue from personal income tax, while they receive 90% and 80%, respectively, of the revenues from property tax and tax on the transfers of land and building ownership (Brodjonegoro and Asanuma 2000; Brodjonegoro and Martinez-Vazquez 2004).

[15] In 2004, the two revised decentralization laws, i.e., Law 32/2004 on Regional Government and Law 33/2004 on the Fiscal Balance between the Central Government and the Regions, were enacted and replaced Law 22/1999 and Law 25/1999, respectively. Under Law 32/2004, the roles of provincial governments were strengthened: provincial governors, who are now elected by popular vote, not only guide and supervise the governance of their district governments but also coordinate the implementation of central government affairs in their provinces, while under Law 33/2004, which was fully implemented in 2008, the revenue shares of oil- and gas-producing regions (provinces and districts) have increased slightly to 15.5% and 30.5%, respectively, for oil and gas, and geothermal energy has been added in other natural resources (Soesastro and Atje 2005).

[16] Between 2005 and 2007, the share of general and special allocation grants (DAU and DAK) in the total district government budget increased significantly from 59% to 67%, while the proportion of the shared revenues from natural resources and taxes (DBH) has declined from 24% to 17% (Lewis and Smoke forthcoming). DAU is widely referred to as an equalization grant and thought to have inequality-reducing effects, as opposed to DBH (Lewis 2001).

**Figure 5: Expenditure Inequalities by Kuznets 20/20 Ratio**
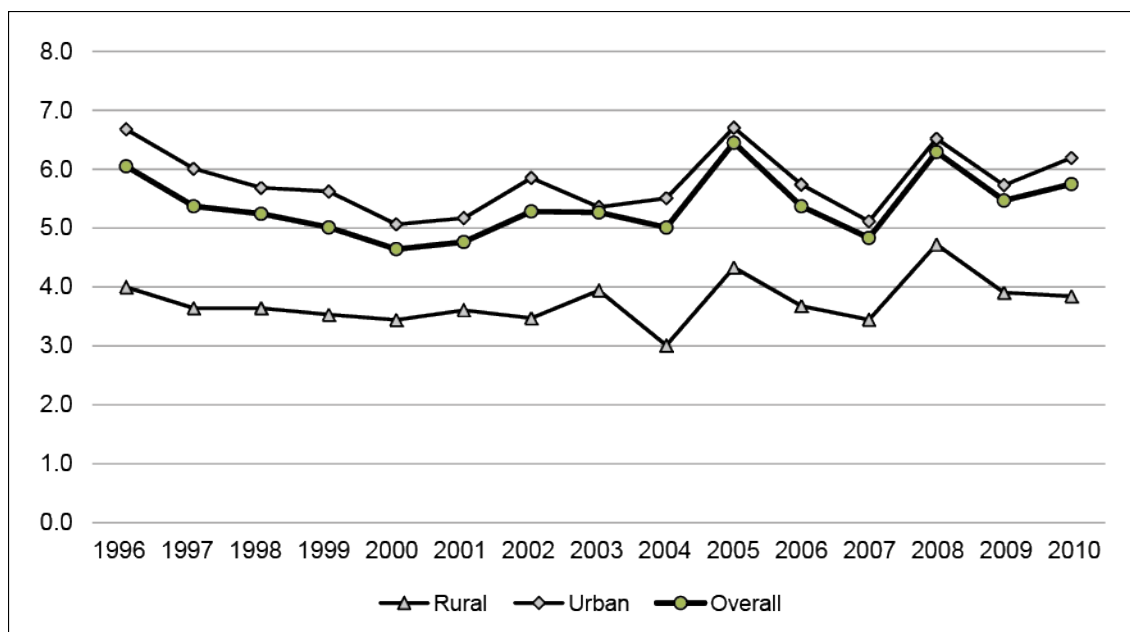


In 2005, the government reduced fuel subsidies and more than doubled domestic fuel prices.[17] The intention was not only to narrow the gap between domestic and international prices but also to reduce the burden on the national budget as fuel subsidies constituted a substantial portion of the budget (Mcleod 2008; Agustina, Schulze, and Fengler 2012; Howes and Davies 2014). At the same time, the government provided massive unconditional cash transfers to the poor (BLT) to compensate for the damage caused by the domestic fuel price increase (Sumarto and Suryahadi 2010).[18] While the gap between domestic and international fuel prices has still existed, this policy package seems to have mitigated expenditure inequality in both the urban and rural sectors between 2005 and 2007.

