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HOUSEHOLD CONSUMER EXPENDITURE INEQUALITIES IN INDIA: A DECOMPOSITION ANALYSIS

BY PADMAJA MISHRA AND ASHOK PARIKH

University of East Anglia

The objectives of this study are to decompose household consumer expenditure inequalities in India by regions (states) and sectors (urban-rural) for the years 1977-78 and 1983 based on the National Sample Survey data. A class of Generalised Entropy measures is used. Our results consistently indicate that the inequality within states contributes much more towards national inequality and within-sector inequality explains a large part of state level inequality. The inequality at state levels has shown a decline from 1977-78 to 1983 due to a better monsoon season in 1983, and anti-poverty programmes.

INTRODUCTION

The literature on decomposition of inequality measures is vast and has contributed a great deal towards understanding the determinants of inequality and detecting the relative contributions of various independent factors. It is well known that multiple factors in combination determine the existing level of inequality in a given country, at a point of time. Any egalitarian economist (acting for policy purposes) is likely to be interested in quantifying the relative contributions of different factors causing inequality and would concentrate more on the factors amenable to effective policy treatment.

The objective of the present paper is to decompose the inequality in household consumer expenditure in India in order to measure the contribution of inequality within regions, between regions, within sectors and between sectors for two periods, i.e. 1977-78 and 1983. For this purpose, the technique of decomposing inequality measures by population sub-groups has been adopted. The criteria for grouping has been the population belonging either to the region or sector depending on the purpose of decomposition. The details of the decompositions and the corresponding groupings are discussed below. Three measures of inequality i.e. Theil's entropy measure and Theil's second measure and Atkinson's measure, have been used for the decomposition analysis. Both period and region analysis are attempted here.

In section 1, we explain the nature of grouping of the whole population and the levels at which the decomposition has been undertaken. In section 2 we review the literature by discussing the theoretical properties of the measures for decomposability followed by the reason for choosing the three measures for the present purpose. This section also includes a brief review of the earlier studies. In section 3 we discuss the data base and in section 4 we give the interpretations

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of the results of decomposition. A few policy conclusions drawn from the whole exercise are given in section 5.

1. Levels of Decomposition

The reason for decomposition in the present context is to examine the trend in inequality between and within the regions as well as between and within the sectors for each of the regions. The study area is divided into seventeen regions referring to the seventeen major states of India. Each of the regions is divided into two sectors—urban and rural. Two sets of decompositions have been undertaken. In the first decomposition, the all India inequality has been decomposed into between-state and within-state components. This includes the decomposition of three concepts of total inequality: (i) all-India urban inequality (ii) all-India rural inequality and (iii) all-India overall inequality (urban and rural combined). Hence, we are decomposing three total inequalities into their respective between-region and within-region components. In each of these three decompositions there are 17 sub-groups. The second set of decomposition has been done for each state and also for all India. So there are altogether 18 total inequalities decomposed into their respective between-sector and within-sector components. For each of these 18 decompositions there are two population sub-groups: rural and urban. These two sets of decompositions are obtained for the period 1977–78 and 1983. The primary purpose has been to examine the between-region and within-region components in the all-India inequality while the secondary purpose is to examine the between-sector and within-sector components in the state level inequalities and in the all-India inequality.

2. Theoretical Properties of Decompositions

In this section, theoretical properties of various measures from a decomposition point of view are presented. In a number of recent studies the issue of relating sub-group inequality levels to overall inequality has been discussed (Cowell, 1980; Cowell and Kuga, 1981; Bourguignon, 1979; Shorrocks, 1980 and 1984; Shorrocks and Mukherjee, 1982; Das and Parikh, 1982; and Blackorby *et al.*, 1981). If the total inequality can be expressed as a function of sub-group inequality values, when the sub-groups are mutually exclusive and exhaustive, then a variety of ways is found to decompose the total inequality. The particular method of decomposition depends on the nature of the inequality index and the way in which it is decomposed since the decomposability of the indices differ from measure to measure.

