Development and Growth - PS3

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Abstract

This document reports my solution to the Problem Set 3. The respective Python code is *ps3.py*.[1]

[1] Any errors are exclusively my responsibility.

Consumption Insurance Tests

The objective of the following exercises is test for full insurance in Uganda and to investigate the relationship between insurance, income and wealth.

The data set used through out this study consists of a balanced panel data[2] of 1490 households during 4 waves: 2009-2010, 2010-211, 2011-2012, 2013-2014.

As discussed below, the main variables of interest are in time-difference, that is, a variable's growth rate (log-rate) between two consecutive waves (time periods). This means that, for each individual, there are 3 observations per variable.

1 Individual Insurance

A) Level Regression

To do the insurance test per household - that is, estimate individual coefficients β_i, ϕ_i - I am going to use as dependent variable the residual of level regression of HH's consumption on controls; and as explanatory variable the residual of level regression of HH's income on controls, and average aggregate consumption.

That is, my first step is the following estimation at the household level - using the entire panel data set:

$$\ln X_{it} = \beta_0 + \sum_k \alpha_k C_k + \ln x_{it} \qquad X_{it} = \{C_{it}, Y_{it}\} \tag{1}$$

where C_k is the set of controls[3]: head's age, squared age, family size, year fixed effects, head's gender and rural residency, and x_{it} are the residuals.

B) Insurance Regression

Then, using the residuals from the first step above I performance the Individual Insurance Test. That is, I regress the following at the individual level:

$$\boxed{\Delta \ln c_{it} = \beta_i \Delta \ln y_{it} + \phi_i \Delta \ln \bar{C}_t + \Delta \epsilon_{it}} \tag{2}$$

[2] I excluded households who were not interviewed in at least one wave.

[3] Some controls are time-dependent and others are not, as specified in the Problem Set Document.

where Δ denotes one-period difference.

Theory says that for full insurance it must be that $\beta_i = 0$. Also, it should be that $\phi_i = 1$. That is, individual smooth consumption over time: his consumption does not vary with his income, and moves accordingly with the village/region aggregate consumption.

C) Results

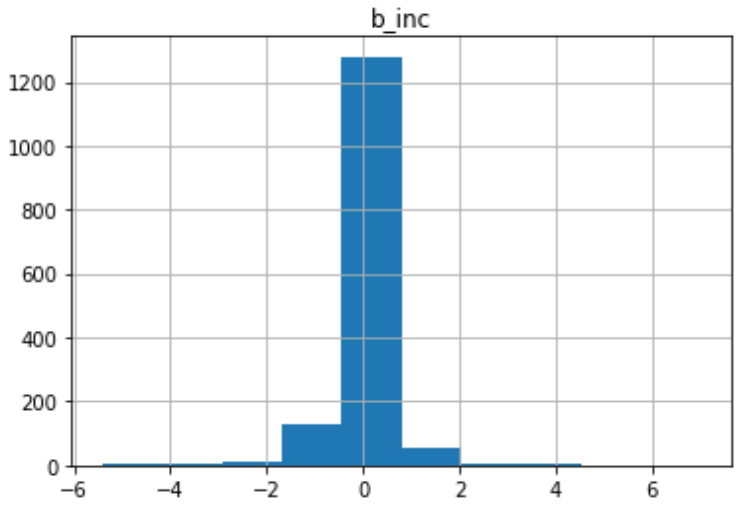
Income Coefficients

Using 4 waves from the Uganda Data set, I report the results of the test specified in this section.

For the coefficient on individual income β_i I find that values are statistically different from zero, so one rejects the hypothesis of full individual insurance. However, coefficient are on average not too far from 0. This indicates that, even though individuals cannot fully insure themselves, they do a pretty good job on it.

Below is the summary statistics and histogram.

