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**Overview Presentation:
Trends in Income and Consumption Volatility,
1970-2000**

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1 Introduction

This paper provides background information on trends in income and consumption volatility over time and by major demographic groupings, and is intended as an overview to accompany the papers which follow. The results presented update and expand upon previous work on volatility, using a longer time frame (in particular, looking at the 1990s) to address patterns in income and consumption volatility.

The mean earnings of all White male earners has increased nearly \$10,000 real (1988\$) dollars over the past thirty years, representing a sizable improvement in living standards for households near the middle of the earnings distribution.¹ Figure 1 presents the growth in the mean and standard deviation of White male earnings for 1970-2000. The solid line, the mean annual earnings of White males, reveals the effects of business cycles (as evidenced by dips in mean earnings in the mid-1970s, early 1980s, and early 1990s), and the sharp increase in earnings after 1991.

At the same time, the earnings distribution has significantly widened. The dashed line in figure 1 represents the standard deviation in earnings over the same time period, which has steadily increased since roughly 1980. By any metric, inequality in the annual earnings distribution of White adult males has widened over the past thirty years. Figure 2 presents the 90/10 ratio of White

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¹The mean increased from \$26,915 to \$36,715 between 1970 and 2000. The growth in median earnings is roughly \$7000 over the same time period (from \$24,467 to \$31,797).

male earnings for 1970-2000, which shows an increase in inequality between the 90th percentile and 10th percentile in earnings starting in the late 1970s.

The increase in inequality in any given year can be decomposed into two distinct pieces, one due to the increase in the dispersion of average earnings, the other due to the increase in earnings volatility for a given individual (Baker 1997, Baker and Solon 2003, Gottschalk 1997, Haider 2001). Thus the increase in the total variance is the sum of the increase in “lifetime” earnings inequality and the increase in earnings instability. When researchers and pundits discuss the growth of earnings inequality, these two components are usually considered jointly, using a measure of inequality such as the Gini coefficient or the 90%/10% ratio. However, it is of great interest for researchers and policymakers to determine which component is the primary driving force behind the increase in inequality.

One simple approach to measuring the components of income inequality is to perform a variance decomposition. Let y_{it} be the log of real annual earnings of an individual i in year t , age-adjusted by regressing log earnings on a quartic in age, and using the residual as the measure of y .² We can consider a permanent-transitory decomposition:

$$y_{it} = \mu_i + \nu_{it}, \quad (1)$$

where μ_i is permanent earnings and ν_{it} is transitory earnings which vary over time. These are uncorrelated, so calculating the variance is a straightforward sum:

$$\text{var}(y_{it}) = \text{var}(\mu_i) + \text{var}(\nu_{it}). \quad (2)$$

The first term on the right-hand side is the permanent variance. When estimated in a population, it can be interpreted as a measure of the overall dispersion of permanent income, or the degree of permanent income inequality. The second term represents the transitory variance, and can be thought of as the instability in a given individual’s earnings profile.

Empirically, we are interested in the sample mean of these second moments. To define the variance of the transitory component, I follow Gottschalk and Moffitt (1994) in selecting a time period T and computing the squared deviations from an individual’s (age-adjusted) earnings around his mean earnings:

$$\text{var}(\nu_i) = \frac{1}{T_i - 1} \sum_t^{T_i} (y_{it} - \bar{y}_i)^2, \quad (3)$$

where \bar{y}_i is the mean earnings of the individual over T_i periods. Note that some individuals are not observed for all T years, so T_i varies at the individual level. We denote the mean (across N individuals) of $\text{var}(\nu_i)$ as σ_ν^2 .

²Thus for each time period, all individuals are constrained to have an identical age-earnings profile, and we measure deviations from the profile. In addition, the log specification removes any years with zero earnings. We use the same (wildly unrealistic) restriction for consumption and family income, which we refer to as “age-adjusted.”

The variance of the permanent component is thus the total variance minus the variance of the transitory component, using the following formula:

$$\sigma_{\mu}^2 = \frac{1}{N-1} \sum_i^N (\bar{y}_i - \bar{y})^2 - \left(\frac{\sigma_{\nu}^2}{T}\right), \quad (4)$$

where \bar{T} is the mean of T_i over all i and \bar{y} is the mean of log earnings over all individuals over all time periods.