After 2007, overall inequality started to rise again. Unlike the previous periods, however, the within-sector within-district inequality component, i.e., non-spatial component, is mostly responsible for the change, as it accounts for 80% of the increase. Its contribution to overall inequality has risen from 59% to 64% between 2007 and 2010. Yusuf, Sumner, and Rum (2014) argued that large fuel subsidies would have increased inequality, since their impact on expenditures is known to have been regressive and thus they have had a dis-equalizing effect on household expenditures. They argued also that changes in formal labor market regulations, such as increasing minimum wages, rising retirement benefits, and the strengthening of labor unions, would have increased inequality, as the changes are likely to have benefited the rich disproportionately more than the poor. Since these factors were less likely to have spatial effects, they might have some bearing on the increase in the within-sector within-district component.

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[17] The government raised the price of premium gasoline from Rp1,810 to Rp4,500 per liter. It also raised the price of kerosene from Rp700 to Rp2,000 per liter.

[18] An unconditional cash transfer program, known as BLT (Bantuan Langsung Tunai), was launched in October 2005. The government allocated more than half of the savings generated by the fuel subsidy cut to this cash transfer program. The BLT program provided poor households (more than a quarter of all households) with Rp300,000 per household every 3 months from the fourth quarter of 2005 to the third quarter of 2006 (Sumarto and Suryahadi 2010).

Between 2007 and 2008, both rural and urban inequalities rose sharply (Figures 3 and 5) and this rapid rise was found to be uniform across districts as most districts recorded an increase in their within-district inequalities in both sectors. This suggests that non-spatial factors are mainly responsible for the rise. In this period, the world oil price rose sharply from around $60 per barrel to more than $90 per barrel, and this was accompanied by a rapid increase in the consumer price index (CPI) inflation rate, from 6% in mid-2007 to more than 10% (McLeod 2008). Meanwhile, domestic fuel prices have remained low owing to large fuel subsidies, and the gap between domestic and international fuel prices has been widening. This has made domestic fuels much less expensive than other commodities. Since the rich consume much more energy, this has benefited the rich more than the poor. As mentioned above, the effect of fuel subsidies on expenditures has been regressive, particularly under the situation where the difference between domestic and international fuel prices is large. Large fuel subsidies in this period thus appear to have raised expenditure inequality substantially. In October 2008, the government cut fuel subsidies again and raised fuel prices by 33% (Howes and Davies 2014).[19] At the same time, it introduced a social protection program, including unconditional cash transfers (BLT) and rice subsidies to the poor, to compensate for the domestic fuel price increase. This policy package would have lowered expenditure inequalities slightly between 2008 and 2009, particularly in the rural sector. However, a large gap has still existed between domestic and international fuel prices, and it was not until July 2013 that the government raised domestic fuel prices (Howes and Davies 2014).

## 4.2   Hierarchical Inequality Decomposition Analysis in the Urban and Rural Sectors: Region–Province–District Framework

According to Table A2 in the Appendix, which provides the result of a non-hierarchical decomposition analysis, the sector–district interaction term has a large negative value (see equation [4]). This indicates that expenditure inequality among districts is due in part to the expenditure disparity between the urban and rural sectors. Therefore, an inequality decomposition analysis needs to be conducted for each sector separately, not only to examine the urban–rural difference in the magnitude of inequality among districts but also to analyze the contributions of interregional and interprovincial inequalities in each of the urban and rural sectors. In this section, we perform a hierarchical decomposition analysis in the region–province–district framework to investigate the spatial dimensions of expenditure inequality for each sector (see equation [6]).

Figures 6-1 and 6-2 present the results of the region–province–district hierarchical decomposition analysis in the rural and urban sectors, respectively. Several observations emerge from the analysis. While there were some fluctuations over the study period, around 25%–30% of urban inequality and around 15%–25% of rural inequality are explained by inequality among districts, i.e., the sum of the between-region, between-province, and between-district inequality components.[20] In other words, inequality among districts constitutes a significant portion of expenditure inequality in both the urban and rural sectors. However, the contribution of the disparity

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[19] The government increased premium gasoline from Rp4,500 to Rp6,000 per liter and kerosene from Rp2,000 to Rp2,500 per liter. However, this fuel price increase did not last owing to oil price decrease.