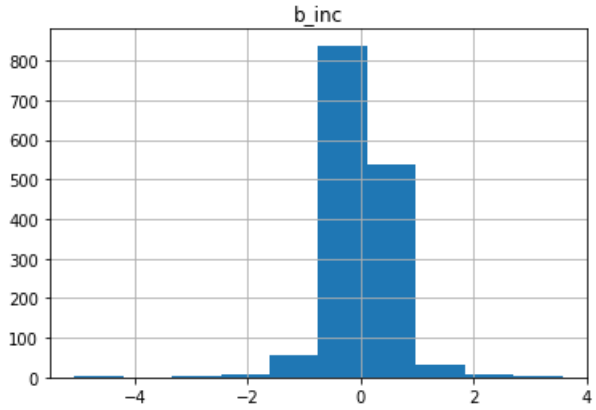
	β_i
count	1,490
mean	0.02
std	0.62
min	-5.42
25%	-0.16
50%	0.03
75%	0.23
max	7.03



There are some outliers. So I also analyze the β_i distribution controlling for those. To do so, I trim their values on the top/bottom 1% and 5% percent.

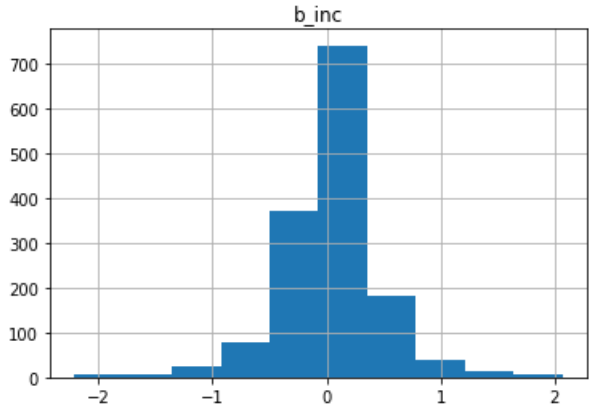
Above/below the top/bottom 1% there are 4 individuals. Excluding them gives the following results:

	$\beta_{i/1\%}$
count	1,486.00
mean	0.02
std	0.55
min	-5.08
25%	-0.16
50%	0.03
75%	0.23
max	3.58



Above/below the top/bottom 5% there are 16 individuals. Excluding them gives the following results:

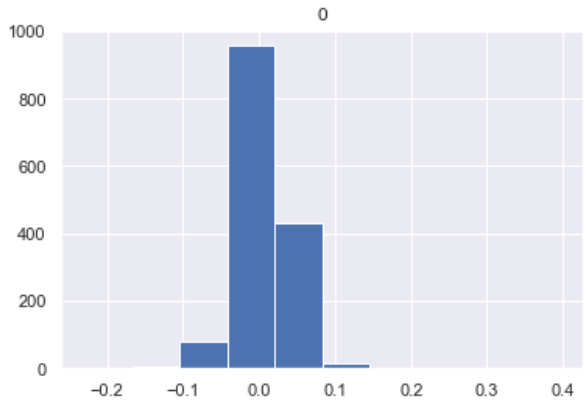
	$\beta_{i/5\%}$
count	1,474.00
mean	0.03
std	0.45
min	-2.21
25%	-0.16
50%	0.03
75%	0.23
max	2.07



Aggregate Consumption Coefficients

Surprisingly, coefficients are pretty much around zero.

	ϕ_i
count	1,490.00
mean	0.01
std	0.04
min	-0.23
25%	-0.01
50%	0.01
75%	0.02
max	0.40



D) Conclusion

From the results reported, we reject the hypothesis of individual full insurance since individual income coefficients are significant and different from zero. However, its mean is 0.02 and the vast majority of agents have coefficient between $[-1, 1]$.

This may suggest that even though full risk sharing is not achieved, individuals can partially insure themselves. This raises the question of how this is done.

It is worth noticing that some β_i are negative. This is somewhat counter intuitive: individual consumes more when his income is lower. But again, this may suggest that individuals are getting insurance from other agents.

