Dual Income Polarization by Age Groups in Korea: 1990–2014

Byung In Lim[1], Sung Tai Kim[2] and Myoungkyu Kim[3]

Abstract

This study aims to find the income polarization trends by dividing households into five age groups, using the 'Household Survey' data for 1990-2014, and see if there exists a dual pattern in the income polarization by age groups of 20's and 60's. Also we estimate which factors determines the dual pattern by regression equation. We found from empirical findings that the income disparity has been widened during the 1990–2014 period for all age groups in Korea. The major reason for the worsened income disparity comes from so-called a dual income polarization within two age groups, i.e., people in their 20s and people in their 60s. Also, we estimate the determinants of income disparity by a regression equation using the panelized data for five age groups during 1990–2014 periods. We confirmed the existence of double income polarization within two age groups of people in 20s and people in 60s.

I. Introduction

Recently income polarization has been a very important and solvable issue. Especially, it has been more interested than before after Piketty's new book, "Capital in the Twenty-First Century", published in 2014, where he focused on the income share of the top 1-percent class to total population.

There are a few definitions for it. A polarization concept is related but distinct from an inequality concept, and then tries to capture the distance or the degree of separation between individuals or households in a distribution. Another definition is that incomes move towards the extremes and thus there are fewer in the middle. Also starting with Foster and Wolfson (1992), Esteban and Ray (1994), and Wolfson (1994) have contributed to a number of different polarization measures. After that, the income polarization has been an academic and measurable issue to being discussed and thus considered. And now most related works deal with it using an index like the Esteban-Ray Index or the Wolfson Index, and sometimes the deciles distribution ratio using the Income Quintile Share Ratio (hereafter, IQSR). It is known that IQSR used for an income polarization index are not based on the theory, differently from Esteban-Ray index or Wolfson index. Those indexes found in related works say that the polarization of income has been increased and enlarged year annually. There seems to be no exception in Korea, which can be found from Choi(2002), Min et al. (2006), Shin and Jeon (2005), Shin

[1] Coresponding Author, Professor, Department of Economics, Chungbuk National University, 52 Naesudong-ro, Seowon-gu, Cheongju, uz 362-763, Republic of Korea, Phone: +82-43-261-2216, e-mail: billforest@hanmail.net
[2] Professor, Department of Economics, Cheongju University, e-mail: stkim@cju.ac.kr
[3] Associate Research Fellow, Chungbuk Research Institute, e-mail: kolosu@naver.com

and Shin(2007), to name a few.

Now we are interested in how different its pattern or trend are by age groups, especially young group. It supports from the Luxembourg Income Study (hereafter, LIS). LIS reports, "single young people are getting poorer compared to the average population even those with dependent children, with stagnating disposable income and onerous living costs pressing down on prosperity. In other words, singletons aged 25 to 29 in eight rich countries – the US, UK, Australia, Canada, Spain, Italy, France and Germany – have become poorer over the last 20 years compared with the average population, and unattached young adults are finding it harder than ever to set up on their own."(See the article of 8 March 2016 from http://www.theguardian.com). This seems to be the same as in Korea. In addition to that, we focus on the old people. The reason is that Korea is going toward the aged society the fastest in the world. It is why we focus on two age groups of people in 20s and people in 60s,

In this context, our purpose is two-fold. First, we try to find the income polarization trends by dividing the households into several age groups, using the 'Household Survey' released by 'Statistics Korea' for 1990-2014, and see if there exists a dual pattern in the income polarization by age groups of 20's and 65's. Second, we estimate which factors determines the dual pattern with summary statistics and regression equation.

Our work is composed of as follows: Section 1 introduces. Section 2 describes the literature survey, and section 3 explains the data, age groups, and income types. Section 4 discusses characteristics of the income polarization and estimation results from a regression equation. Section 5 summarizes and concludes.

II. Literature Survey

There are lots of studies on the income polarization around the world, for example, Foster and Wolfson (1992), Esteban and Ray (1994), and Wolfson (1994). However, we discuss mainly works published in Korea, such as, Choi (2002), Min et al. (2006), Shin and Jeon (2005), Shin and Shin (2007), to name a few.

Choi (2002) claimed that the inequality index had not been consistent with the two income polarization indexes, i.e. the Esteban-Ray Index (1994) and the Wolfson Index (1994). Min et al. (2006) said that the structural causes of the deepening polarization seemed to be the following: globalization, the rise of China as a world factory, the rapid development of IT, and even institutional changes like the restructuring of big enterprises, financial institutions, and the labor market.