To estimate these variances in the population, we need longitudinal data to follow the same individuals over time. I use the Panel Study of Income Dynamics (PSID), a nationally representative survey which interviews roughly 2500 White males annually (bi-annually starting in 1997), and obtains information on earnings, family income, consumption, family structure, and many other household-level and individual-level attributes. I use log earnings and drop all zero observations, and trim the top and bottom 1% of the distribution. I follow Gottschalk and Moffitt and narrow my sample to non-student heads of household observed between the ages of 20 and 59.³

2 Investigating Trends

Table 1 presents the basic results of the above decomposition for the annual earnings of White males aged 20-59. The table presents the two components of the variance in earnings for three time periods and for various demographic groups, which allows comparisons of both the level of earnings variability and the change over time. Below I discuss the primary trends visible in the data.

The increase in the permanent component of variance of (age-adjusted) earnings for White males across the three decades is evidence of the increase in lifetime earnings inequality. The difference from the 1970s to the 1990s represents a 32% increase in the dispersion of average wages.

The 38% growth in the transitory component of earnings, on the other hand, represents the increase in the average instability of individual earnings, which I shorthand as “earnings volatility.” This is a sizeable increase, and in line with earlier estimates (Gottschalk and Moffitt, 1994). In addition, note that most of the growth in both the permanent and transitory variance of earnings occurred in the 1980s, and has been essentially flat in the 1990s. The permanent component is over twice as large as the transitory component in levels, suggesting that most of the overall dispersion is due to lifetime differences in earnings.

The second panel of the table splits the sample by years of education. Those without a high school degree (row 1) have both larger permanent and transitory components of variance than the full White male sample, with a similar increasing trend over the period. By comparison, the growth in lifetime earnings inequality has increased dramatically for individuals with at least a college

³Thus individuals can enter the sample by turning 20 or leave the sample at age 60. The sample size in each year for White males ranges from 1,444 in 1970 to 2,928 in 1990.

degree (row 3), however the variability of income in any given year has stayed roughly flat. The levels of both components are below that of the full sample.

These patterns are reflective of the changes to low-skilled labor demand over the past thirty years, and the increasing returns to skill over the time period. Similar comparisons across age group (3rd panel) and average “permanent” earnings (4th panel) suggest that younger and lower-skilled workers are experiencing significantly greater income volatility than they did thirty years ago. The instability in the highest quartile of permanent earnings is roughly four times smaller than the instability in the lowest quartile.

Finally, table 1 also presents differences across race and gender.⁴ White female heads of households have both greater permanent and transitory components. The income volatility is over double that of White males, and this is likely an underestimate of the instability in earnings, given that this analysis excludes any years in which the household head has no earnings, and that women are more likely to temporarily exit the labor force. Notably, the trend in inequality among White women is in the opposite direction of that of White men, as the permanent component of the variance has fallen by 22%.

The volatility of earnings of African-American men and women also have increased over the past thirty years. However, the inequality of earnings of Black men has vastly increased (88%), while the trend in the permanent component of variance for Black women is flat. The results from the 4th panel of table 1 demonstrate that inequality among women (within race) has actually declined over the past thirty years, volatility has increased more slowly for women than men, and that earnings are more unstable for African-Americans across gender.

Table 2 investigates the similar decomposition for (age-adjusted) household consumption. The only measure of consumption available in the PSID for thirty years is food consumption. Here I use the sum of the cost of food consumed at home and food purchased at a restaurant, not including food stamps. I take logs, remove zero observations, and trim outliers as in the earnings data. In addition, there are a few missing years of data due to the food consumption questions not being asked.

The first row of table 2 demonstrates that there is far less instability in food consumption than there is in earnings, consistent with households smoothing consumption across income fluctuations as predicted by the Permanent Income Hypothesis (PIH). Figure 3 also presents evidence that there has been little growth in either the mean or variance of food consumption. Compared to earnings in figure 4, the coefficient of variation (the mean divided by the standard deviation) of consumption is consistently below that of earnings (.45 as compared to .55, on average). However, as shown in the remainder of table 2, the basic demographic facts about lifetime inequality and instability hold for consumption as well as earnings:

- Households where the head is less educated have greater lifetime inequality of consumption, as well as greater consumption instability; this instability

⁴The sample sizes for these subgroups are all significantly smaller than for white male-headed households, so the estimates should be viewed with caution.

was nearly twice as large as the volatility for households headed by a college graduate in the 1990s.

- Younger households have significantly more consumption instability, a consistent trend throughout the time period.
- Low “permanent” consumption households have much greater volatility than high “permanent” consumption households.
- Households headed by White women have roughly twice the transitory variance of households headed by White men, and African-American-headed households also have significantly greater consumption volatility than White households (within gender).