The most attractive type of decomposability has been *additive decomposability*. An index is additively decomposable if it can be neatly expressed as the sum of a "between-group" term and a "within-group" term. Conceptually, the between-group component can be defined as the value of the inequality index when all the within-group inequalities are assumed to be non-existent by a hypothetical assignment of the group average income to each member of the same group. So it quantifies only the inequality between the group means. Similarly, the within-group component can be defined as the value of the inequality index when all the between-group inequalities are suppressed by an hypothetical equalisation of group mean incomes to the overall mean which can be achieved by an equi-proportionate change in the income of every unit within each of the groups. Shorrocks (1980) and Cowell and Kuga (1980) have shown that there exists one parameter family of Generalised Entropy (GE) indices which are additively decomposable in the above defined sense. On the basis of the independence of between-group and within-group terms, an additively decomposable index can be called *strongly* or *weakly* additive. This is because sometimes the decomposition coefficients in the within-group term can be affected by the change in the group means. This happens when the income shares are the coefficients in the within-group term. In such a case, if the between-group inequality is eliminated by equalising all the group means, the reduction in total inequality will not necessarily be the amount of between-group inequality. However, when the weights or coefficients of the within-group indices are population shares instead of income shares, the total reduction in the inequality will be exactly by the amount of between-group inequality (because the population shares are not affected by the change in group means) and such indices are called strongly additively decomposable. One example in this context is Theil's second measure. As all the additively decomposable indices do not possess this property they can be divided into strongly additively and weakly additively decomposable indices (Shorrocks, 1980; Anand, 1983). Only for the strongly additively decomposable measures equalisation of group means or in other words, elimination of between group inequality, will reduce total inequality exactly by the same amount.

As additive decomposability is considered to be a superb quality of the indices, these measures are largely used for decomposing inequality for population sub-groups, especially the Theil's entropy index. Shorrocks (1984) suggests that when decomposability is desired and scale and replication invariance are accepted, there is nothing substantially lost by concentrating on GE class measures. This view is stated more clearly and forcefully in Shorrocks (1988).

It is fortunate that we can get a set of "*Generally decomposable or aggregative*" indices where there always exists a suitable transformation to move to an additively decomposable index belonging to the GE family. According to Shorrocks (1984), a "*generally decomposable or aggregative*" index is defined as that index where the overall inequality level can be expressed simply as some general function of the sub-group means, population sizes and inequality levels. That is to say, if total inequality is I, then,

(1) $$I = F[(I_1, \mu_1, n_1), (I_g, \mu_g, n_g)]$$

where (I_i, μ_i, n_i) are sub-group inequality levels, mean incomes and population respectively and $i = 1 \ldots g$.

If I is a generally decomposable measure in the above sense, any transformation of I, i.e. $I' = J(I)$ will also be a generally decomposable index as long as the following are satisfied:

(i) $J(I, \mu, n)$ is continuous and strictly increasing in I.

(ii) $J(0, \mu, n) = 0$ for all μ and n.

Among the various possibilities of the nature of transformation J, we always find a suitable transformation to move from a generally decomposable index to an additively decomposable index where,

$$I' = J(I_1) + \ldots + J(I_g) + J(\mu_1, \ldots, \mu_g) \tag{2}$$

As an additive decomposable and differentiable index must take the form $I = f(\mu, n) \sum_i \{h(y_i) - h(\mu)\}$, it is possible to derive any generally decomposable index from an additively decomposable index by a monotonic transformation. As long as, population sizes and aggregate incomes of the sub-groups are the same, both the generally decomposable and additively decomposable indices rank the distributions in the same way.

One important result which emerges from the above discussion is that Atkinson's family of inequality indices can be added to the one parameter GE class of measures and all these can be put together into a set of "generalised decomposable measures." Unfortunately, the most popular measure of inequality, namely the Gini Coefficient, does not fall into the GE class and therefore, this paper excludes the decomposition results of this measure.[1] Cowell (1988) shows that for Gini-coefficient, log variance and relative mean-deviation, it is possible that inequality in every group goes up while overall inequality goes down. Hence, this study is confined to the discussion of results using GE class measures.[2]

On the basis of the above discussion, we can group the inequality measures, as far as decomposability is concerned, into three groups:

(1) Strongly additively decomposable
(2) Weakly additively decomposable
(3) Generally decomposable

where (1) is a subset of (2) and (2) is a subset of (3). So we can see that the above ordering is done in a descending order of the strength of their decomposability.

The three indices selected for the present study are:

(i) Theil's second measure (L) belonging to (1),
(ii) Theil's entropy measure (T) belonging to (2) and
(iii) Atkinson's index (A) with $\varepsilon = 2.5$ belonging to (3).