[20] As mentioned in the methodology section, the between-province and between-district inequality components refer, respectively, to the within-region between-province and within-province between-district components.

between the five regions (the between-region component) is very small. Particularly in the urban sector, it is almost negligible as it amounts to merely 0%–2% of urban inequality; for the five regions, the ratio of the largest to smallest mean per capita expenditure is only around 1.2–1.4. On the other hand, the disparity between the five regions constitutes 1%–5% of rural inequality, and it appears to have been increasing over the study period.

**Figure 6-1: Hierarchical Decomposition of Rural Expenditure Inequality: Region-Province-District, Theil Index L**
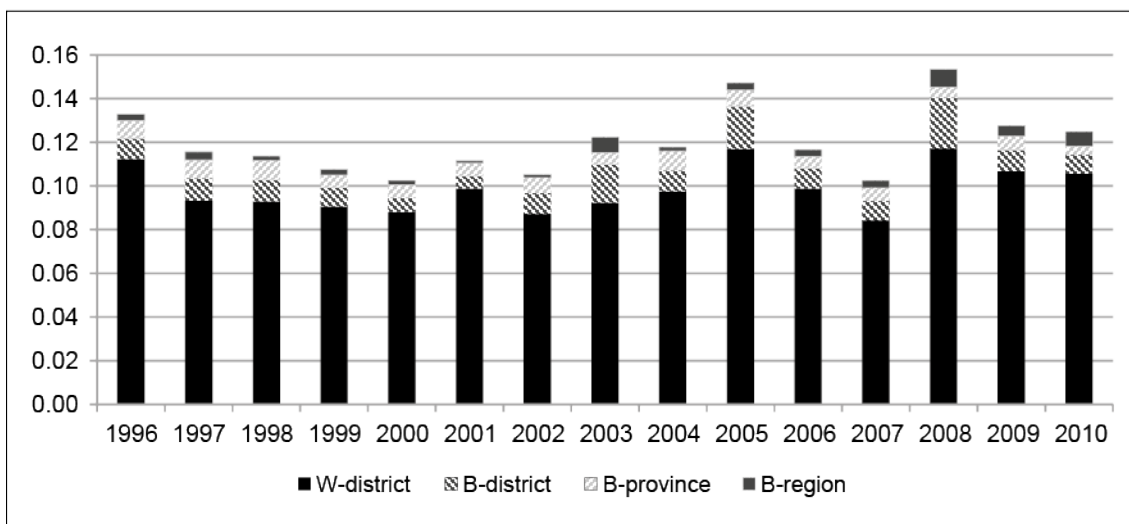


**Figure 6-2: Hierarchical Decomposition of Urban Expenditure Inequality: Region-Province-District, Theil Index L**
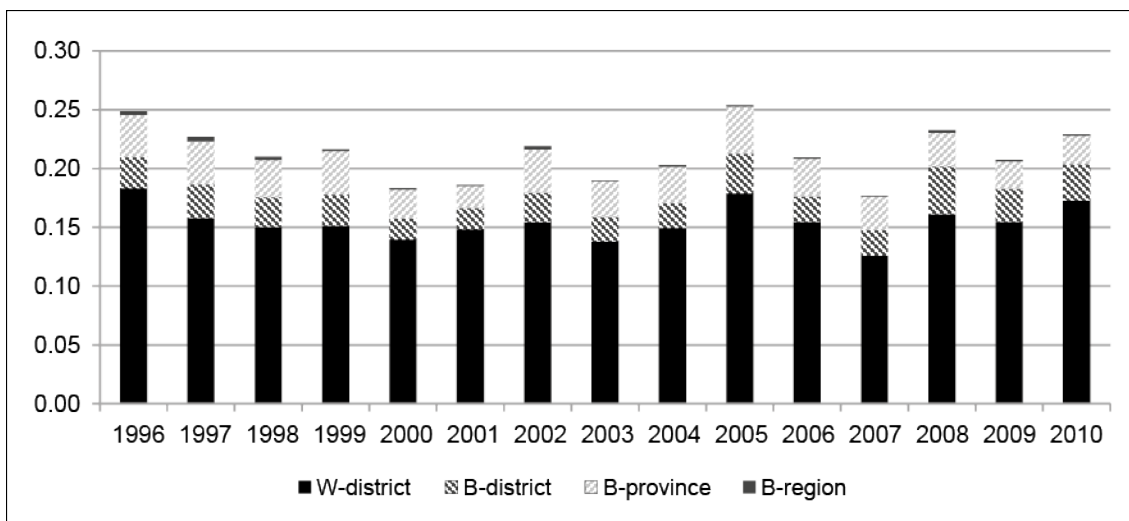
On the other hand, the between-province and between-district inequality components have much larger contributions in both the urban and rural sectors. Their combined contribution is 25%–30% to urban inequality and 10%–20% to rural inequality. If a comparison is made between these two components, the between-district component has played a more important role in the rural sector. Its contribution amounts to 5%–15% of rural inequality. In contrast, the between-province component had played a more important role in urban inequality, though this was until 2007 and the between-district component has overtaken the between-province component since 2008. We should note, however, that much of the urban sector's between-province inequality component is due to interprovincial inequality in the Java-Bali region, particularly the disparity between Jakarta and the other Java-Bali provinces, as Java-Bali's interprovincial inequality accounts for more than 80% of the between-province component in the urban sector. Jakarta, the largest metropolitan area, has the largest mean per capita expenditure among 26 provinces in Indonesia; its mean per capita expenditure has been more than twice as large as the smallest (registered by Central Java) in the Java-Bali region. If Jakarta and its adjacent province (West Java) were merged and treated as one province, Java-Bali would have a much smaller disparity between provinces, making the between-province inequality component smaller than the between-district component.[21]

