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A TEST OF CONSUMPTION INSURANCE

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ABSTRACT

Are individuals effectively insured against idiosyncratic shocks to income or wealth by either formal or informal mechanisms? This paper shows that under perfect insurance, marginal utility should grow at the same rate for all consumers, and that the distribution of measured consumption growth rates should be independent of variables that are exogenous to the individual consumer when we allow for measurement error in consumption and for variation in preferences. This proposition is tested by cross sectional regressions of individual consumption growth on a variety of variables that should not be correlated with it under perfect insurance, including illness, being fired from a job, etc.

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1. Introduction

If markets were complete and perfect, or if there was some other institution or mechanism that implemented a full information pareto optimal consumption allocation, then individuals' consumption would vary only with aggregate consumption and would not respond to idiosyncratic variations in income or wealth. This proposition can be viewed as a cross sectional counterpart to the permanent income hypothesis: perfect insurance implies that consumption growth should not vary across individuals in response to idiosyncratic shocks, just as perfect asset markets imply that an individual's consumption should not vary over time in response to temporary shocks in income.

At face value this is a ludicrous proposition: the consumption of state lottery winners certainly rises, even when aggregate consumption declines. However, it is not so obvious that the proposition is ludicrous for shocks that are important to macroeconomists: when an consumer loses his job, gets sick, works in an industry that suffers a loss in demand, etc., does that consumer suffer a loss of wealth, revealed in his consumption choice? Or are such shocks effectively insured, either by formal institutions such as unemployment and disability insurance, or by the network of informal institutions that can proxy for insurance, including gifts and "loans" from relatives, friends and neighbors, "labor hoarding" or other implicit insurance on the part of employers, local or national charities, etc.?

Beyond direct interest in this question, the presence or strength of consumption insurance has further implications in a number or contexts. As a first example, perfect insurance implies the existence of a representative consumer, i.e. a social welfare function that is independent of changes in the distribution of income or wealth (but not, in general, independent of the individual Pareto weights). Without perfect insurance, the existence of such a representative consumer depends on specific functional forms for utility and technology, for example quadratic utility and linear technology (see Hansen (1986)). As a result, the presumed lack of perfect consumption insurance in the real world is often cited as an explanation for empirical failures of representative consumer models, and as motivation for studying macroeconomic and financial theories without perfect insurance and hence with "missing markets" and a dependence on the ex post distribution of wealth. (Constantinedes (1988) gives a good review of recent research in this direction.) By testing for consumption insurance, we can test the presumption behind this explanation and motivation.

As a second example, the need for explicit treatment of private information in macroeconomics is similarly ascribed to a lack of consumption insurance due to that private information. In many private information setups, the Pareto optimal consumption allocation less than perfectly insures individuals against risk, as a result of moral hazard. A test for perfect consumption insurance is a test of this implication, and hence a test for the empirical relevance of private information theory for macroeconomics. Conversely, in many circumstances it is attractive to apply the results of a full information Pareto planning exercise directly to an actual economy without worrying about the mechanism or market or other institutions that implement it (see Townsend (1987)); a test for consumption insurance can give us some evidence whether this approach is a good idea for our economy.

The basic idea of the tests for consumption insurance in this paper is that since individual consumption growth should only depend on aggregate consumption growth, then β should equal zero in a regression like

$$\Delta c_j = \alpha + \beta X_j + \epsilon_j \tag{1}$$

where Δc_j = a measure of household j's nondurable consumption growth, and X_j is some shock variable that is exogenous to the consumer (not a decision variable), for example days of work lost due to illness. By running regressions like (1) we not only test the theory (which, as mentioned above, is ludicrous if take too literally), but we can find out for which shocks and among which groups of consumers the theory does hold, and for which it does not.

