

Appendix: Methodology and Sources for Computing Consumption Growth by Quintile

Data excerpt from years 1999-2005 to demonstrate calculations

line #	Series Name <small>Source_#</small> (hyperlinks inserted)	Units	Methodology	1999	2000	2001	2002	2003	2004	2005
1	NIPA Personal Consumption Expenditure ¹	Billions, Nominal USD,		6,282.5	6,739.4	7,055.0	7,350.7	7,703.6	8,211.5	8,742.4
2	Consumer Price Index (CPI) ²	Index		166.58	172.19	177.04	179.86	183.97	188.88	195.27
3	Price Index for Personal Consumption Exp. ³	Index		97.58	100	102.09	103.54	105.60	108.37	111.49
4	Population ⁴	Millions		278	281	284	287	290	293	295
5	Consumption Exp. Shares for 3rd Quintile ⁵ (see note 1)	Percentage Share		16.87%	17.25%	17.23%	17.33%	16.94%	17.04%	17.04%
6	NIPA PCE deflated by CPI Index	Billions, Constant 2004 USD	a	7,123.2	7,392.4	7,526.6	7,719.2	7,909.1	8,211.5	8,456.2
7	Aggregate Share for 3rd quintile	Billions, Constant 2004 USD	b	1,201.6	1,275.5	1,296.5	1,337.7	1,339.8	1,399.3	1,441.0
8	Per Capita Consumption for 3rd Quintile	Constant 2004 USD	c	21,629	22,698	22,831	23,316	23,123	23,916	24,394
9	Annual Percentage Change of Per Capita Consumption for 3rd Quintile (with CPI)	Percentage	d	----	4.94%	0.59%	2.12%	-0.83%	3.43%	2.00%
10	Annual Percentage Change of Per Capita Consumption for 3rd Quintile (with PCEPI)	Percentage	See note 3	----	5.85%	1.30%	2.30%	-0.54%	3.47%	2.50%

Note: numbers may not add up exactly due to rounding off.

1. Methodology Used to Derive the Series:

a. Converting nominal PCE to PCE in constant 2004 dollars using CPI Index (see note 2):

$$PCE_x^{2004_USD_CPI} = PCE_x * \frac{CPI_{2004}}{CPI_x}$$

where PCE_x = (line 1) Nominal Personal Consumption Expenditure in year x

CPI_x = (line 2) Consumer Price Index in year x

x = 1999...2005

b. Calculating aggregate share of consumption for 3rd (or any other) quintile:

$$AS_x^{3^{rd}} = CEX_x^{3^{rd}} * PCE_x^{2004_USD}$$

where: $AS_x^{3^{rd}}$ = (line 7) aggregate share for 3rd quintile (billions, constant 2004 USD)

$CEX_x^{3^{rd}}$ = (line 5) percentage share of total for 3rd quintile (%)

$PCE_x^{2004_USD}$ = (line 6) PCE in constant 2004 USD from part a, (billions)

c. Calculating per capita consumption for 3rd, or any other, quintile (line 8):

$$Capita_PCE_x^{2004_USD} = \frac{AS_x^{3^{rd}}}{Population_x / 5} \quad \text{where } Population_x = \text{(line 4) aggregate national population in year } x$$

d. Calculating annual percentage change of per capita consumption (line 9):

$$g_x^{3^{rd}} = \frac{Capita_PCE_x^{3^{rd}}}{Capita_PCE_{x-1}^{3^{rd}}} - 1 \quad \text{where } g_x^{3^{rd}} = \text{percent change from year } (x-1) \text{ to year } x \text{ of per capita consumption for } 3^{rd} \text{ quintile}$$

2. Calculating Geometric Mean of Annual Percentage Change of Per Capita Consumption for 3rd Quintile (see note 4)

EXAMPLE: Years 2000 through 2005

Using real PCE that was deflated by CPI Index:

$$G((1 + g_{2000}) \dots (1 + g_{2005})) - 1 = \left(\prod_{x=2000}^{2005} (1 + g_x^{3^{rd}}) \right)^{1/6} - 1 = ((1+0.0494)*(1+0.0059)*(1+0.0212)*(1-0.0083)*(1+0.0343)*(1+0.02))^{1/6} - 1 = 0.0203 = 2.03\%$$