While spatial inequality constitutes a significant portion of expenditure inequality among households, the contribution of the within-district inequality component is much larger, amounting to 70%–75% of urban inequality and 75%–85% of rural inequality. Figures 7-1 and 7-2 present, respectively, frequency distributions of districts in the rural and urban sectors with respect to within-district inequality in 2010, where districts are classified into the Western and Eastern regions. The Western region includes Sumatra and Java-Bali, while the Eastern region includes Kalimantan, Sulawesi, and Eastern Indonesia.[22] The Eastern region has a higher mean within-district inequality than the Western region in both rural and urban areas. The Eastern region also has a larger variation than the Western region. In Eastern rural areas, most of the high-inequality districts (inequality above 0.20) are concentrated in Eastern Indonesia, particularly in the province of Papua (11 out of 15 high-inequality districts), while in Eastern urban areas, 47 high-inequality districts are scattered over Eastern provinces. On the other hand, more than 90% of Western rural districts have inequalities smaller than 0.15 and only two Western rural districts are high-inequality districts (inequality above 0.20). In Western urban areas, three-quarters of the districts have inequality in the range of 0.10–0.20 and half of high-inequality districts are concentrated in the provinces of Jakarta, West Java, and Central Java.

Though it is not the task of our study to explore factors determining expenditure inequalities within urban and rural areas, education and occupation of household head appear to have been the main factors. According to randomly selected urban and rural districts from the 2010 *Susenas* sample, educational and occupational differences constitute 20–30% of inequalities within urban and rural districts. However, there are large variations in the contributions of these factors among districts, due perhaps to social, economic, and cultural differences.

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[21] Akita and Lukman (1995) indicated this point, though they employed the provincial GDP data to measure interprovincial inequalities.

[22] In the Western region, there are 221 and 254 districts in the rural and urban sectors, respectively. On the other hand, in the Eastern region, there are 217 and 197 districts.