Undeniably, the first two measures are selected because of their superb additive decomposability. L being strongly additively decomposable will give us the exact amount by which total inequality will be reduced if group mean incomes were equalised. Both L and T will give clear separation of between-group and within-group inequalities. However, it is also realised that these are arbitrary formulae and do not say much in terms of welfare implications.

In contrast, Atkinson's index is preferred because of its easily interpretable welfare implications. It has direct welfare implications and can be easily manœuvred to concentrate on different parts of the distribution by changing the inequality aversion parameter ε. We have chosen $\varepsilon = 2.5$ to give more weight towards the lower end of the distribution.

For the two Theil's indices, i.e. L and T, the usual formula for decomposing into within and between group components have been used. For the decomposi-

[1]It is fairly well-known that when the Gini-coefficient is used for decomposing inequality by population sub-groups, some contradictions emerge while comparing between-group and within-group components with the similar components for other measures.

[2]The results of decompositions based on the Gini-coefficient can be obtained from the authors.

tion of A,[3] the Das-Parikh (1981) technique has been adopted which is similar in form to Pyatt's decomposition (1976) of the Gini-coefficient. The notations and formulae are given in Appendix 1.

A Brief Review of Earlier Studies

There have been many studies of inequality in the literature using the technique of decomposition by population sub-groups. Bhattacharya and Mahalanobis (1967) had decomposed the Gini-coefficient and the standard deviation of logarithms for the year 1957-58 based on the household consumer expenditure survey data of India and found that one-quarter of the total inequality was being explained by between-state inequality and the remaining three-quarters was explained by the within-state inequality. Similar studies have been done by others in other countries. To mention a few recent ones, Mehran (1974), Mangahas (1975), and Pyatt (1976) have decomposed the Gini-coefficient for cities in Iran, regions in Phillipines and regions (urban/rural) in Sri Lanka, respectively. Glewee (1986) and Fields and Schultz (1980) have used decomposition analysis for studying inequality in Sri Lanka and Colombia, respectively. All of these studies have agreed more or less on the lack of importance of regional effects in the total inequality of a country even with much pronounced inter-regional income disparities. Das and Parikh (1982) have decomposed a number of measures for both the U.K. economy and the U.S.A. economy. Their grouping was not on the basis of region or sector, but on the basis of the size of the family. However, they found the decomposition results were very sensitive to the particular measure of inequality used whereas Mukherjee and Shorrocks (1982) found a broadly consistent pattern across a number of indices used for studying the trends in U.K. inequality.

3. Data For Decompositions

The data used for the decomposition analysis has been taken from the Household Consumer Expenditure Survey done by the National Sample Survey Organisation (NSSO) of India. Two survey periods are covered, i.e. June 1977—July 1978 and January 1983—December 1983. The basic data has been given in the form of frequency distributions where we are able to obtain the distribution of sample households according to monthly per capita consumer expenditure classes. The number of expenditure classes and the class intervals are not the same for the two survey periods. The uppermost class is also different for rural and urban sectors within the same survey period 1977-78. Moreover, some states have zero frequency in some expenditure classes. Therefore, for decomposition and comparison purposes, everything has been calculated over 10 expenditure classes for the period 1983 and 11 expenditure classes for 1977-78. This has been done by merging the bottom four classes into one class. The total population for

[3]The attempted decomposition of Atkinson's inequality index does not use a monotonic transformation of a generally decomposable measure to turn into an additively decomposable measure. Despite this, our empirical analysis on between/within components do not go against the conclusions reached through other measures.

each distribution has been cross-classified into 10 ($j = 1, 2, \ldots, 10$) (or 11) expenditure classes in an ascending order and into 17 ($i = 1, 2, \ldots, 17$) exhaustive and mutually exclusive groups for all three decompositions of the first kind. Similarly, in the case of the second set of decompositions there are two mutually exclusive groups (urban and rural) for each of the 18 decompositions (17 states and all India).

4. Results

We present the results based on three different indices. Table 1 shows that during the period 1977–78 to 1983, overall inequality has decreased for all the measures. The within-group component has also decreased, while the between-group component has remained almost static. There is a slight decline in the between group term measured by L whereas T and A show a very negligible increase.