The food stamp program and other support services place a particular emphasis on aiding single mothers and households with children more generally. Tables 3 and 4 investigate instability and inequality of earnings and consumption for different household types. The second panel of table 3 splits the sample of White male headed households by whether there are children in the household, and whether the household head is married with children or unmarried with children. White males in married households appear to have slightly lower earnings volatility than in unmarried households (both with children). In the third panel, the earnings of black males in married households are substantially less unstable than unmarried households with children and in households with no children present.

For female-headed households, I present results for unmarried women without children and the case of single mothers, as the PSID generally classifies all married couples as “male-headed.” Relative to male-headed families, both married and unmarried, single mothers have much greater lifetime income inequality (permanent component of variance) and greater earnings instability. Furthermore, the transitory component is more than double that of single childless women (for whom the volatility trend is essentially flat), which is a particular difficulty for the children of households headed by single mothers to overcome.

Table 4 shows that the headship patterns of earnings volatility also hold for consumption volatility. Male-headed households with children have somewhat smaller consumption inequality and consumption instability than other types of male-headed households. Single moms are again subject to the greatest instability, and this volatility has increased since 1970. Recall that I exclude any consumption from food stamps, which would smooth out consumption fluctuations, as shown in previous work by Gundersen and Ziliak (2003).

In tables 5 and 6 I perform the same decomposition for (age-adjusted) family income (instead of individual earnings), as the consumption measure is a household-measure and thus might be more comparable. If spouses’ earnings ensure against either spouse’s possible earnings fluctuations, we would expect that there would be less variability in household income. Indeed, as seen in table 5, for White males the transitory component of variance is slightly smaller when measured by family income (.135) than by earnings from wages and salaries

(.157). Comparing family income to earnings, there is essentially no difference in inequality in the 1990s, though in the previous two decades family income was dramatically less disperse. This change is perhaps due to increases in dual-earner households or trends in assortative mating by education (and earnings potential).

Not surprisingly, family income is no different than earnings or consumption with regard to demographic patterns, as families headed by less-educated men, younger men, and lower-income men all have much higher family income instability (table 6). Households headed by White women have double the family income volatility in the 1990s, and measures of income instability are even larger for African-American households headed by either men or women. One departure from earlier results is that female-headed households have similar levels and trends in both income inequality and instability regardless of the presence of children in the household. Other sources of income appear to attenuate earnings differences between female-headed households with and without children.

3 Concluding Remarks

Clearly the unit-root decomposition used in this analysis is an oversimplification of the dynamic process of earnings, consumption, and family income. A more structural and realistic decomposition of variances which uses facts from the autocovariance structure of earnings, wage-growth heterogeneity, and other aspects of the labor market is a superior approach to the one taken here (Baker 1997, Baker and Solon 2003, Haider 2001, Moffitt and Gottschalk 1995). Nonetheless, I believe that this approach is illustrative for the brief time available and the captures the general trends and demographic heterogeneity relevant for the emphasis of this conference.

A full review of the literature would describe the possible determinants of these trends and demographic differences provided by other authors, such as skill-biased technical change (SBTC), secular declines in unionism, increased openness for international trade, capital complementarities, and computerization of the workforce, among others.

The primary lessons from the results presented above are as follows:

- The permanent component of the variance of earnings, which measures lifetime inequality, has substantially increased over the past 30 years for all demographic groups except women. However, at the household level, female-headed households have experienced an increase in the inequality of family income.
- Earnings and income volatility has increased over the past three decades for all groups based on race, gender, education, age, and family structure.
- Furthermore, the earnings instability of the least-skilled, the young, and African-American workers is the largest policy concern. This is in part due to the sizable relative magnitude of the variance, but also because they are the population directly served by the government's assistance programs.

- Consumption volatility is drastically smaller than earnings volatility, and suggests that households are able to smooth consumption across years by borrowing and saving accordingly. Nonetheless, these fluctuations are of particular interest if consumption is the basic measure of well-being.

The papers in this symposium will broaden our understanding of the relationships between income and consumption volatility and the important role which assistance programs, such as the Food Stamp Program, can serve to reduce the impact of short-term earnings fluctuations on the well-being of our nation's families.