Shin and Cheon (2005) asserted from characteristics of the index that the gradual increase of income polarization after the exchange crisis was due to an increase in the income disparity between

the upper-income class and the lower-income class and a decrease in the disparity within the lower-income class. Shin and Shin (2007), using the Esteban, Gardin, and Ray (1999) index, found that polarization stemmed mainly from those who had graduated from elementary and junior high school and the elderly. Nam and Lim (2008) found interesting results indicating that income polarization has been deteriorated during the period from 1995 to 2005, but the same kind of trend was not found in the expenditure polarization, using the Wolfson index. Cho (2005) examined the sharp increase in the IQSR after the exchange currency crisis in 1997 and concluded it was a product of the structural change.

Ⅲ. Data and Age Groups

1. Data

We make use of the "Household Income and Expenditure Survey" released by Statistics Korea (hereafter, see http://kostat.go.kr/portal/english/surveyOutlines/4/1/index.static) for 1990–2014. Its purpose is as follows: providing the data needed for estimating and analyzing the changes in household incomes and expenditures, providing the basic data to be used for the weighting of the Consumer Price Index and for making various economic and social policies, providing data for the production of income distribution indicators, providing basic data to be used for estimating total amounts such as the national account, and providing data to be used for calculating migration expenses, supporting the needy, and calculating the standard wages of workers for the homepage of Statistics Korea.

Until 2005, households who had two or more family members were surveyed. However, in 2006 it started to survey one-person households, whose backgrounds can be found in the census results from Statistics Korea. The census said that the number of one-person households increased from 1.64 million (12.5% of the total number of households) in 1995 to 3.3 million (20.1%) in 2007.

2. Age groups and Income Types

We divide the total households into the five groups by the age of a household head: under 30, 31–39, 40–49, 50–59, and over 60. In addition, we extract a focus age group, the under 30 (20–29 years old) group in order to find the status quo in the labor market for the young.

We use four types of the income to measure income polarization: the labor income, the market income, the current income, and the disposable income (see Table 1). The market income adds the business income, the financial income, and the private disposable income to the labor income. The sum of the current income and the public transfer income is the current income. The disposable income is defined by deducting the income tax and the social insurance premium from the current income.

Table 1. Income Types in the Survey

<table>
<tr><td rowspan="5">Disposable income</td><td rowspan="4">Current Income</td><td rowspan="3">Market Income</td><td colspan="2">Labor income</td></tr>
<tr><td colspan="2">Business Income</td></tr>
<tr><td colspan="2">Financial Income</td></tr>
<tr><td rowspan="2">Transfer Income</td><td>Private Transfer Income</td></tr>
<tr><td></td><td>Public Transfer Income</td></tr>
<tr><td></td><td></td><td colspan="2">Income tax and Social Insurance premium</td></tr>
</table>

Ⅳ. Characteristics of income polarization in Korea

Now we explain the empirical results of the IQSR, dividing the fifth quintile by the first quintile to measure the income polarization. Let us begin with measures based on the labor income, followed by the market income, the current income, and the disposable income. We focus on the income polarization index of the age group of 20's.

First, the IQSR indicates that the income disparity widened during the 1990–2014 period for all age groups. As we expected, economic crises, like both the exchange currency crisis in 1997 and the global financial crisis in 2008, have a serious impact on income polarization.

Second, we found a striking result, so to speak: the ratio of the IQSR for 2014 to the IQSR for 1990 is the largest for the age group of people in their 20s, as shown in Table 2. This ratio is much higher than the one for the age group of people in their 60s. This trend can also easily be seen in Figure 1. This result seems to be due to a gradual increase in the unemployment ratio of the young, which was 8.1% in 2009, 8.0% in 2010, 7.6% in 2011, 7.5% in 2012, 8.0% in 2013, and 9.0% in 2014. Therefore, the major reason for why the income disparities for the groups as a whole have worsened comes from the income polarization of the young and the old groups – double income polarization.

Third, the trends of IQSR for the age group of people in their 20s and people in their 60s are more unstable than other age groups, as shown in Figure 1.

Fourth, we can see that the IQSR measures decrease as an income type is added. If we include the private transfer income to the labor income, it will be the market income. The income disparity is lessened for the market income compared with that of the labor income, as shown in Table 3.