2 Relationship between Insurance and Household income

In this section, I am interested on the average (log) income per household and its relation with the individual income coefficient of the insurance test. For better analysis, I compiled the variables of interest - average income, average consumption, urban dummy variable, income coefficient and aggregate consumption coefficient - in a panel.

Below is the summary statistics of the data set:

	$\bar{y}_i$	$\bar{c}_i$	β_i	ϕ_i	$urban_i$
mean	7.68	7.26	0.02	0.01	0.24
std	0.53	0.62	0.62	0.04	0.43
min	5.11	5.25	-5.42	-0.24	0.00
25%	7.36	6.83	-0.16	-0.01	0.00
50%	7.67	7.23	0.03	0.01	0.00
75%	8.01	7.64	0.23	0.02	0.00
max	9.57	9.63	7.03	0.40	1.00

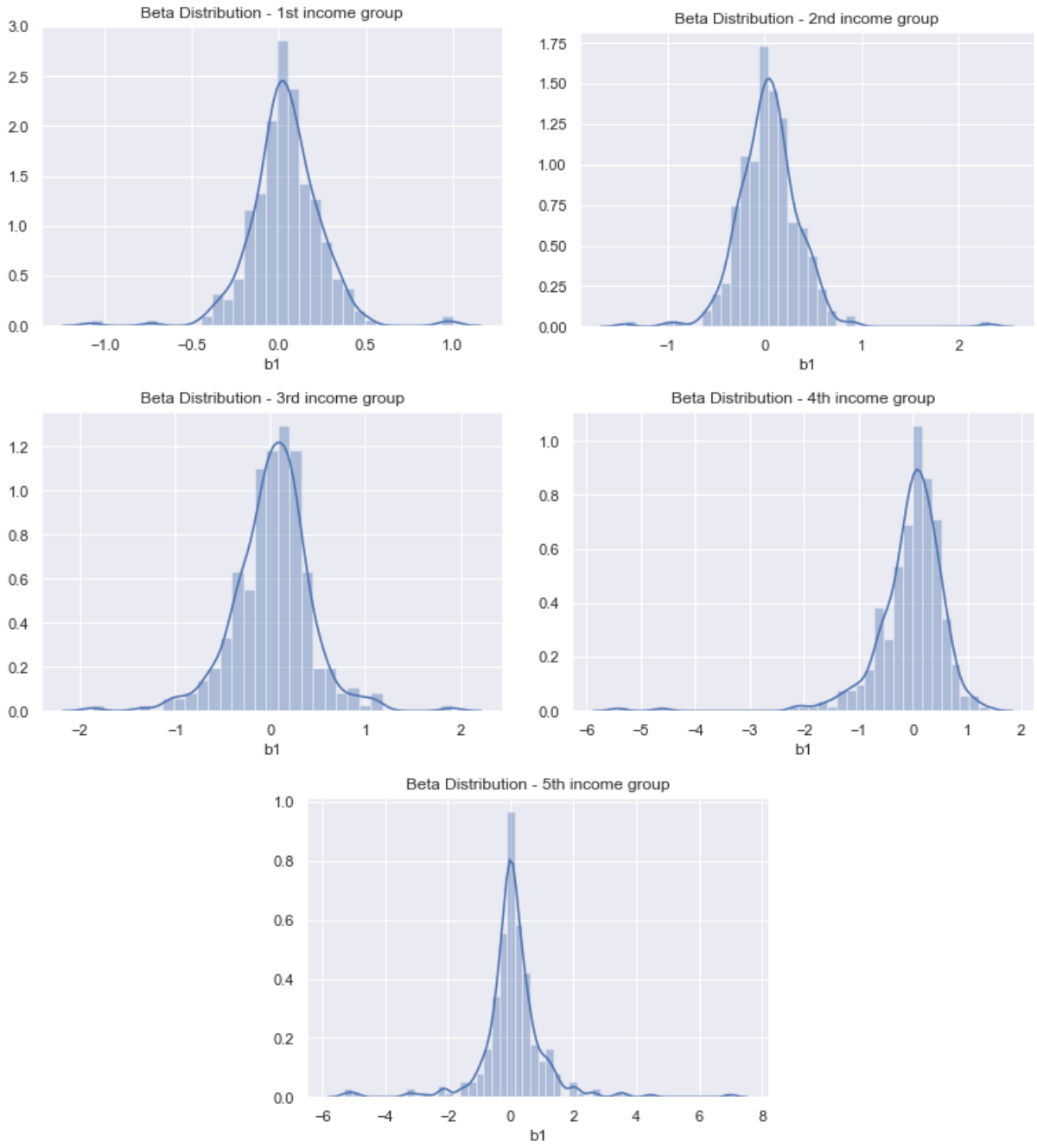
A) Income Ranking

I group households into 4 groups - bottom 20%, 20-40%, 40-60%, 60-80%, top 20% - according to their individual income level. The interest is to see how β_i's vary across groups.

The income percentiles cut-offs are: 20%= 7.261, 40%= 7.548, 60%= 7.797, 80% =8.110.