NOTES:

1. There are differences in trends in the Consumption Expenditure (CE) data from the BLS Survey and NIPA's Personal Consumption Expenditure from BEA. While the CE trend across years is relatively flat, NIPA's PCE has an upward trend. For further information on this, refer to a paper by Erich Battistin (2003) where he explores this discrepancy⁶. The NIPA trend is viewed as more reliable.
2. In terms of deflating nominal PCE to real, we tested both BLS's CPI Index² and the Price Index for PCE (PCEPI or PCE Deflator) from NIPA³. Results were very similar but using BLS's CPI Index results in more conservative figures for consumption growth. Hence, we report

consumption figures that were derived using BLS' CPI Index. Section 1 demonstrates calculations using the CPI Index only. In the above table, however, we provide consumption growth numbers that were derived using both CPI and PCEPI indices (see: lines 9 & 10). The CPI and the PCEPI may differ due to the following reasons (1) The PCE measures goods and services purchased by individuals and households, while the CPI measures out-of-pocket expenditures of urban households. As a result there are numerous items included in the PCE deflator which are completely out of the scope of the CPI (2) The CPI is a fixed weight Laspeyre's price index, while the PCEPI is constructed using the Fisher Ideal Quantity index. Thus the PCE deflator uses current period quantities as the weights, rather than a fixed weight. (3) The CPI also weights certain items more than the PCE, such as Owner's Equivalent Rent, while the PCE assigns greater weight to medical services. For a discussion of these differences, see Fixler and Jaditz (2002).⁷

3. Line 10: consumption growth is calculated the same way as d; the only difference is that PCE deflated by PCEPI was used instead of CPI.
4. In section 2, we calculated geometric mean of consumption growth for 3rd quintile with CPI deflated series. However, average consumption growth is slightly higher with PCEPI deflated series as shown below:

$$G((1 + g_{2000}) \dots (1 + g_{2005})) - 1 = \left(\prod_{x=2000}^{2005} (1 + g_x^{3rd}) \right)^{1/6} - 1 = ((1+0.0585)*(1+0.013)*(1+0.023)*(1-0.0054)*(1+0.0347)*(1+0.025))^{1/6} - 1 = 0.0246 = 2.46\%$$

where g is from line 10.

Sources:

1. Bureau of Economic Analysis, National Income and Product Accounts, Table 2.3.5. Personal Consumption Expenditures by Major Type of Product, Line 1 (SA at Annual Rates), <http://bea.gov/> (accessed on September 27, 2006).
2. Bureau of Labor Statistics, Consumer Price Indexes, Series ID : CUSR0000SA0 (Annual Average, Urban Consumers, All Items, SA, 1982-1984 base year); <http://www.bls.gov/cpi/home.htm>, accessed on September 27, 2006
3. Bureau of Economic Analysis, National Income and Product Accounts, Table 2.3.4. Price Indices for Personal Consumption Expenditures by Major Type of Product, Line 1 (Index Numbers, 2000=100), <http://bea.gov/> (accessed on September 28, 2006).
4. Federal Reserve of St. Louis, Total Population: All Ages Including Armed Forces Overseas, Series ID: POP (Note: Population level in the first month of each year is taken as the annual level), <http://research.stlouisfed.org/fred2/series/POP?&cid=104> (accessed on September 27, 2006).
5. Bureau of Labor Statistic, Consumption Expenditure Survey, Aggregate Expenditure Share Tables, Table 55 (Note: BLS data are available up until 2004, hence shares in 2005 are artificially replicated to be equal to 2004 BLS shares)), <http://www.bls.gov/cex/csxashar.htm> (accessed on September 27, 2006).
6. Battistin, Erich (2003). "Errors in Survey Reports of Consumption Expenditures," *The Institute for Fiscal Studies*, London. May 6, 2003.
7. Fixler, Dennis and Jaditz, Ted (2002), "An Examination of the Difference Between the CPI and the PCE Deflator", BLS Working Paper 361, June 2002