TABLE 1

Decompositions for All-India Inequalities

(A) Urban and Rural Combined

Inequality Measures	1977–78 Between	1977–78 Within	1977–78 Total	1983 Between	1983 Within	1983 Total
Theil's Entropy (T)	0.0101 (4.37)	0.2209 (95.63)	0.2311	0.0106 (5.52)	0.1814 (94.48)	0.1920
Theil's second measure (L)	0.0138 (5.00)	0.2622 (95.00)	0.2765	0.0096 (5.27)	0.1724 (94.73)	0.1821
Atkinson's index (A)	0.0241 (6.30)	0.3549 (93.70)	0.3790	0.0244 (7.40)	0.3056 (92.60)	0.3300

(B) Rural

Inequality Measures	1977–78 Between	1977–78 Within	1977–78 Total	1983 Between	1983 Within	1983 Total
T	0.0244 (8.32)	0.2102 (91.68)	0.2326	0.0143 (8.50)	0.1539 (91.50)	0.1682
L	0.0232 (10.86)	0.1902 (89.14)	0.2135	0.0135 (8.23)	0.1505 (91.77)	0.1640
A	0.0477 (13.90)	0.2985 (86.10)	0.3433	0.0304 (10.73)	0.2527 (89.27)	0.2831

(C) Urban

Inequality Measures	1977–78 Between	1977–78 Within	1977–78 Total	1983 Between	1983 Within	1983 Total
T	0.0071 (3.00)	0.2255 (97.00)	0.2326	0.0062 (3.36)	0.1778 (96.64)	0.1841
L	0.0040 (1.82)	0.2151 (98.18)	0.2192	0.0058 (3.37)	0.1741 (96.63)	0.1800
A	0.0151 (3.90)	0.3694 (96.10)	0.3845	0.0142 (4.30)	0.3159 (95.70)	0.3301

Note: The figures in the brackets show the percentages of the total inequality.

In the case of the rural and urban sectors, between-state inequality has decreased according to all the measures. Interpreting in terms of the relative contribution of the components, between-state components contribute around 5 percent of the total inequality. In the case of the rural inequality, the between-state component contributes about 10 percent whereas in the case of the urban inequality it contributes less than 5 percent. This is the overall impression from the three indices used. Over time the between-state component seems to have contributed increasingly as shown by the majority of the measures. In the case of the rural inequality, there is no clear conclusion regarding the trend of the components. However, in the case of urban inequality, the contribution of the between-state inequality has increased according to all measures.

However, it is important to note that the contribution of within-state inequality has been quite high (nearly 90 percent) in comparison to the between-state inequality. Analysing the second type of decomposition results (Table 2), it is evident that the inequality between the two sectors—urban and rural—is quite high and more so in the case of highly urbanised states like Maharastra and West Bengal and also for states like Assam and Bihar, which may be due to the impoverished rural sector. Of the 17 states, the percentage contribution of between-sector inequality for 10 states has been higher in comparison to the All-India figure in 1977-78 and the picture is broadly the same, except for two states i.e. Karnataka and Madhya Pradesh, in 1983. These 10 states are: Andhra Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharastra, Orissa and West Bengal. Again, of these 10 states, three states i.e. Andhra Pradesh, Himachal Pradesh and West Bengal, have experienced an increase in the relative contribution of between-sector inequality. Besides these, another 4 states i.e. Kerala, Rajasthan, Tamilnadu and Uttar Pradesh, have also experienced an increase in the percentage contribution of between-sector inequality in the state level inequality.

TABLE 2

DECOMPOSITIONS FOR STATE-LEVEL AND ALL-INDIA INEQUALITIES (1977-78 AND 1983)
(in percentages)

		Between Sector		Within Sector	
States		1977-78	1983	1977-78	1983
Andhra Pradesh	(a)	6.67	6.85	93.33	93.15
	(b)	7.10	7.12	92.90	92.88
	(c)	9.07	9.10	90.93	90.90
Assam	(a)	22.23	16.57	77.77	83.43
	(b)	27.14	16.84	72.85	83.16
	(c)	34.99	18.34	65.01	91.66
Bihar	(a)	19.42	16.30	80.35	83.70
	(b)	20.57	16.97	79.43	83.03
	(c)	24.77	19.62	75.23	80.38
Gujarat	(a)	11.42	10.60	88.58	89.40
	(b)	12.68	11.43	87.31	88.57
	(c)	16.85	14.52	83.15	85.48

Note: (a), (b) and (c) stand for Theil's entropy, Theil's second measure and Atkinson's index respectively.