In a perfectly measured economy of identical consumers with constant relative risk aversion, there should be no error term in a regression (1) under perfect insurance: each individual's consumption growth would be *exactly* equal to all the others and to aggregate consumption growth. However, we can expect an error term when applying (1) to our economy. The theory of perfect insurance states that the growth in *marginal utility* of consumption should be the same for all consumers, but measured consumption growth can vary across individuals if the consumers' utility functions have different shapes, undergo shifts, or if consumption growth is measured with error. In particular, I will take a household as the basic unit of analysis rather than try to construct an age-standardized per capita consumption measure, so changes in the composition of the household -- having a baby or a child leaving -- are an obvious source of preference shocks, as are the aging of existing household members, or shocks to the preferences of individuals in the household.

Since the error term is composed of measurement error and variation in preferences, it is important to pick right hand side variables that are plausibly uncorrelated with the measurement error in consumption, that are well measured themselves, and that are uncorrelated with variation in preferences across individuals and with preference shocks. For example, *quitting* a job might be correlated with other events that reduce an individual's desired level (marginal utility) of consumption, and so would not be an appropriate right hand variable; being *fired* from a job is more plausibly uncorrelated with such events. Hence, the best right hand variables in an equation like (1) are variables that are exogenous to the household, and not decision variables of the household.

In particular, I will not emphasize income as a right hand variable. Though regarding income as exogenous to the individual has a long and honored tradition, households that undergo a preference shock (say, having a baby, or having a child leave) have an incentive to work more or less to increase or decrease income. This is especially important if the shock is unexpected, or if well functioning insurance markets are accompanied by poorly functioning markets for borrowing and lending. Hence, income is quite likely to be correlated with preference shocks.

The observation that individual's consumption should vary together under perfect insurance, and the attempt to verify this assertion are of course not new. As a few examples, Scheinkmann and Weiss (1986) look at variation in consumption across countries, Abel and Kotlikoff (1988) look at consumption within a dynastic family, in which case altruistic preferences are the mechanism for perfect insurance, and Mace (1988) focuses on the use of income as a right hand variable, using a variety of techniques to mitigate its potential correlation with the error term.

2. Testable Implications of Consumption Insurance

This section presents two results. First, under perfect insurance, the marginal utility of consumption should grow at the same rate for all individuals. Second, consumption growth rates ought to be independent of variables that are external to the consumer, and hence uncorrelated with the consumer's type, preference shocks, and measurement error in consumption. This last proposition is the basis of the tests that follow.

I will characterize the behavior of consumption under perfect markets by examining the Pareto problem rather than explicitly constructing an equilibrium or other implementation mechanism. The Pareto problem is

$$\max \sum_j \lambda^j \; E \sum_t (\beta^j)^t \; u^j(c_t^j) \tag{2}$$

(j indexes consumers and t indexes time) subject to a feasibility constraint. The period utility function $u^j(c^j_t)$ may include preference shocks. Other goods, and leisure in particular, may enter separably (this is generalized below). The feasibility constraint is

$$c_t^A \le T_t^A \tag{3}$$

where $c_t^A = \sum_j c_t^j$, and T_t^A is the aggregate amount of the consumption good available at time t. (A indicates aggregate quantities).

In an endowment economy, the total endowment is available for distribution,

$$T_t^A = e_t^A \tag{4}$$

where $e_t^A = \sum_j e_t^j$ and e_t^j are endowment streams (labor income). With a linear capital accumulation technology, we have instead

$$T_t^A = R\, K_t^A + e_t^A - K_{t+1}^A \tag{5}$$

where K denotes the capital stock or nonhuman wealth at time t. The form of the intertemporal transformation of consumption will drop from the analysis, so more complicated production technologies will give the same results. The important assumption is that consumption can be costlessly reallocated across individuals, embodied in (3).