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Table 1. Variances of Permanent and Transitory Real Annual Earnings, 1970-2000

Results	Permanent Variance				Transitory Variance			
	1970-1979	1980-1989	1990-2000	Percent change	1970-1979	1980-1989	1990-2000	Percent change
White Males	0.279	0.365	0.367	31.5%	0.114	0.163	0.157	37.7%
By years of completed education								
<12 years	0.320	0.448	0.408	27.5%	0.143	0.245	0.203	42.0%
12+	0.227	0.319	0.314	38.3%	0.099	0.144	0.149	50.5%
16+	0.188	0.262	0.336	78.7%	0.099	0.092	0.092	-7.1%
By age								
20-29	0.203	0.295	0.357	75.9%	0.120	0.155	0.151	25.8%
30-39	0.265	0.398	0.377	42.3%	0.088	0.128	0.131	48.9%
40-49	0.310	0.405	0.350	12.9%	0.075	0.097	0.106	41.3%
By "permanent" earnings								
Lowest quartile					0.260	0.355	0.313	20.4%
Middle 2 quartiles					0.075	0.107	0.124	65.3%
Top quartile					0.044	0.059	0.081	84.1%
White Women	0.625	0.596	0.486	-22.2%	0.323	0.362	0.352	9.0%
Black Men	0.423	0.711	0.797	88.4%	0.177	0.344	0.337	90.4%
Black Women	0.912	0.903	0.878	-3.7%	0.437	0.434	0.511	16.9%

Source: Panel Study of Income Dynamics (PSID).

Heads of households, with positive wage and salary earnings, aged 20-59, earnings are in logs, observations are weighted using sample weights. "Percent change" is measured as the difference between the 1990s and the 1970s, relative to the value for the 1970s.

Table 2. Variances of Permanent and Transitory Real Annual Food Consumption, 1970-2000

Results	Permanent Variance				Transitory Variance			
	1970-1979	1980-1989	1990-2000	<i>Percent change</i>	1970-1979	1980-1989	1990-2000	<i>Percent change</i>
White Males	0.105	0.133	0.165	57.1%	0.078	0.097	0.102	30.8%
By years of completed education								
<12 years	0.114	0.181	0.257	125.4%	0.087	0.136	0.147	69.0%
12+	0.096	0.127	0.148	54.2%	0.075	0.090	0.095	26.7%
16+	0.099	0.121	0.152	53.5%	0.069	0.072	0.066	-4.3%
By age								
20-29	0.096	0.129	0.166	72.9%	0.093	0.131	0.149	60.2%
30-39	0.017	0.135	0.179	952.9%	0.064	0.081	0.091	42.2%
40-49	0.128	0.150	0.185	44.5%	0.056	0.074	0.081	44.6%
By "permanent" consumption								
Lowest quartile					0.104	0.141	0.145	39.4%
Middle 2 quartiles					0.075	0.090	0.092	22.7%
Top quartile					0.056	0.066	0.070	25.0%
White Women	0.205	0.239	0.242	18.0%	0.180	0.223	0.202	12.2%
Black Men	0.124	0.212	0.215	73.4%	0.144	0.212	0.227	57.6%
Black Women	0.254	0.357	0.359	41.3%	0.318	0.360	0.377	18.6%

Notes: See table 1.

Table 3. Variances of Permanent and Transitory Real Annual Earnings, 1970-2000

Results	Permanent Variance				Transitory Variance			
	1970-1979	1980-1989	1990-2000	Percent change	1970-1979	1980-1989	1990-2000	Percent change
White Males	0.279	0.365	0.367	31.5%	0.114	0.163	0.157	37.7%
By headship, marital status and children:								
White Male headed								
no children	0.300	0.405	0.360	20.0%	0.113	0.168	0.172	52.2%
married w/children	0.244	0.354	0.389	59.4%	0.097	0.132	0.123	26.8%
unmarried w/children	0.191	0.446	0.292	52.9%	0.088	0.174	0.178	102.3%
Black Male Headed								
no children	0.515	0.950	1.100	113.6%	0.189	0.407	0.376	98.9%
married w/children	0.308	0.398	0.457	48.4%	0.140	0.173	0.196	40.0%
unmarried w/children	0.424	0.596	0.69	62.7%	0.291	0.136	0.459	57.7%
White Female Headed								
unmarried w/children	0.760	0.733	0.690	-9.2%	0.428	0.562	0.461	7.7%
unmarried w/o children	0.501	0.437	0.364	-27.3%	0.240	0.188	0.224	-6.7%
Black Female Headed								
unmarried w/children	1.022	0.970	0.871	-14.8%	0.464	0.559	0.654	40.9%
unmarried w/o children	0.553	0.521	0.897	62.2%	0.303	0.226	0.249	-17.8%

Notes: See table 1.