Table 2. IQSR based on the Labor income

Year	Age: 20s	Age: 30s	Age: 40s	Age: 50s	Age: 60s
1990(A)	4.1426	3.3747	4.4152	7.2554	34.4871
1991	3.7388	3.3560	3.8068	5.7811	11.3305
1992	3.5281	3.2144	3.8240	4.5820	19.7619
1993	3.6200	3.4828	3.9777	5.2386	29.5851
1994	3.5874	3.6472	3.6049	4.9921	44.7440
1995	3.6314	3.4794	3.5700	4.9272	35.8410
1996	3.6848	3.6353	3.8737	4.8566	27.4684
1997	3.8577	3.5247	4.0900	4.5516	40.1134
1998	5.4894	5.0526	5.4543	7.4925	33.0197
1999	5.1399	5.0114	5.4463	7.6342	29.5813
2000	4.4362	4.4186	4.6700	6.5356	32.7175
2001	4.7029	4.5416	4.9752	6.2502	26.8222
2002	4.3200	4.5152	5.3816	7.4056	51.4510
2003	4.4704	4.0576	5.3358	6.9311	22.9414
2004	5.2762	4.6004	6.2900	7.2502	19.2952
2005	5.7768	4.4099	5.4782	7.2438	24.6575
2006	6.9666	5.2437	6.3527	9.3054	78.7094
2007	6.8541	5.3942	6.0324	9.2251	75.2426
2008	10.3688	4.9895	6.8600	10.4077	79.0466
2009	18.6218	4.5681	6.6919	9.7815	48.2986
2010	8.6111	5.8847	6.8983	8.7841	51.4432
2011	21.2095	5.3558	5.8263	9.0949	52.5997
2012	7.5529	4.5197	6.2103	8.4928	87.9585
2013	5.3944	4.2449	5.5150	8.2564	56.8105
2014(B)	12.2564	4.2420	5.2167	8.5859	55.8628
B/A	2.9586	1.2570	1.1815	1.1834	1.6198

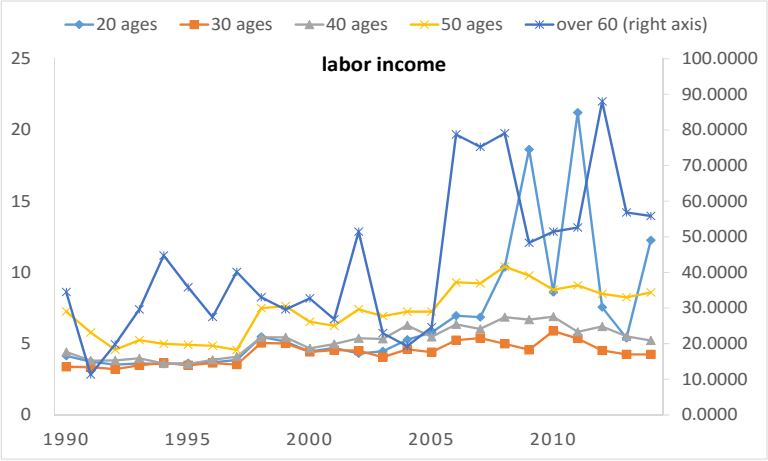

Figure 1. IQSR Trends based on the Labor Income

In the case of current income, which is the sum of the market income and the public transfer income, and the social insurance premium, the income disparity is further lessened compared with that of the

market income, as shown in Table 4. This implies that the public transfer income and the social insurance premium can lessen the income disparity and income polarization. It also implies that relatives' subsidies and the incomes transfers performed through government policy have a positive influence on income disparity and polarization. The IQSRs for market income and current income are shown in the Appendix.

Figure 2 clearly shows that the income disparity with respect to labor income is lessened by private transfers and other sources of income. Also, the income disparity with respect to market income is lessened by public transfers and other government subsidies.

Now we set the age group 'people in their 30s' as the reference group, because the IQSR was almost unchanged during the 1990–2014 period (see Table 4). The age group of people in their 20s has the highest ratio of 2014 IQSR/1990 IQSR among all groups except the age group of people in their 60s (see Table 3).