The first order conditions for the Pareto problem max (2) subject to (3) and (4) or (5) include an intertemporal condition for each individual,

$$u^{j\prime}(c_t^j) = \beta^j E_t(R\ u^{j\prime}(c_{t+1}^j)) \tag{6}$$

where R is either the physical rate of return in (5) or the shadow price associated with (4) and a cross sectional condition,

$$\lambda^j\ u^{j\prime}(c_t^j) = \lambda^k\ u^{k\prime}(c_t^k) \quad . \tag{7}$$

The intertemporal condition (6) is the basis of the permanent income hypothesis; this paper studies the cross sectional condition (7). Note that (6) and (7) may hold independently of each other. A group of agents may be perfectly insured, but the shadow price R in (6) may not correspond to the relevant marginal product; conversely, they may be able to borrow and lend or to invest in backyard technologies, and not be perfectly insured.

To derive an empirically useful relation, use (7) at two different dates to eliminate the λ weights:

$$\frac{u^{j\prime}(c_{t+\tau}^j)}{u^{j\prime}(c_t^j)} = \frac{u^{k\prime}(c_{t+\tau}^k)}{u^{k\prime}(c_t^k)} \tag{8}$$

or *marginal utility must grow at the same rate for all individuals*.

Note this is a distinct proposition than that which results form dividing the intertemporal condition (6) for two individuals: (8) holds ex post, not just in expected values, and, since (8) does not use the intertemporal conditions at all, it holds no matter what the technology for intertemporal transformation. The essential trick used in deriving (8) is that the λ weights at two time periods cancel, because we are watching the evolution over time of one economy.

The equality of marginal utility growth does not imply that consumption growth rates should be equal, unless consumers have identical CRRA preferences and consumption is perfectly measured. To derive a testable implication, I'll first display a parametric example that makes the logic clear, and then present the general statement. Assume that utility functions display constant relative risk aversion with a multiplicative shock δ_t^j, and a risk aversion coefficient γ that is common across consumers.

$$u^{j\prime}(c_t^j) = \delta_t^j \frac{(c_t^j)^{(1+\gamma)} - 1}{1+\gamma} \tag{9}$$

Then, the condition (8) that marginal utility grows at the same rate is

$$\frac{\delta_{t+\tau}^j \ (c_{t+\tau}^j)^\gamma}{\delta_t^j \ (c_t^j)^\gamma} = \frac{\delta^k{}_{t+\tau}(c^k{}_{t+\tau})^\gamma}{\delta_t^k \ (c_t^k)^\gamma} \tag{10}$$

or

$$\nu_{t+\tau}^j + \gamma \log (c_{t+\tau}^j/c_t^j) = \nu_{t+\tau}^j + \gamma \log (c_{t+\tau}^j/c_t^j) \tag{11}$$

where $\nu_{t+\tau}^j = \log(\delta_{t+\tau}^j/\delta_t^j)$. Denote the common value of (11) as $\alpha\gamma$. Then, we can rewrite (11) as

$$\log (c_{t+\tau}^j/c_t^j) = \alpha - \nu_{t+\tau}^j/\gamma \tag{12}$$

Finally, allow a mean zero error $\epsilon_{t+\tau}^j$ in measuring consumption growth, so

$$\log(c^j_{t+\tau}/c^j_t) = \alpha - (\nu^j_{t+\tau}/\gamma + \epsilon^j_{t+\tau}) . \tag{13}$$

Consider a variable X^j that is independent of preference shifts $\nu^j_{t+\tau}$ and measurement error $\epsilon^j_{t+\tau}$. (13) implies that *X^j and consumption growth $\log(c^j_{t+\tau}/c^j_t)$ are independent of each other;* or *consumption growth rates are distributed independently of X^j.*

As a test of this proposition, I will run regressions of the form

$$\log(c^j_{t+\tau}/c^j_t) = \alpha + \beta X^j + \xi^j_{t+\tau} \qquad j = 1,2,\ldots n \tag{14}$$

So long as the measurement error in consumption growth and preference shocks are mean zero, homoskedastic, uncorrelated across individuals, and uncorrelated with the variables X^j, we can use OLS estimates and conventional t or F tests to test whether $\beta = 0$.