Table 4. Variances of Permanent and Transitory Real Annual Food Consumption, 1970-2000

Results	Permanent Variance				Transitory Variance			
	1970-1979	1980-1989	1990-2000	Percent change	1970-1979	1980-1989	1990-2000	Percent change
White Males	0.105	0.133	0.165	57.1%	0.078	0.097	0.102	30.8%
By headship, marital status and children:								
White Male headed								
no children	0.123	0.150	0.173	40.7%	0.094	0.102	0.108	14.9%
married w/children	0.081	0.114	0.131	61.7%	0.051	0.074	0.069	35.3%
unmarried w/children	0.134	0.124	0.161	20.1%	0.083	0.055	0.125	50.6%
Black Male Headed								
no children	0.146	0.224	0.210	43.8%	0.178	0.213	0.230	29.2%
married w/children	0.082	0.180	0.162	97.6%	0.089	0.145	0.154	73.0%
unmarried w/children	0.117	0.252	0.212	81.2%	0.353	0.181	0.232	-34.3%
White Female Headed								
unmarried w/children	0.186	0.315	0.309	66.1%	0.174	0.251	0.264	51.7%
unmarried w/o children	0.197	0.210	0.194	-1.5%	0.156	0.181	0.157	0.6%
Black Female Headed								
unmarried w/children	0.301	0.437	0.423	40.5%	0.324	0.423	0.429	32.4%
unmarried w/o children	0.211	0.258	0.277	31.3%	0.214	0.238	0.205	-4.2%

Notes: See table 1.

Table 5. Variances of Permanent and Transitory Real Annual Family Income, 1970-2000

Results	Permanent Variance				Transitory Variance			
	1970-1979	1980-1989	1990-2000	Percent change	1970-1979	1980-1989	1990-2000	Percent change
White Males	0.202	0.276	0.366	81.2%	0.075	0.100	0.135	80.0%
By years of completed education								
<12 years	0.246	0.326	0.400	62.6%	0.093	0.147	0.205	120.4%
12+	0.157	0.237	0.317	101.9%	0.069	0.088	0.120	73.9%
16+	0.158	0.203	0.279	76.6%	0.059	0.070	0.078	32.2%
By age								
20-29	0.160	0.233	0.317	98.1%	0.079	0.106	0.150	89.9%
30-39	0.181	0.281	0.370	104.4%	0.061	0.067	0.106	73.8%
40-49	0.208	0.316	0.421	102.4%	0.054	0.072	0.108	100.0%
By "permanent" family income								
Lowest quartile					0.107	0.152	0.203	89.7%
Middle 2 quartiles					0.070	0.089	0.121	72.9%
Top quartile					0.055	0.062	0.091	65.5%
White Women	0.283	0.389	0.444	56.9%	0.181	0.199	0.264	45.9%
Black Men	0.357	0.658	0.885	147.9%	0.125	0.286	0.410	228.0%
Black Women	0.310	0.519	0.632	103.9%	0.172	0.238	0.355	106.4%

Notes: See table 1.

Table 6. Variances of Permanent and Transitory Real Annual Family Income, 1970-2000

Results	Permanent Variance				Transitory Variance			
	1970-1979	1980-1989	1990-2000	Percent change	1970-1979	1980-1989	1990-2000	Percent change
White Males	0.202	0.276	0.366	81.2%	0.075	0.100	0.135	80.0%
By headship, marital status and children:								
White Male headed								
no children	0.278	0.347	0.436	56.8%	0.081	0.108	0.162	100.0%
married w/children	0.156	0.228	0.291	86.5%	0.060	0.072	0.097	61.7%
unmarried w/children	0.273	0.262	0.342	25.3%	0.073	0.124	0.137	87.7%
Black Male Headed								
no children	0.560	0.901	1.149	105.2%	0.187	0.431	0.586	213.4%
married w/children	0.257	0.290	0.348	35.4%	0.087	0.103	0.138	58.6%
unmarried w/children	0.275	0.456	0.480	74.5%	0.137	0.090	0.615	348.9%
White Female Headed								
unmarried w/children	0.245	0.399	0.471	92.2%	0.169	0.205	0.250	47.9%
unmarried w/o children	0.319	0.370	0.431	35.1%	0.199	0.180	0.246	23.6%
Black Female Headed								
unmarried w/children	0.267	0.465	0.506	89.5%	0.150	0.228	0.307	104.7%
unmarried w/o children	0.397	0.706	0.979	146.6%	0.208	0.314	0.397	90.9%

Notes: See table 1.