**Figure 7-1: Distribution of Districts in the Rural Sector
by Within-District Inequality in 2010, Theil Index L**
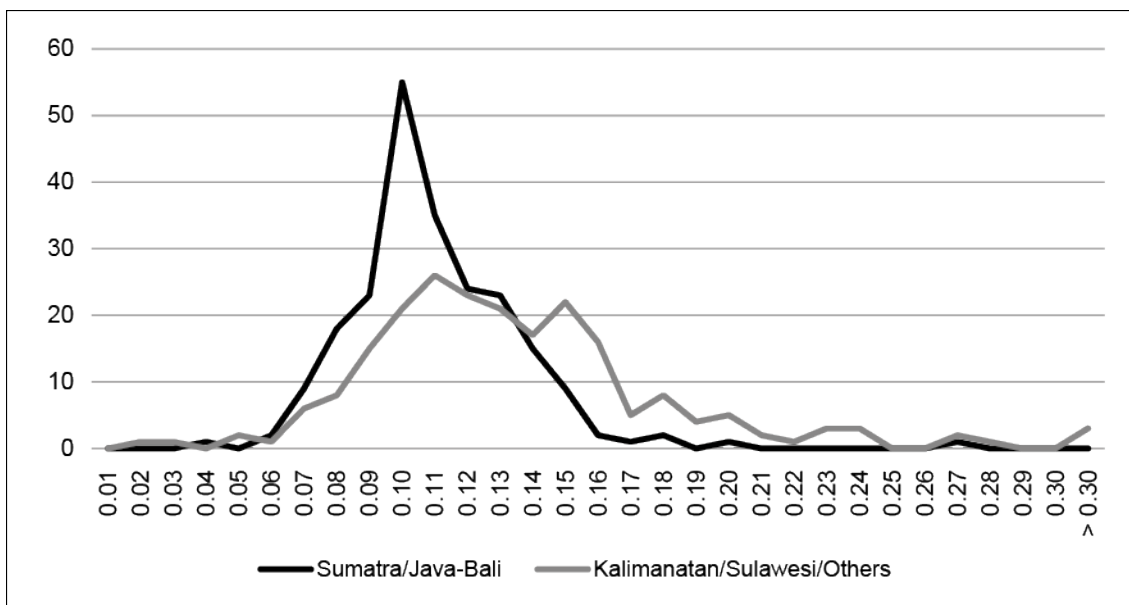


**Figure 7-2: Distribution of Districts in the Urban Sector
by Within-District Inequality in 2010, Theil Index L**
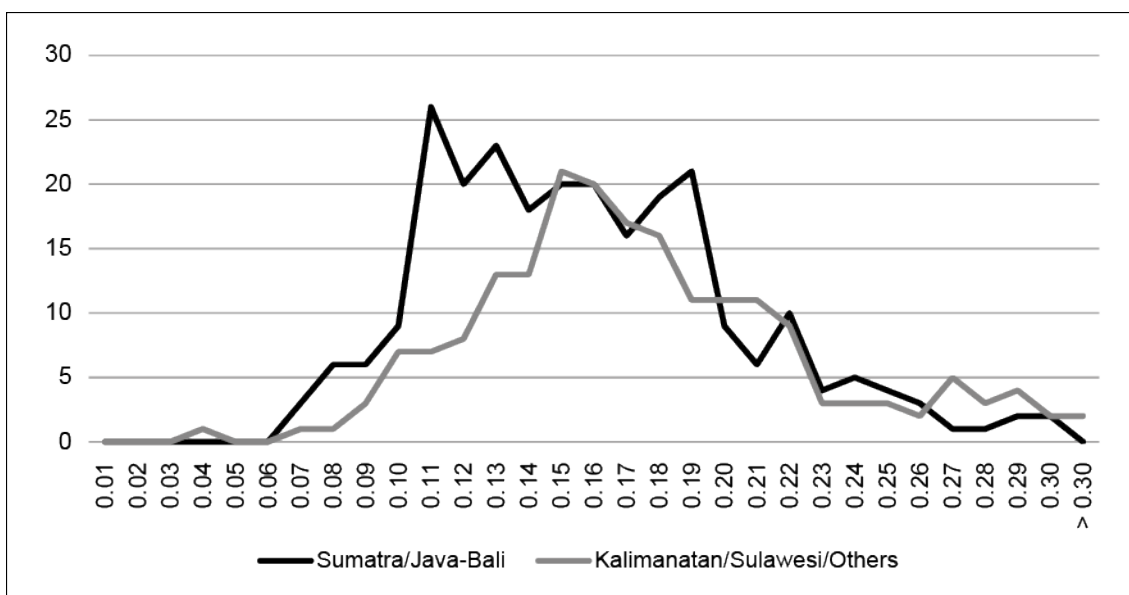


# 5. CONCLUSIONS

Based on the National Socio-economic Survey (*Susenas*) from 1996 to 2010, this study analyzed spatial dimensions of inequality under decentralization in Indonesia using the hierarchical decomposition method of the Theil index. Unlike most previous studies, it used household expenditure data rather than regional accounts data to measure spatial inequalities as the former is considered a better indicator of regional welfare levels. The following summarizes major findings. First, due mainly to rising urbanization

and relatively high urban inequality, the levels and trends of overall expenditure inequality resemble very closely those of urban inequality. Urban–rural disparity has a similar trend pattern, and its contribution to overall inequality is around 15%–25%. Second, a large difference exists between urban and rural areas in the magnitude of inequality among districts (*kabupatens* and *kotas*). After controlling for the urban–rural difference, the inequality accounts for 15%–25% of overall expenditure inequality.