(continued overleaf)

TABLE 2—continued

States		Between Sector 1977-78	Between Sector 1983	Within Sector 1977-78	Within Sector 1983
Haryana	(a)	3.09	5.40	96.91	94.60
	(b)	3.35	5.42	96.65	94.58
	(c)	4.43	6.53	95.57	93.47
Himachal Pradesh	(a)	14.07	16.20	85.93	83.74
	(b)	13.95	15.29	86.05	84.71
	(c)	16.21	16.67	83.79	83.33
Jammu and Kashmir	(a)	5.92	6.88	94.00	93.12
	(b)	6.94	7.44	93.05	92.56
	(c)	9.14	9.01	90.86	90.99
Karnataka	(a)	8.13	8.83	91.87	91.17
	(b)	8.59	5.18	91.41	94.82
	(c)	11.54	7.84	88.46	92.16
Kerala	(a)	2.22	2.98	97.78	97.02
	(b)	2.26	3.14	97.74	96.86
	(c)	3.26	4.45	96.74	95.55
Madhya Pradesh	(a)	10.60	10.31	89.40	89.69
	(b)	10.95	10.90	89.05	89.10
	(c)	15.85	13.73	84.15	86.27
Maharastra	(a)	16.10	19.70	83.90	80.13
	(b)	20.23	21.30	79.74	78.67
	(c)	29.24	26.95	70.76	73.05
Orissa	(a)	17.04	16.90	82.96	83.10
	(b)	18.15	16.89	81.15	83.11
	(c)	23.12	19.50	76.88	80.50
Punjab	(a)	2.81	2.00	97.19	98.00
	(b)	2.77	2.00	92.23	98.00
	(c)	3.37	2.54	96.63	97.46
Rajasthan	(a)	1.11	3.76	98.89	96.24
	(b)	0.12	3.83	99.88	96.17
	(c)	0.25	5.11	99.75	94.89
Tamilnadu	(a)	6.76	9.14	93.24	90.86
	(b)	7.70	9.91	92.30	90.09
	(c)	10.61	13.86	89.39	86.14
Uttar Pradesh	(a)	4.67	7.11	95.33	92.89
	(b)	5.18	7.50	94.82	92.50
	(c)	7.15	9.68	92.85	90.32
West Bengal	(a)	23.09	23.75	76.91	76.25
	(b)	22.94	27.33	77.06	72.67
	(c)	29.24	32.90	70.76	67.00
All-India	(a)	2.76	11.01	97.24	88.99
	(b)	2.35	10.46	97.64	89.54
	(c)	11.99	14.29	88.01	85.71

Note: (a), (b) and (c) stand for Theil's entropy, Theil's second measure and Atkinson's index respectively.

5. Conclusion

We have seen that all the measures show agreement in most of the decompositions. The overall conclusion which emerges from the above analysis is that it is the inequality within the states which contributes much more towards the national inequality and within-sector inequality contributes more towards the within-state inequalities. If we equalise the per capita consumption of all the states, the overall inequality will be reduced exactly by 5.3 percent as measured by the strongly additively decomposable measure *L*. As far as other measures are concerned, we cannot say by how much total inequality is going to be reduced (or increased) by equalising per capita consumer expenditure. However, the problem of reduction of inequalities seems to be best solved by concentrating on reducing the within-state inequalities.

Looking at the problem of reduction of the within-state inequalities, it is as much necessary to reduce the gaps between rural and urban sectors inside the states as it is necessary to reduce the within-rural and within-urban inequalities simultaneously.

Previous time series studies have shown that regional disparities in average state domestic product (SDP) (A. Mathur; 1983) or in average household consumer expenditure (Kakwani and Subbarao; 1990) have shown a tendency to increase over time. Our study shows a nearly constant level of between-state inequality which does not suggest anything contrary to the other longer-time trend studies. All India inequality as well as the state level inequalities have decreased between the period 1977–78 to 1983 (except for Assam and Tamilnadu). In India, inequalities based on consumer expenditure depend heavily on the agricultural situation of a particular year. The year 1977–78 was a good agricultural year. In 1983, the first three sub-rounds of the survey were influenced by the drought condition that had prevailed in a number of states during 1982–83, but 1983 was a period of excellent monsoon. The survey also reflects the whole period of 1983 rabi crop and also a part of 1983 good kharif crop. Hence, a part of reduction in within-state inequalities can be explained by the good harvests in most of the states.