Figure 1. Growth in Mean and Variance of Earnings for White Males, 1970-2000

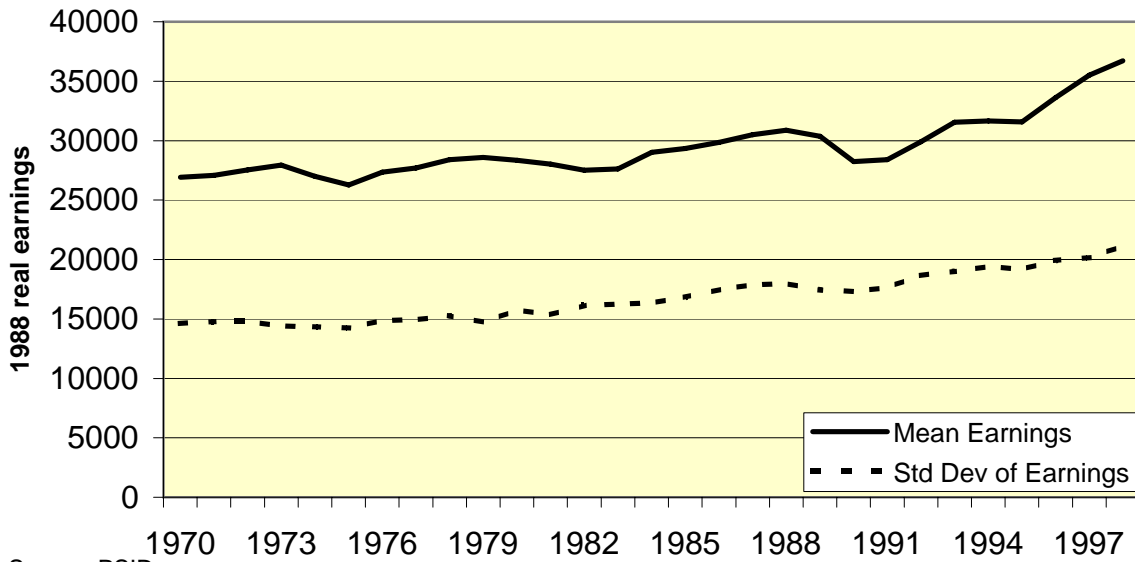


Figure 2. Ratio of 90th to 10th percentile of annual earnings of White Males, 1970-2000