Third, the main determinant of the decline in overall expenditure inequality until 2000 appears to have been the decrease in urban–rural disparity. The 1997/1998 financial crisis seems to have narrowed the disparity, as the effect was borne disproportionately by major urban areas. Fourth, rising overall inequality from 2000 to 2005 seems to have been due to the increase in inequality among districts in both urban and rural areas. While the increasing number of districts under the "Big-Bang" decentralization has raised the inequality to some extent, one of the possible factors would be fiscal decentralization, since the natural resources revenue sharing scheme has made natural-resource-abundant districts richer as compared with resource-poor districts.

Fifth, all inequality components seem to be equally responsible for the decrease in overall inequality from 2005 to 2007. While the effects of the 2004 revised decentralization laws remain ambiguous, the revision might have exerted some effects on the decline. Meanwhile, a drastic reduction of fuel subsidies in 2005 accompanied by a compensation package may have reduced expenditure inequality in both urban and rural areas. Though we do not claim a direct causal relationship of a fuel subsidy reduction since there are various other potential factors of the decline of inequality during this period, we believe the effect of policy change in fuel subsidy was not negligible. Sixth, the non-spatial component (i.e., within-district inequality component) is mostly responsible for the rise in overall inequality from 2007 to 2010, as it accounts for 80% of the increase. Among others, changes in formal labor market regulations would have increased inequality as the changes are likely to have benefited the rich disproportionately more than the poor. Low domestic fuel prices owing to sustained large fuel subsidies also may have raised inequality since they have benefited the rich, who consume much more energy. While a cut in fuel subsidies accompanied by a compensation package in 2008 would have lowered inequality slightly, the increasing trend seems to have persisted. Finally, in both urban and rural areas, inequality among districts constitutes a significant portion of expenditure inequality as it accounts for 25%–30% of urban inequality and 15%–25% of rural inequality. However, disparity between Sumatra, Java-Bali, Kalimantan, Sulawesi, and Eastern Indonesia is almost negligible. Meanwhile, inequalities between districts within provinces seem to have been playing an increasingly important role in both urban and rural inequalities.

In order to mitigate spatial inequalities and to cope with periodic secessionist movements, the government embarked on "Big-Bang" decentralization in the aftermath of the 1997/1998 financial crisis and the subsequent fall of the Suharto regime. However, the effects of the decentralization remain uncertain and large inequalities still exist between provinces and districts. According to district-level data from *Susenas*, the ratio of the largest to smallest mean per capita expenditure was 6.8 in 2010, compared with 6.3 in 1996. If nominal expenditure data are adjusted for price differentials across districts, the inequalities will be reduced to some extent, but not substantially.

As Akita, Kurniawan, and Miyata (2011) suggested, there are three major factors of spatial inequalities in Indonesia. The first is the uneven spatial distribution of immobile natural resources. Though this has become less prominent due to the declining role of mining activities in the national economy, the resource-rich provinces of Riau, East Kalimantan, and West Papua still have relatively high mean per capita expenditure. The second is the primacy of Jakarta and its adjacent districts, i.e., Bogor, Depok, Tangerang, and Bekasi (usually abbreviated as Jabodetapek). Under globalization and economic liberalization, Jabodetapek has nurtured agglomeration economies as the center of politics and economy. Its mean per capita expenditure is more than twice as large as the national average. As pointed out by Hill, Resosudarmo, and Vidyattama (2008), the regions that have easier access to the global economy, such as Jabodetapek, appear to have performed much better than those that have poor access. The third factor is related to the industry structure of Indonesia: the uneven spatial distribution of resource-based manufacturing industries such as wood processing and plantation- and mineral-based industries in Sumatra, Kalimantan, and Eastern Indonesia, as these industries tend to be located closer to areas where raw materials are available. There are other factors which could be responsible for spatial inequality such as migration. For example, given the increase in economic agglomeration in urban areas observed, such as in Jabodetapek area, a substantial number of people migrated to urban areas seeking jobs.[23] Though gradual structural transformation away from the primary sector has been observed overall at the national level, the spatial inequalities still continue to persist in Indonesia due to these possible factors.