The statement that measured consumption growth ought to be independent of an external variable X^j holds with more general utility functions. Assume that $u^j(\cdot)$ is monotone, concave and differentiable, but may vary across individuals. Let θ^j be a type index of individual utility functions, and let $\nu^j_{t+\tau}$ represent a (not necessarily multiplicative) preference shock as above (θ^j indexes utility functions at time t, $\nu^j_{t+\tau}$ indexes utility functions at time $t+\tau$.) I will use the following notation for marginal utility growth:

$$f(c^j_{t+\tau}/c^j_t;\; c^j_t,\; \theta^j,\; \nu^j_{t+\tau}) = \frac{u^{j\prime}(c^j_{t+\tau})}{u^{j\prime}(c^j_t)}, \tag{15}$$

(f is written this way because marginal utility growth depends on $c^j_{t+\tau}$ and c^j_t

and not just on the growth rate $c^j_{t+\tau}/c^j_t$, without power utility.) The properties of the function f are unessential; what matters is the list of variables that make measured consumption growth rates vary across individuals while marginal utility growth is constant.

With the measurement error $\epsilon^j_{t+\tau}$ in consumption growth, the equality of marginal utility growth (8) implies that

$$f(c^j_{t+\tau}/c^j_t - \epsilon^j_{t+\tau};\ c^j_t,\ \theta^j,\ \nu^j_{t+\tau}) \tag{16}$$

should be constant across consumers, so if X^j is independent of measurement error $\epsilon^j_{t+\tau}$, initial consumption c^j_t, types θ^j, and preference shocks $\nu^j_{t+\tau}$, measured consumption growth should be independent of X^j. The effect of the CRRA assumptions in the example above was to remove c^j_t and θ^j from the list of variables that affect marginal utility growth given consumption growth.[1]

If leisure (or another good) enters the utility function nonseparably, then leisure affects the marginal utility of consumption, and this drives a further wedge between marginal utility growth and consumption growth. However, leisure must enter in a way that is nonseparable under arbitrary monotone transformations, not just linear transformations, as only the ordinal properties of the utility functions, or marginal rates of substitution, enter into the derivation of the equality of marginal utility growth, (8).[2] For example Cobb-Douglas preferences $c^{\alpha}L^{1-\alpha}$ are separable after a log transformation. With nonseparabilities that cannot be removed by a monotonic transformation, the prediction that consumption growth rates should be independent of X^j will still hold, if X^j is distributed independently of leisure.

Under perfect insurance, we predict that coefficients β as in (14) should equal zero. If we find a nonzero coefficient, it is tempting to cast this not just as a statistical rejection of the theory, but also as a measurement of the rule for the allocation of consumption conditional on outcomes X^j. The caveat to this interpretation is that if there are several variables that are not perfectly insured, say X^j and Y^j, and if these variables are correlated, then a single regression coefficient as in (14) will not be the same as the true allocation rule, which would be revealed by the multiple regression coefficient of consumption growth on both X^j and Y^j.

3. Results

I used data from the Panel Study of Income Dynamics for the years 1981 - 1984. Table 1 presents a description of the variables. I used two measures of consumption growth. In the first, I rejected households that had any change in composition, because composition changes ought to imply a shift in the household's utility function. The second measure of consumption does not screen out these households. Utility shifts induced by family composition changes contribute to the error term in (14); since the right hand variables are chosen to be uncorrelated with those shifts, the inclusion of households that change composition does not bias coefficient estimates, but will influence standard errors. Including households with a change in composition raises the variance of the error term, but increases the number of observations.

The right hand variables include illness, strikes, being forced to move, involuntary job loss, and weeks looking for unemployment. I also used household composition change as a right hand variable as a test whether the technique can pick up a coefficient we know should be positive, and I included the obvious regression on growth in total family income.