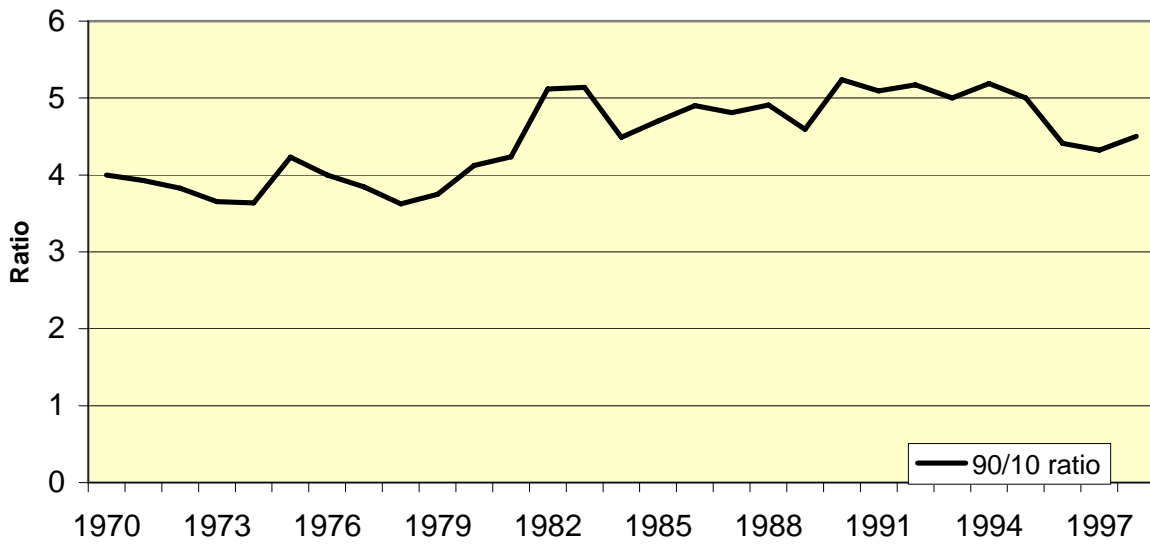
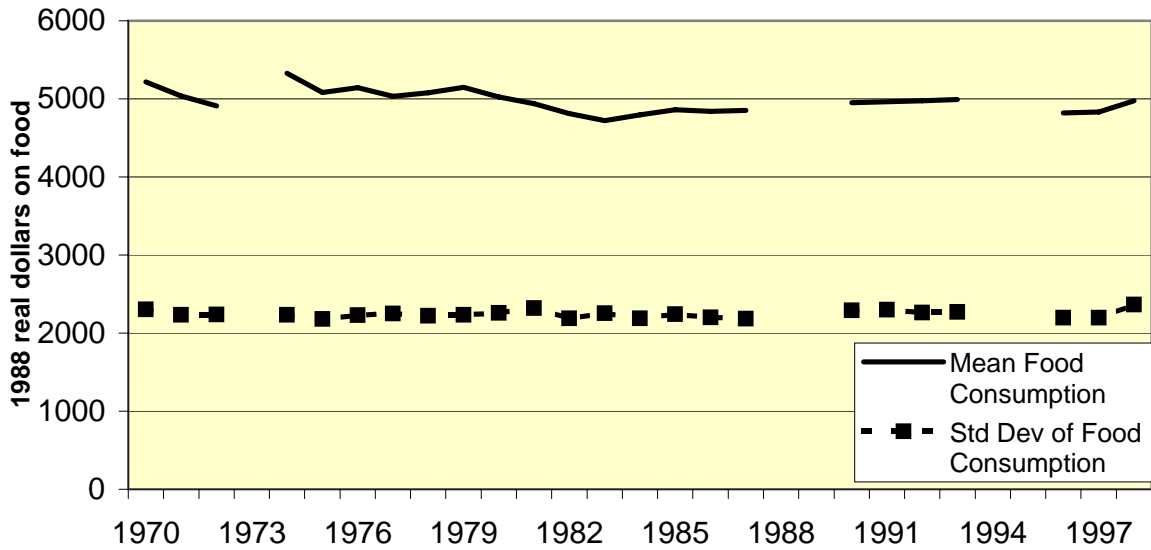
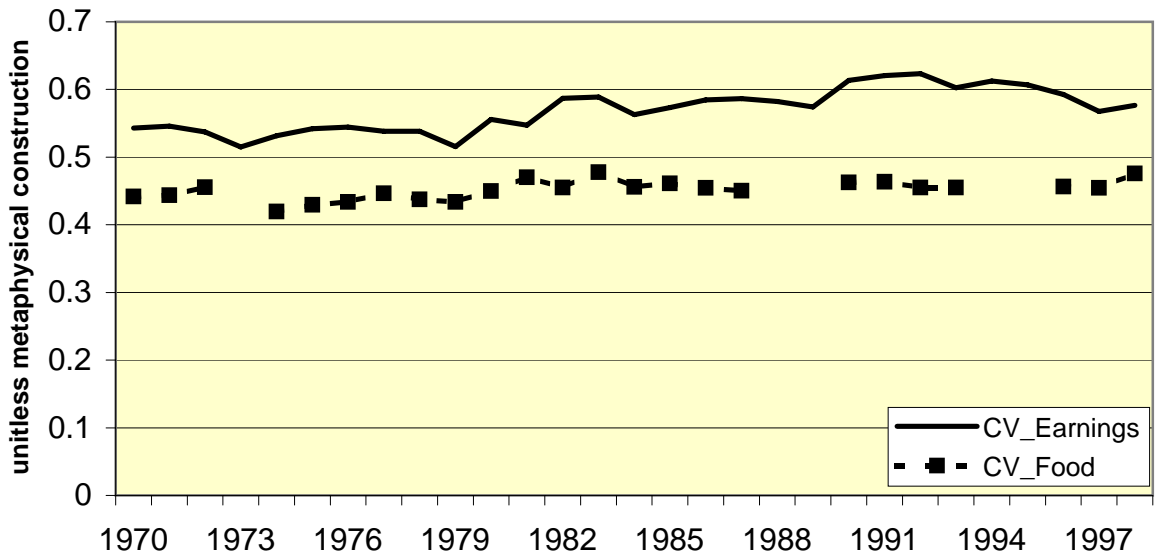


Figure 3. Growth in Mean and Variance of Food Consumption for White Males, 1970-2000