To investigate individual insurance difference, I report the mean and median of β_i for each group. Also, below is the β_i distribution per group.

%	β_i mean	β_i median
≤ 20	0.04	0.03
$(20, 40]$	0.04	0.04
$(40, 60]$	0.02	0.04
$(60, 80]$	-0.05	0.03
$(80, 100]$	0.07	0.02



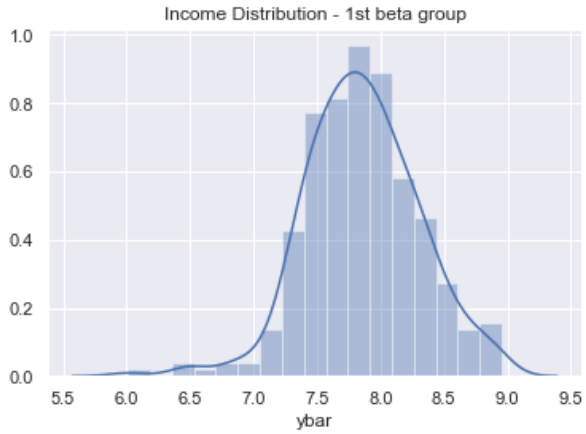
The β_i distribution of lower income groups is less dispersed. The highest income group has the highest mean, followed by the two lowest income groups. So the middle income household have the lowest income coefficient, which implies that they are better insured.

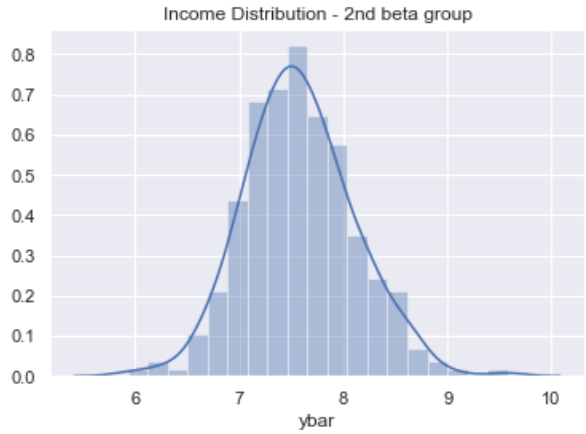
It is interesting to notice that the richest households are further away from full insurance and their β distribution has greater variance. This suggests that their consumption is more volatile. On the other hand, the 4th highest income group has a negative average β, which implies that they consume more when their income is lower (like a "reversed" insurance).