Table 2 presents the results. For each right hand variable and each consumption measure it presents an OLS regression, an OLS regression using a dummy right hand variable, and a χ^2 test for independence of the events (consumption growth > 0) and (right hand variable > 0). The OLS regression using dummy variables amounts to an estimate and test of the difference in sample means between the group with $X^j > 0$ and $X^j = 0$.

The illness variable (panel II) is statistically significant in the regressions. The value of the parameter is quite small--each day of illness is associated with a .048 percentage point decline in consumption growth from 80 to 83. However, the relationship seems to be nonlinear, and the rejection due to households with lots of illness: households with more than 100 days of illness have consumption 11.2 - 14.2 percentage points lower than other families, more than the 4.8-5.6% suggested by multiplying the OLS coefficients by 100. Furthermore, the regression using a dummy for illness > 0 was insignificant, as is the χ^2 test for independence of (consume > 0) and (illness > 0).

The lostjob variable (panel III) has the largest and most significant coefficient. Households with lostjob = 1 had consumption growth 24 - 26 percentage points lower than households with lostjob = 0, which is about half of the standard deviation of reported consumption growth rates. The t-statistics and p value for χ^2 clearly reject independence. Fig. 1 presents a histogram of the conditional distributions of consumption given lostjob = 0 and 1, and the difference in conditional distribution is clearly visible.

The wkslook variable (panel IV) is an attempt to find a continuous scale over which the effects of lostjob can be seen. However, the coefficients on wkslook are small and insignificant. The major reason is that most households with lostjob = 1 did not report any weeks spent looking for employment. The strike variable (panel V) is another plausible external shock to labor income, but it too produced small and insignificant coefficients.

The move variable (panel VI) is another possible indicator of an external shock to hit the household. The coefficients are large, but on the borders of significance, and one is of the wrong sign.

The regression of consumption growth on income (panel VII) yielded a positive and significant coefficient of a surprisingly low magnitude. A model with liquidity constraints and no insurance would predict a coefficient of 1; the coefficients here are .051 and .104. Note also that the coefficients on income are roughly double for families with a composition change, reinforcing the view that income changes are correlated with preference shocks, in this case induced by household composition changes.

I also regressed consumption growth on net number of new people added to the household, (panel VIII) as a test of the power of the technique to uncover a coefficient that ought to be positive and large in the enormous measurement error of this consumption variable. Consumption growth increases by 16.10 percentage points for every added person, with a t-stat of 18; the χ^2 test has a p-value of an impressive 1.06×10^{-23}

4. Concluding Remarks

The central point of this paper is a technique for testing consumption insurance, and for measuring which shocks are and aren't insured, based on the proposition that measured consumption growth rates ought to be independent of variables that are exogenous to the consumers.

Many of the variables yielded mixed results: the coefficients were small, and the t-statistics were around 2, which does not allow me to "fail to reject" the theory, but are not very convincing rejections in sample sizes of 2000-4000. On the other hand, the loss of more than 100 days of work due to illness and the loss of a job are important right hand variables, whose associations with consumption growth are both economically and statistically significant. Unless these variables are significantly correlated with the error terms (sick people might lose their appetites, and leisure might enter nonseparably), this is evidence against perfect insurance. Income also yielded a large coefficient, but this is more plausibly correlated with shocks to preferences.

The empirical results in this study can be extended in a variety of ways, with richer data sources. The most obvious extensions are to other variables and more time periods. Also, we should expect stronger insurance among groups that are geographically close to each other, work together, or among relatives, because the informal arrangements or altruistic motives that proxy for consumption insurance should be stronger for these groups, and regressions for subgroups can be used to test this hypothesis.

Table 1

Variable Definitions

Consume:

% consumption growth, 100*log(1983 consumption / 1980 consumption). Consumption = total food consumption (food at home + foodstamps + meals away from home).
Data rejected if: splitoff, refused an interview, composition change, quality of match, food accuracy codes, farmers, consumption = 0 in either 80 or 84.

Impcons:

Same as above, with no rejection for composition change.