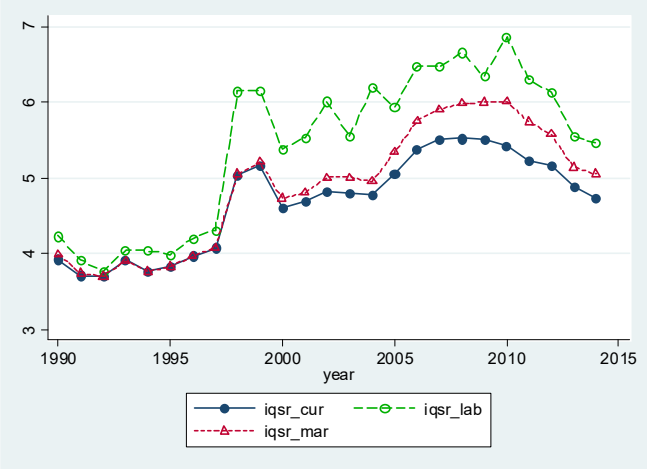

Figure 2. IQSR Trends based on the Labor Income, the market income, and the current income

Table 3. Trends of the Ratio of IQSR by Age Group to Reference Age Group (Age of 30's)

Year	Age: 20s	Age: 30s	Age: 40s	Age: 50s	Age: 60s
1990	1.1076	1.0000	1.1830	1.5291	2.3136
1991	1.0473	1.0000	1.1022	1.4411	2.0702
1992	1.0254	1.0000	1.1344	1.2224	2.7028
1993	1.0295	1.0000	1.1417	1.3388	2.6206
1994	1.0239	1.0000	1.0609	1.3283	2.4590
1995	0.9523	1.0000	1.0962	1.3312	2.7812
1996	1.0169	1.0000	1.1124	1.3151	2.6037
1997	0.9728	1.0000	1.1314	1.2621	2.7599
1998	0.9343	1.0000	1.0727	1.3297	2.2695
1999	0.8767	1.0000	1.1475	1.3298	2.2522
2000	0.8193	1.0000	1.1097	1.3342	2.1146
2001	0.9215	1.0000	1.0874	1.2264	2.0016
2002	0.8784	1.0000	1.1028	1.4342	2.0476
2003	0.9494	1.0000	1.2411	1.4764	2.5265
2004	1.0676	1.0000	1.2199	1.4126	2.3890
2005	1.0429	1.0000	1.2062	1.4150	2.3012
2006	1.2751	1.0000	1.1698	1.6086	2.8836
2007	1.0484	1.0000	1.1196	1.6292	2.9419
2008	1.0321	1.0000	1.3162	1.8279	3.1079
2009	2.0807	1.0000	1.3613	1.8785	3.3039
2010	1.1675	1.0000	1.1793	1.4721	3.2855
2011	1.9093	1.0000	1.1174	1.5829	3.6309
2012	1.3171	1.0000	1.2658	1.7536	4.1624
2013	1.0890	1.0000	1.1420	1.6580	3.7757
2014	1.7179	1.0000	1.2068	1.7408	3.5970

Note: Current Income

In Figure 3, we illustrate the income disparity by age group during the 1990–2010 period. The line of years=1990 shows the income disparities for five age groups from people in their 20s to people in their 60s. We calculated the average income disparity for five year –1990–1994 – periods for each age group to get rid of short-term fluctuations. First, it is worth noting the U-shaped curve of income disparity by age groups for all periods, as shown in Figure 3. The IQSR hits the minimum at the age group of people in their 30s, then increases up to the age group of people in their 60s. Second, the income disparity for people in their 60s has worsened as time goes by. The curvature of the U-shaped curve has become larger recently.

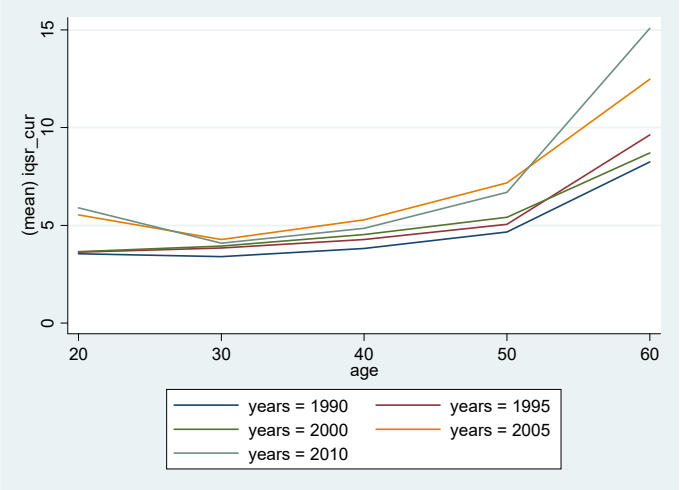

Figure 3. Income Disparity by Age Group during 1990-2014 periods

Note: (1) Income disparity is measured by the IQSR.

(2) (years=1990) represents the average of 1990-1994 IQSR's. The same formula applies to (years=1995), (years=2000), (years=2005), and (years=2010) cases respectively.