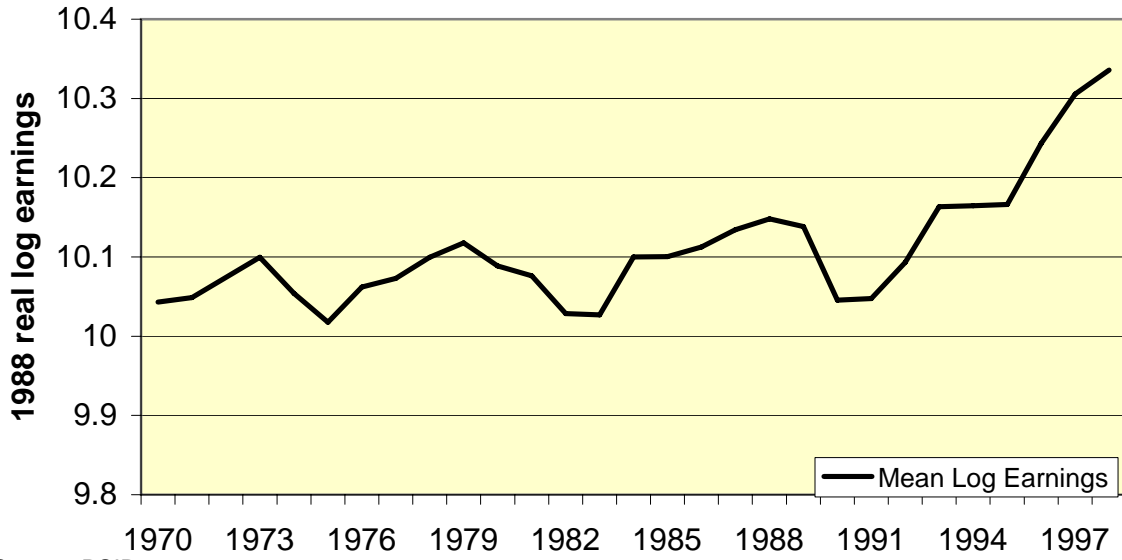
Source: PSID

Figure 4. Coefficient of Variation of Earnings and Food Consumption for White Males, 1970-2000



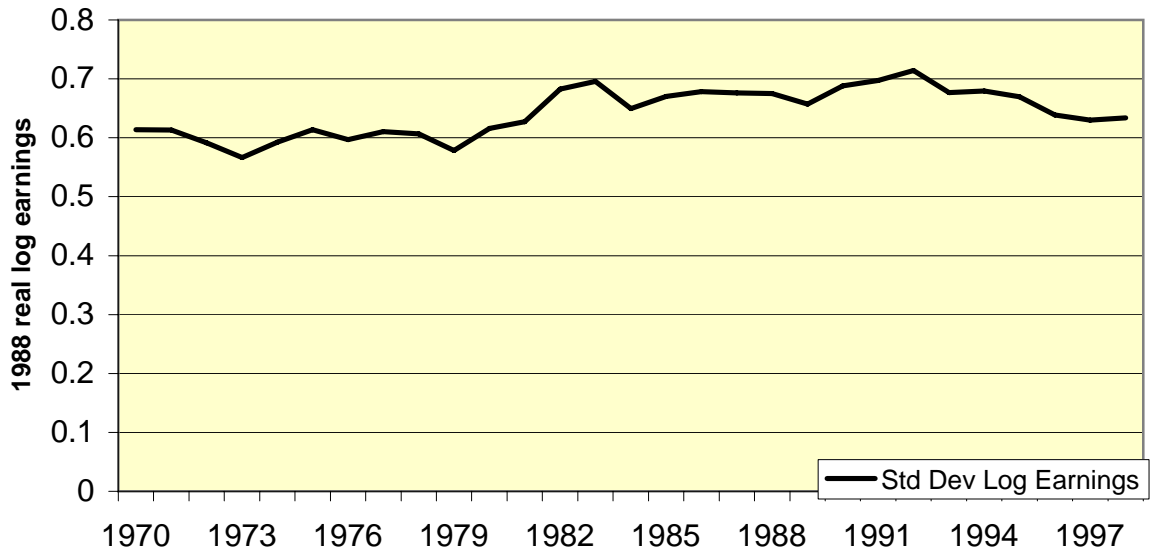
Source: PSID

Figure a1. Growth in Mean of Log Earnings for White Males, 1970-2000



Source: PSID

Figure a2. Growth in Standard Deviation of Log Earnings for White Males, 1970-2000



Source: PSID