Also, the reduction can be partly due to the various anti-poverty programmes undertaken during this period. Since mid–70s the central government as well as the state governments have launched various direct anti-poverty programmes such as Integrated Rural development Programme (IRDP), National Rural Employment Programme (NREP), and Rural Landless Employment Guarantee Programme (RLEGP) by the Central government and notable state government programmes like Maharastra's employment guarantee scheme and public distribution systems in Kerala, Gujarat and Andhra Pradesh. The success of the individual programmes has been studied inconclusively by numerous researchers. However, the reduction of poverty ratio as shown by the official statistics can be linked to raising the consumption level of the poor households which probably have also reduced consumer expenditure inequalities to some extent.

It is, therefore, concluded that reduction in inequalities within the states can be very important and effective in reducing all-India inequality. Besides, national factors such as good weather, an active policy towards reducing inequalities through federal transfers can facilitate the reduction in inequality at a state level.

APPENDIX 1

e_{ij} = Total expenditure of the units in i-th group and j-th class.

e_i = Total expenditure of the i-th group.

e = Total expenditure of the whole population.
f_{ij} = Number of units in i-th group and j-th class.
f_i = Total number of units in i-th group $= \sum_j f_{ij}$
n_j = Total number of units in j-th class $= \sum_i f_{ij}$
f = Total number of units in all the groups.
p_{ij} = Proportion of population in the i-th group and j-th class $= f_{ij}/f$.
λ_i = Proportion of units in group i.
μ_i = Mean expenditure of group i.
α_i = Income share of group i.
μ = Mean expenditure of total population.
A_i = Atkinson's index of inequality for group i.
T_i = Theil's entropy index for group i.
L_i = Theil's second index for group i.

(a) Theil's Entropy index (T):

$$T = \sum_i \sum_j (e_{ij}/e) \log (e_{ij}/e)/(f_{ij}/f)$$

$$= \sum_i (e_i/e) \sum_j (e_{ij}/e_i)[\log ((e_{ij}/e_i)/(f_{ij}/f_i)) + \log (e_i/f_i)/(e/f)]$$

$$= \sum_i (e_i/e)\left[\sum_j (e_{ij}/e_i) \log (e_{ij}/e_i)/(f_{ij}/f_i)\right]$$

$$+ \sum_i (e_i/e) \log ((e_i/e)/(f_i/f))$$

$$= \sum_i (e_i/e) T_i + \sum_i (e_i/e) \log ((e_i/e)/(f_i/f))$$

$$= T_W + T_B$$

where T_W and T_B are within-group inequality and between-group inequality respectively.

(b) Theil's second measure (L):

$$L = \sum_i \sum_j (f_{ij}/f) \log ((f_{ij}/f)/(e_{ij}/e))$$

$$= \sum_i (f_i/f) \sum_j (f_{ij}/f_i)[\log ((f_{ij}/f_i)/(e_{ij}/e_i)) + \log ((f_i/f)/(e_i/e)]$$

$$= \sum_i f_i/f\left(\sum_j (f_{ij}/f_i) \log (f_{ij}/f_i)/(e_{ij}/e_i)\right)$$

$$+ \sum_i (f_i/f) \log ((f_i/f)/(e_i/e))$$

$$= \sum_i (f_i/f) L_i + \sum_i (f_i/f) \log ((f_i/f)/(e_i/e))$$

$$= L_W + L_B$$

where L_W and L_B are within-group inequality and between-group inequality respectively.

(c) Atkinson's index (A):

$$A = 1 - \left[\sum_i \lambda_i (\mu_i / \mu)^{1-\varepsilon} + (1 - A_i)^{1-\varepsilon} \right]^{1/1-\varepsilon}$$
$$= A_B + A_W$$

where

$$A_B = 1 - \left[\sum_i \lambda (\mu_i / \mu)^{1-\varepsilon} \right]^{1/1-\varepsilon}$$

$$A_W = \left[\sum_i \lambda_i (\mu_i / \mu)^{1-\varepsilon} A_i^{1-\varepsilon} \right]^{1/1-\varepsilon} + \text{Residual}.$$

where A_W and A_B are within-group inequality and between-group inequality respectively.

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