Illness:

Days of work missed by head in 81 82 and 83 because he/she or someone else was ill.
Data only rejected for accuracy codes.

Strike:

Days of head's work lost due to strikes in 81 82 and 83.
Data only rejected for accuracy codes.

Move:

Dummy = 1 if head moved in 81 82 or 83 because of "response to outside events (involuntary reasons): HU coming down, being evicted, armed services, etc., health reasons, divorce, retiring because of health."

Lostjob:

Dummy variable. Lostjob = 1 if head was employed in 1980, lost job in 81 82 or 83, was unemployed, and gave reason 1) "Company folded/changed hands/moved out of town; employer died/went out of business", 2) "Strike; lockout", or 3) "Laid off; fired". Lostjob = 0 if head was employed in 1980, stayed employed or lost job for other reasons (including quit). Data rejected if head not employed in 1980.

Wkslook:

Total weeks spent looking for work in 81 82 and 83 if Lostjob = 1.

Movin:

Number of movers in - movers out of household in 81 82 and 83.

Ygrow:

% total income growth (1983+1982)/(1980+1981). Data rejected if Income = 0 in 83+82 or 80+81.

Table 2
Results

I. Statistics on Consumption

	Consumption growth with Composition changes removed	Consumption growth with Composition changes not removed
Mean	13.99	12.53
Std. Dev.	47.27	59.55
Observations	1741	4629

II. Consumption on days of Illness:

n	1738	4614
n illness = 0	868	1925
n illness > 0	870	2689
n illness ≥ 100	99	333

Consume =	15.109	- .048	Illness
s.e.:	1.222	.020	
t-stat:		-2.360	

Impcons =	14.090	- .056	Illness
s.e.:	.895	.015	
t-stat:		-3.738	

Consume =	14.123	- .178	Illness > 0
s.e:	1.605	2.268	dummy
t-stat:		-.078	

Impcons =	12.162	+ .703	Illness
s.e.:	1.357	1.778	> 0
t-stat:		.396	dummy

Consume =	14.828	-14.22	Illness ≥ 100
s.e:	1.605	4.93	dummy
t-stat:		-2.89	

Impcons =	13.367	- 11.27	Illness
s.e.:	0.908	3.42	≥ 100
t-stat:		-3.29	dummy

Crosstab:

	Observed		Expected	
	c ≤ 0	c > 0	c ≤ 0	c > 0
I ≤ 0	310	558	297	571
I > 0	285	585	298	572

χ^2: 1.686 p-value: 43.04%

	Observed		Expected	
	c ≤ 0	c > 0	c ≤ 0	c > 0
I ≤ 0	740	1185	722	1203
I > 0	990	1699	1008	1681

χ^2: 1.264 p-value: 53.16%

(Table 2, cont'd)

III. Consumption on Lostjob:

n	: 1173	n	: 3373
n lostjob = 0	: 1097	n lostjob = 0	: 3082
n lostjob = 1	: 76	n lostjob = 1	: 291

Consume = 14.475 - 24.025 Lostjob
s.e.: 1.234 4.849
t-stat: - 4.954

Impcons = 13.964 - 26.741 Lostjob
s.e.: 1.006 3.425
t-stat: - 7.808

Crosstab:

	Observed c ≤ 0	Observed c > 0	Expected c ≤ 0	Expected c > 0
lj = 0	356	741	371	726
lj = 1	41	35	26	50

χ^2: 14.67 p-value: 0.065%

	Observed c ≤ 0	Observed c > 0	Expected c ≤ 0	Expected c > 0
lj = 0	1090	1992	1149	1933
lj = 1	167	124	108	183

χ^2: 55.16 p-value: 1.05E-10%

IV. Consumption on Wkslook:

n	: 1171	n	: 3362
n wkslook = 0	: 1153	n wkslook = 0	: 3316
n wkslook > 0	: 18	n wkslook > 0	: 46
mean, > 0	: 22.56	mean, > 0	: 29.52