We try to figure out the determinants of income disparities in Korea during the 1990–2014 period using regression analysis. The dependent variable is the IQSR for five age groups during the 1990–2014 periods. Thus, we will use the panel data for estimation, considering the error structure. The estimation results are shown in Table 4. We interpret the estimation results based on the random effect model, since the Hausman test statistic indicates that the random effect model is optimal. First, the income disparity has widened as time goes by since the coefficient estimate of the time trend variable is positive (0.066) and statistically significant. Second, we confirm that a dual income polarization by the 20's and the 60's contribute the overall income disparity, since the coefficients of the dummy variables for both age groups are positive and statistically significant. Furthermore, the old group contributes more than the young group to the widening of the overall income disparity.

Third, we expect that the labor market environment will also affect the income disparity. The estimation results support our expectation. The estimate of the coefficient for the variable $Regjob$, representing the ratio of households who have regular jobs in the sample, is negative (-10.877) and statistically significant. Fourth, the global financial crisis in 2008 increased the income disparity. The estimate of the coefficient for the dummy variable ($Dummy2008$) is significanly positive (1.606).

Table 4. Determinants of Income Disparity in Korea

	Dependent Variable: $IQSR$ (Income Quintile Share Ratio)	
Explanatory Variables	Fixed Effect Model	Random Effect Model*
$Deficit$ (Ratio of deficit households)	-13.291*** (-3.321)	-13.857*** (-3.533)
$Regjob$ (Ratio of regular job)	-8.535*** (-3.748)	-10.877*** (-7.339)
$Dummy2008$ (Dummy variable for 2008)	1.371** (2.424)	1.606*** (2.987)
$Trend$ (Time trend)	0.083*** (3.970)	0.066*** (3.937)
$Dummy20$ (Dummy variable for 20's)		0.681** (2.321)
$Dummy60$ (Dummy variable for 60's)		2.870*** (4.267)
Constant	-152.334*** (-3.538)	-117.820*** (-3.432)
R^2	0.507	0.869
Obs.	125	125
Hausman test statistic	1.84	

Note: (1) IQSR is calculated based on current income.

(2) The t-value is in parenthesis.

(3) *: significance level is 10%, **: significance level is 5%, ***: significance level is 1%.

Ⅴ. Conclusion

We analyzed the trends of IQSR by age groups. The main findings are as follows. First, the IQSR indicates that the income disparity widened during the 1990–2014 period for all age groups in Korea. The major reason for the worsened income disparity came from the so-called double income polarization within the age groups of people in their 20s and people in their 60s. It is worth noting the U-shaped curve of income disparity by age groups for all periods, as shown in Figure 2. The IQSR hits the minimum at the age group of people in their 30s, then increases up to the age group of people in their 60s. The income disparity for the age group of people in their 60s has worsened over time. The curvature of the U-shaped curve has recently become greater.

Second, we found that the income disparity with respect to labor income has been lessened by private transfers and other sources of income. Also, the income disparity with respect to market income has been lessened by public transfers and other government subsidies. Third, we tried to find the determinants of income disparity by regression analysis using the panel data for five age groups during

the 1990–2014 period. We confirmed the existence of double income polarization from the age groups of people in their 20s and people in their 60s. Also, we found that the labor market environment, such as the proportion of regular jobs, was important in determining the income disparity.

References

Cho, D. W., "Structural Change of Income Inequality after the Economic Crisis," *Journal of Public Economics* 20(1), 2005. (in Korean).

Choi. H., "Diminishing Middle Class since 1997: Application of Polarization Index to Korean Income Distribution," *KUKJE KYUNGJE YONGU* 8(2), 2002, pp. 1–19 (in Korean).

Esteban, J. and D. Ray, "On the Measurement of Polarization," Boston University, Institute for Economic Development, Working Paper 18, 1991.

Esteban, J. and D. Ray, "On the Measurement of Polarization," *Econometrica* 62, pp. 819–852.

Foster, J.E. and M.C. Wolfson (1992): "Polarization and the Decline of the Middle Class: Canada and the U.S.," mimeo, Vanderbilt University, 1994.

Min et al., *Status Quo and Causes of the Income Polarization*, SERI, 2006, (in Korean).

Nam, S., and B.I. Lim, "A Study on the Trend of Inequality and Polarization in Income and Consumption in Korea: 1995-2005," *KYONG JE HAK YON GU* 56(1), 2008, pp. 219–247 (in Korean).