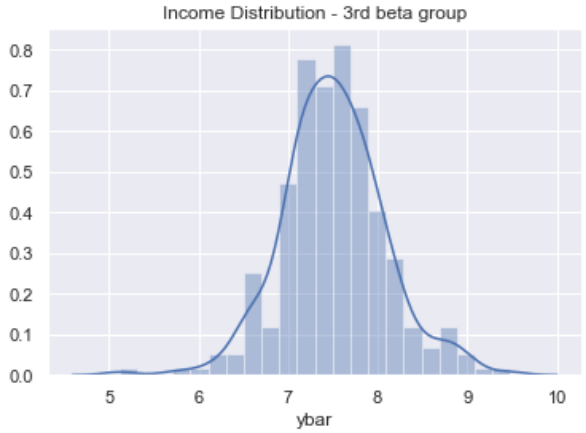
B) Beta Ranking

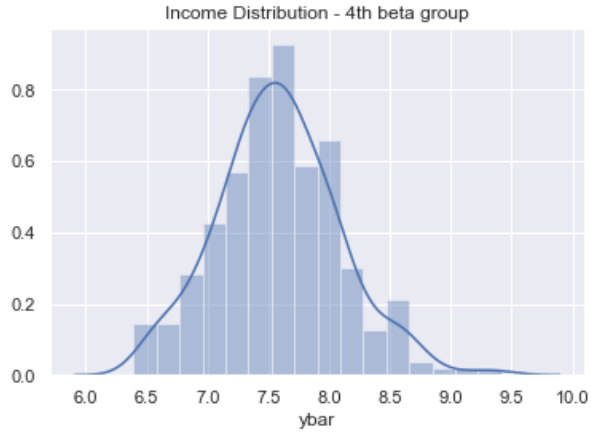
β-percentiles: 20%= -0.235, 40%= -0.024, 60%= 0.108, 80%= 0.302.

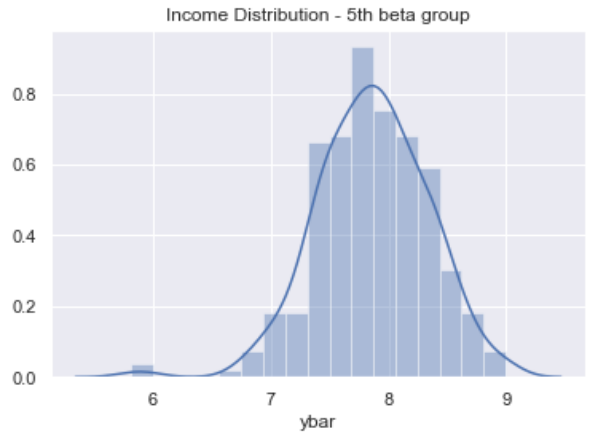
%	y_i mean	y_i median
≤ 20	7.86	7.83
$(20, 40]$	7.58	7.55
$(40, 60]$	7.51	7.50
$(60, 80]$	7.59	7.59
$(80, 100]$	7.86	7.86











The better insured households (with lowest β - 1st group) have, on average, higher income. Actually, they are similar to the household further away from full insurance (with highest β - 5th group). This suggest that there is no clear relation between β and income.

3 Full Insurance Test - Same Coefficients

	Δc
Δy	0.0457^{***}
	(0.0053)
$\bar{C}_t$	0.0062^{***}
	(0.0012)

Hence, since $\hat{\beta} \neq 0$, we reject the hypothesis of full risk sharing. Moreover, $\hat{\phi}$ is also different from what full insurance theory predicts: it is different than one.

These results are in line with the previous ones. Overall I find that full risk-sharing is not achieved. However, it seems that individuals are not too far away from this efficient allocation, if one take β as a quantitative measure as well.

Notice that, when specifying β_i as individual-specific, its mean is lower than with a common coefficient for all households. And one can say even more: β is greater than the median of β_i. That is, β value relates to the top-50%β_i, which are those further away from full insurance.