Given uneven spatial distributions of resource endowments, public infrastructure, and economic activities, some spatial inequalities are inevitable from the efficiency point of view. Nevertheless, sustained efforts are necessary to reduce spatial inequalities to facilitate national unity, cohesion, and stability. In a geographically and culturally diverse archipelagic country where natural resources and economic activities are unevenly distributed, the government needs to accelerate infrastructure development, particularly development of transportation networks.

Indonesia is facing a major infrastructure deficit (Ray and Ing 2016). In the road transport sector, the number of motor vehicles increased conspicuously by 12% per year between 1970 and 2013 owing to rapid motorization, while the total length of roads (national, provincial, and district) grew by only 4% per year in the same period (McCawley 2015). Furthermore, due to poor construction quality, overloading, and poor maintenance, roads tend to have short asset lives (Ray and Ing 2016). In the rail transport sector, on the other hand, the total number of passengers grew by 3.5% per year between 1970 and 2013, but Java accommodates much of the railway system and many of its main railway lines remain single-track (McCawley 2015). Poor transport connectivity would not only weaken the competitiveness of the national economy but also facilitate disparities among regions. Recently, infrastructure policy is a major concern among economic policy makers in Indonesia. Fortunately, in 2015, the world oil price has declined notably, from above $100 to less than $50 per barrel; this enables the government to shift its budget from fuel subsidies to infrastructure spending. Given the limited amounts of financial resources, however, coordinated efforts are imperative among public and private sectors based on a strategic long-term plan to promote infrastructure development.

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[23] Internal migration versus spatial inequality is an important issue in itself. However, it is beyond the scope of this study.

This study is not without limitations. First, this study employed nominal expenditure data from *Susenas*. However, there are price differentials across regions; thus it is preferable that nominal expenditures are adjusted for price differentials to examine real disparities across spatial units. It is one of our future studies to estimate spatial inequalities using price adjusted expenditure data. Second, it is not possible for our study to analyze the causal relationship between decentralization and spatial inequalities. Further empirical research, perhaps using regional panel data, is necessary to explore the causal relationship. Third, our study did not include the period after 2010. According to Yusuf, Sumner, and Rum (2014) and Yusuf and Sumner (2015), expenditure inequality has increased further, and in 2013, the Gini coefficient had risen to 0.41, from 0.33 in 2001. This is an alarming level considering the fact that inequality is measured by expenditure rather than income data. Although the Gini coefficient has stabilized at around 0.41 between 2013 and 2015, due perhaps to the end of the commodity boom (Yusuf and Sumner 2015), it is still very high by international standards. It is thus interesting to examine spatial dimensions of expenditure inequality after 2010.

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# APPENDIX

**Table A1: Decomposition of Expenditure Inequality by Urban and Rural Sectors and by District in Each Sector, Theil Index L**

| | Inequality | Contrib. (%) | Pop. Share (%) | | Inequality | Contrib. (%) | Pop. Share (%) |
|---|---|---|---|---|---|---|---|
| **1996** | | | | | | | |
| Total | 0.233 | 100.0 | | | | | |
| B-sector | 0.058 | 25.0 | | | | | |
| W-sector | 0.175 | 75.0 | | | | | |
| Urban | 0.249 | 38.6 | 36.2 | Rural | 0.133 | 36.4 | 63.8 |
| B-district | 0.066 | 10.2 | | B-district | 0.020 | 5.6 | |
| W-district | 0.183 | 28.4 | | W-district | 0.112 | 30.8 | |
| **2000** | | | | | | | |
| Total | 0.166 | 100.0 | | | | | |
| B-sector | 0.030 | 17.8 | | | | | |
| W-sector | 0.137 | 82.2 | | | | | |
| Urban | 0.183 | 46.5 | 42.2 | Rural | 0.103 | 35.7 | 57.8 |
| B-district | 0.043 | 11.0 | | B-district | 0.015 | 5.1 | |
| W-district | 0.140 | 35.5 | | W-district | 0.088 | 30.7 | |
| **2005** | | | | | | | |
| Total | 0.248 | 100.0 | | | | | |
| B-sector | 0.055 | 22.1 | | | | | |
| W-sector | 0.193 | 77.9 | | | | | |
| Urban | 0.254 | 44.2 | 43.2 | Rural | 0.147 | 33.7 | 56.8 |
| B-district | 0.075 | 13.0 | | B-district | 0.030 | 6.9 | |
| W-district | 0.179 | 31.2 | | W-district | 0.117 | 26.8 | |
| **2007** | | | | | | | |
| Total | 0.172 | 100.0 | | | | | |
| B-sector | 0.038 | 21.9 | | | | | |
| W-sector | 0.134 | 78.1 | | | | | |
| Urban | 0.177 | 43.9 | 42.7 | Rural | 0.103 | 34.2 | 57.3 |
| B-district | 0.051 | 12.6 | | B-district | 0.018 | 6.1 | |
| W-district | 0.126 | 31.3 | | W-district | 0.084 | 28.1 | |
| **2008** | | | | | | | |
| Total | 0.228 | 100.0 | | | | | |
| B-sector | 0.037 | 16.0 | | | | | |
| W-sector | 0.192 | 84.0 | | | | | |
| Urban | 0.233 | 49.2 | 48.3 | Rural | 0.153 | 34.7 | 51.7 |
| B-district | 0.071 | 15.1 | | B-district | 0.036 | 8.2 | |
| W-district | 0.161 | 34.2 | | W-district | 0.117 | 26.6 | |
| **2010** | | | | | | | |
| Total | 0.218 | 100.0 | | | | | |
| B-sector | 0.041 | 18.9 | | | | | |
| W-sector | 0.177 | 81.1 | | | | | |
| Urban | 0.229 | 52.5 | 50.1 | Rural | 0.125 | 28.6 | 49.9 |
| B-district | 0.056 | 12.9 | | B-district | 0.019 | 4.4 | |
| W-district | 0.173 | 39.6 | | W-district | 0.106 | 24.1 | |