Shin, D. and B.Y. Jeon, "Polarization Trends of The Income Distribution," *Journal of The Korean Labor Economic Association* 28(3), 2005, pp.77–109 (in Korean).

Shin, K., and D. Shin, "Bi-Polarization of the Income Distribution and Its Socio-Economic Consequences in Korea," Vol. 13, No. 1, *Journal of Korean Economic Analysis*, 13(1), 2007, pp.63–123 (in Korean)

Wolfson, M.C., "When Inequalities Diverge," *American Economic Review* 84, Papers and Proceedings, 1994, pp.353–358.

[Appendix]

Table 5. IQSR based on the market income

Year	Age: 20s	Age: 30s	Age: 40s	Age: 50s	Age: 60s
1990(A)	3.7384	3.4325	4.1126	5.6852	8.5354
1991	3.4634	3.3278	3.7124	4.9617	6.4816
1992	3.4086	3.3287	3.7942	4.1625	8.4243
1993	3.4938	3.4616	3.9683	4.7776	8.3596
1994	3.4353	3.4030	3.5900	4.6125	7.9098
1995	3.2371	3.3993	3.7163	4.5893	9.0822
1996	3.5327	3.4723	3.8455	4.6269	8.7980
1997	3.4018	3.4901	3.9757	4.5027	9.1611
1998	4.1350	4.4926	4.8020	5.8456	9.5096
1999	3.8643	4.4820	5.1916	5.9256	9.3417
2000	3.3371	4.0869	4.6007	5.4634	8.0939
2001	3.8341	4.1829	4.6237	5.1687	7.8871
2002	3.5826	4.1792	4.6515	6.1193	8.7274
2003	3.7685	3.8873	4.9650	5.8829	10.4084
2004	4.1932	3.9044	4.8540	5.5810	10.1123
2005	4.4434	4.1933	5.2178	6.0098	10.1130
2006	5.9400	4.7081	5.7290	7.7900	14.3495
2007	5.0991	4.9347	5.5756	8.3260	15.7342
2008	4.9711	4.5338	6.1866	9.3616	16.5776
2009	8.5590	4.3634	6.3925	8.7916	19.4638
2010	5.6172	5.0299	6.1508	7.5870	21.9816
2011	8.8365	4.7755	5.3448	8.0367	25.6614
2012	6.1887	4.1441	5.3962	7.8735	29.7180
2013	4.4244	4.0636	4.8551	7.4721	29.0770
2014(B)	7.5110	3.8395	4.8963	7.1720	27.7613
B/A	2.0092	1.1186	1.1906	1.2615	3.2525

Table 6. IQSR based on the current income

Year	Age: 20s	Age: 30s	Age: 40s	Age: 50s	Age: 60s
1990(A)	3.7912	3.4228	4.0492	5.2339	7.9191
1991	3.4767	3.3198	3.6592	4.7843	6.8728
1992	3.4171	3.3324	3.7804	4.0734	9.0067
1993	3.5728	3.4705	3.9623	4.6463	9.0949
1994	3.4742	3.3932	3.6000	4.5073	8.3440
1995	3.2334	3.3952	3.7218	4.5197	9.4428
1996	3.5236	3.4650	3.8545	4.5569	9.0218
1997	3.4006	3.4957	3.9549	4.4118	9.6479
1998	4.1307	4.4210	4.7422	5.8788	10.0335
1999	3.8717	4.4160	5.0672	5.8724	9.9457
2000	3.2574	3.9757	4.4119	5.3042	8.4070
2001	3.7668	4.0876	4.4449	5.0132	8.1816
2002	3.5497	4.0411	4.4565	5.7957	8.2746
2003	3.6007	3.7925	4.7067	5.5992	9.5817
2004	4.0666	3.8091	4.6468	5.3808	9.1001
2005	4.1971	4.0243	4.8540	5.6943	9.2606
2006	5.6608	4.4394	5.1932	7.1411	12.8016
2007	4.7943	4.5729	5.1200	7.4501	13.4528
2008	4.4048	4.2679	5.6174	7.8015	13.2643
2009	8.5827	4.1249	5.6154	7.7487	13.6282
2010	5.3206	4.5574	5.3744	6.7091	14.9735
2011	8.2852	4.3394	4.8490	6.8688	15.7559
2012	5.1364	3.8999	4.9363	6.8387	16.2329
2013	4.3359	3.9816	4.5469	6.6014	15.0334
2014(B)	6.3755	3.7112	4.4786	6.4606	13.3493
B/A	1.6816	1.0843	1.1061	1.2344	1.6857