Consume = 13.149 - 0.341 Wkslook
s.e.: 1.207 0.311
t-stat: - 1.095

Impcons = 12.009 - 0.728 Wkslook
s.e.: .978 0.190425
t-stat: - 3.827

Consume = 13.117 - 5.645 Wkslook dummy
s.e.: 1.212 9.778
t-stat: - 0.577

Impcons = 12.009 - 15.915 Wkslook dummy
s.e.: .978 8.359
t-stat: - 1.904

Crosstab:

	Observed c ≤ 0	Observed c > 0	Expected c ≤ 0	Expected c > 0
wl = 0	390	763	390	763
wl > 0	6	12	6	12

χ^2: 0.002 p-value: 99.90%

	Observed c ≤ 0	Observed c > 0	Expected c ≤ 0	Expected c > 0
wl = 0	1224	2092	1231	2085
wl > 0	24	22	17	29

χ^2: 4.53 p-value: 10.40%

(Table 2, cont'd)

V. Consumption on strike days:

n : 1741	n : 4629
n strike = 0 : 1705	n strike = 0 : 4506
n strike > 0 : 36	n strike > 0 : 123

Consume =	14.125	- 0.214	Strike		Impcons =	12.567	- 0.047	Strike
s.e.:	1.138	0.172			s.e.:	0.880	0.130	
t-stat:		- 1.243			t-stat:		- 0.365	

Consume =	14.184	- 9.515	Strike		Impcons =	12.724	- 7.154	Strike
s.e.:	1.145	7.960	dummy		s.e.:	.887	5.441	dummy
t-stat:		- 1.195			t-stat:		- 1.315	

Crosstab:

	Observed $c \leq 0$	Observed $c > 0$	Expected $c \leq 0$	Expected $c > 0$		Observed $c \leq 0$	Observed $c > 0$	Expected $c \leq 0$	Expected $c > 0$
s = 0	582	1123	584	1121	s = 0	1689	2817	1691	2815
s > 0	14	22	12	24	s > 0	48	75	46	77

χ^2: 0.354 p-value: 83.78% χ^2: 0.121 p-value: 94.12%

VI. Consumption on Involuntary Move:

n : 1741	n : 4629
n moved = 0 : 1692	n moved = 0 : 4294
n moved = 1 : 49	n moved = 1 : 335

Consume =	13.548	+ 15.588	Moved		Impcons =	12.942	- 5.642	Moved
s.e.:	1.148	6.841			s.e.:	.909	3.377	
t-stat:		2.279			t-stat:		- 1.671	

Crosstab:

	Observed $c \leq 0$	Observed $c > 0$	Expected $c \leq 0$	Expected $c > 0$		Observed $c \leq 0$	Observed $c > 0$	Expected $c \leq 0$	Expected $c > 0$
m = 0	582	1110	579	1113	m = 0	1583	2711	1611	2683
m = 1	14	35	17	32	m = 1	154	181	126	209

χ^2: 0.718 p-value: 69.84% χ^2: 10.99 p-value: 0.41%

(Table 2, cont'd)

VII. Consumption on Income:

n	:	1065
mean	:	3.59
std. dev.	:	66.92

Consume = 13.739 + 0.051 Ygrow
s.e.: 1.413 0.021
t-stat: 2.432

Consume = 7.537 + 8.741 Ygrow dummy
s.e.: 2.717 3.179
t-stat: 2.750

Crosstab:

	Observed		Expected	
	$c \leq 0$	$c > 0$	$c \leq 0$	$c > 0$
$y \leq 0$	118	169	96	191
$y > 0$	240	538	262	516

χ^2: 9.903 p-value: 0.707%

n	:	3156
mean	:	4.41
std. dev	:	72.55

Impcons = 11.817 + 0.104 Ygrow
s.e.: 1.063 0.015
t-stat: 7.088

Impcons = 1.248 + 15.939 Ygrow dummy
s.e.: 1.912 2.299
t-stat: 6.934

	Observed		Expected	
	$c \leq 0$	$c > 0$	$c \leq 0$	$c > 0$
$y \leq 0$	444	529	367	606
$y > 1$	746	1437	823	1360