**Table A2: Hierarchical vs Non-Hierarchical Decomposition
of Expenditure Inequality, Theil Index L**

| | Hierarchical Decomposition | | Non-Hierarchical Decomposition | |
|---|---|---|---|---|
| | Inequality | Contribution (%) | Inequality | Contribution (%) |
| **1996** | | | | |
| B-sector | 0.058 | 25.0 | 0.058 | 25.0 |
| B-district | | | 0.082 | 35.1 |
| Interaction term | | | −0.045 | −19.3 |
| W-sector B-district | 0.037 | 15.8 | | |
| W-sector W-district | 0.138 | 59.2 | 0.138 | 59.2 |
| Total | 0.233 | 100.0 | 0.233 | 100.0 |
| **2000** | | | | |
| B-sector | 0.030 | 17.8 | 0.030 | 17.8 |
| B-district | | | 0.049 | 29.7 |
| Interaction term | | | −0.023 | −13.6 |
| W-sector B-district | 0.027 | 16.1 | | |
| W-sector W-district | 0.110 | 66.1 | 0.110 | 66.1 |
| Total | 0.166 | 100.0 | 0.166 | 100.0 |
| **2005** | | | | |
| B-sector | 0.055 | 22.1 | 0.055 | 22.1 |
| B-district | | | 0.091 | 36.7 |
| Interaction term | | | −0.042 | −16.8 |
| W-sector B-district | 0.050 | 20.0 | | |
| W-sector W-district | 0.144 | 57.9 | 0.144 | 57.9 |
| Total | 0.248 | 100.0 | 0.248 | 100.0 |
| **2007** | | | | |
| B-sector | 0.038 | 21.9 | 0.038 | 21.9 |
| B-district | | | 0.063 | 36.8 |
| Interaction term | | | −0.031 | −18.1 |
| W-sector B-district | 0.032 | 18.7 | | |
| W-sector W-district | 0.102 | 59.4 | 0.102 | 59.4 |
| Total | 0.172 | 100.0 | 0.172 | 100.0 |
| **2008** | | | | |
| B-sector | 0.037 | 16.0 | 0.037 | 16.0 |
| B-district | | | 0.080 | 35.1 |
| Interaction term | | | −0.027 | −11.9 |
| W-sector B-district | 0.053 | 23.3 | | |
| W-sector W-district | 0.139 | 60.7 | 0.139 | 60.7 |
| Total | 0.228 | 100.0 | 0.228 | 100.0 |
| **2010** | | | | |
| B-sector | 0.041 | 18.9 | 0.041 | 18.9 |
| B-district | | | 0.070 | 32.1 |
| Interaction term | | | −0.032 | −14.7 |
| W-sector B-district | 0.038 | 17.3 | | |
| W-sector W-district | 0.139 | 63.8 | 0.139 | 63.8 |
| Total | 0.218 | 100.0 | 0.218 | 100.0 |