χ^2: 37.624 p-value: 6.8E-07 %

VIII. Consumption on movers in / movers out

(consume rejects composition change)

n	:	4629
n movin = 0	:	2790
mean	:	.004
std. dev.	:	.978

Impcons = 12.474 + 16.101 Movin
s.e.: 0.844 0.863
t-stat: 18.662

Impcons = 6.542 + 28.329 Movin dummy
s.e.: 0.967 2.103
t-stat: 13.474

Crosstab:

	Observed		Expected	
	$c \leq 0$	$c > 0$	$c \leq 0$	$c > 0$
$mi \leq 0$	1508	2142	1370	2280
$mi > 0$	229	750	367	612

χ^2: 105.8 p-value: 1.06 E-21 %

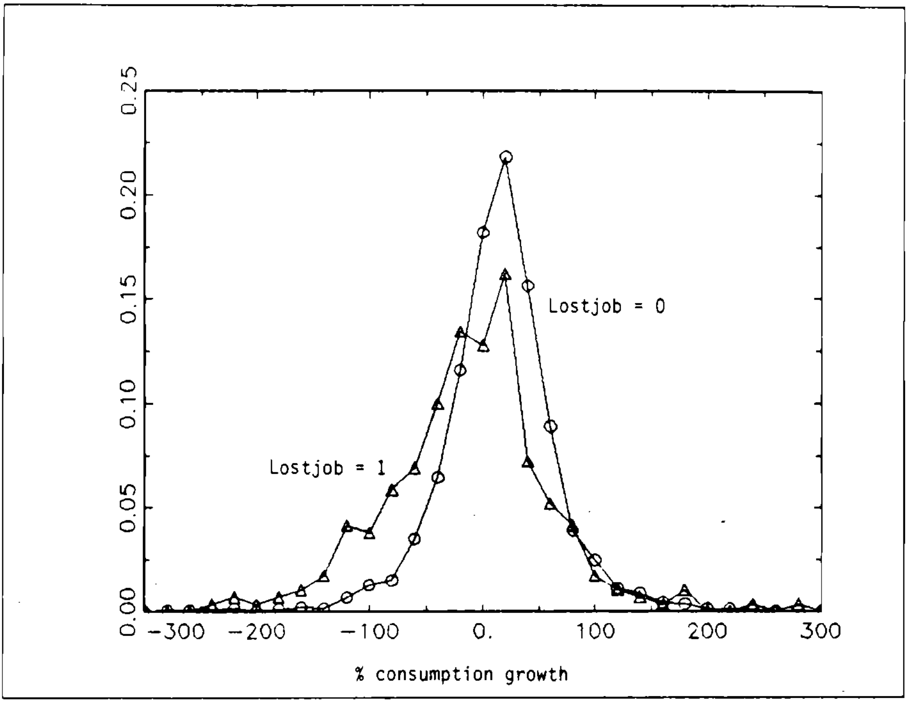
0.25
0.20
0.15
0.10
0.05
0.00
Lostjob = 0
Lostjob = 1
-300
-200
-100
0.
100
200
300
% consumption growth

Fig. 1

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Footnotes

[1]Monotone concave utility also implies that utility growth is monotone in consumption growth:

$$f^j(1; c_t^j, \theta^j, \nu_{t+\tau}^j - \nu_t^j) = 1 \text{ and } f^{j\prime}(\cdot; c_t^j, \theta^j, \nu_{t+\tau}^j - \nu_t^j) > 0.$$

This condition may be useful when using long time series of data. It says that with variation in preference but no preference shocks, consumption growth rates should all have the same *sign*, if not the same *magnitude*.

[2]I thank Robert Townsend for pointing this out