Consumption Insurance Tests - Rural vs Urban

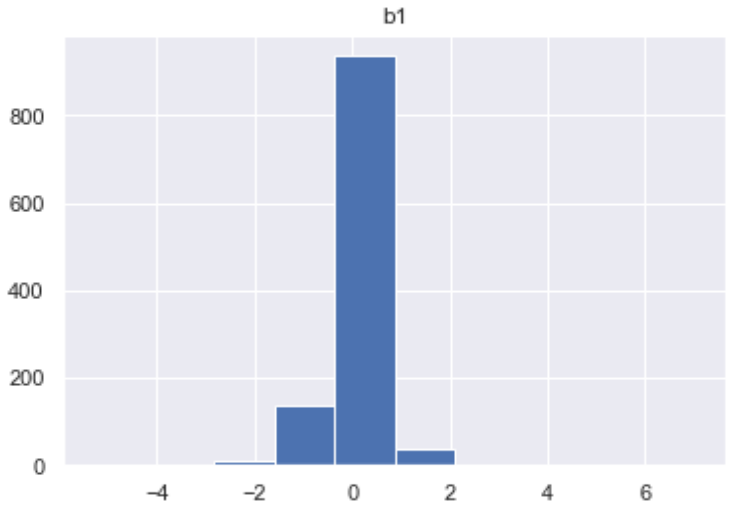
4 Individual Insurance

A) Results

Income Coefficients

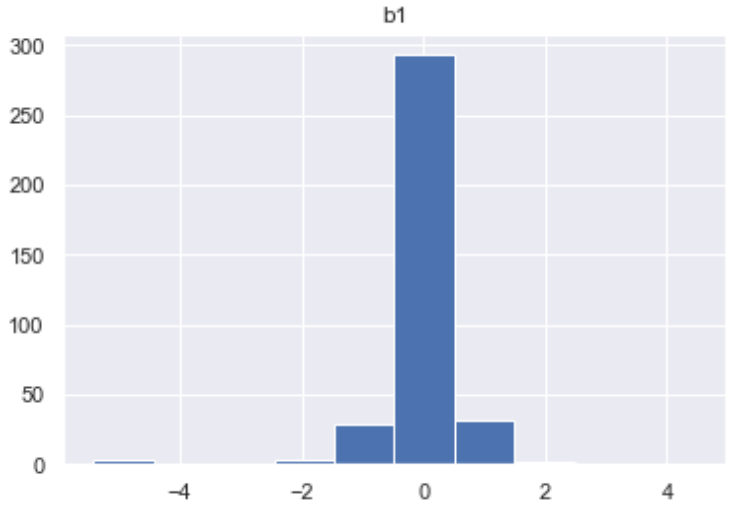
Rural:

	β_i
count	1,127.00
mean	0.03
std	0.59
min	-5.30
25%	-0.17
50%	0.03
75%	0.24
max	7.03



Urban:

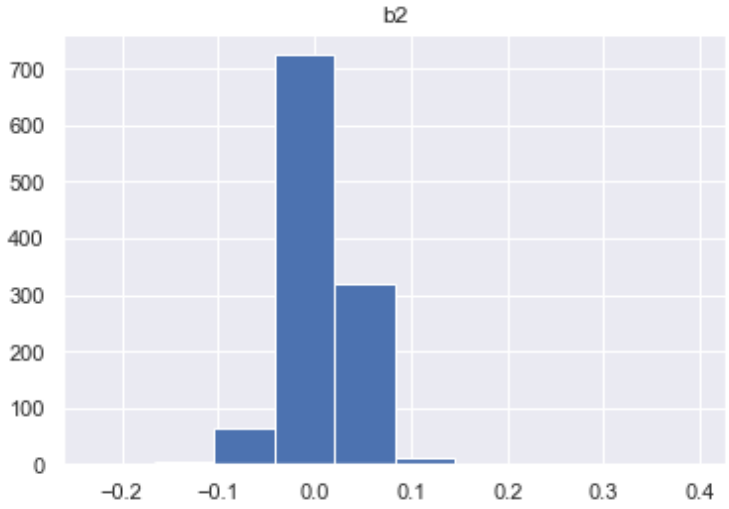
	β_i
count	363
mean	0.00
std	0.70
min	-5.42
25%	-0.14
50%	0.04
75%	0.23
max	4.46



Aggregate Consumption Coefficients

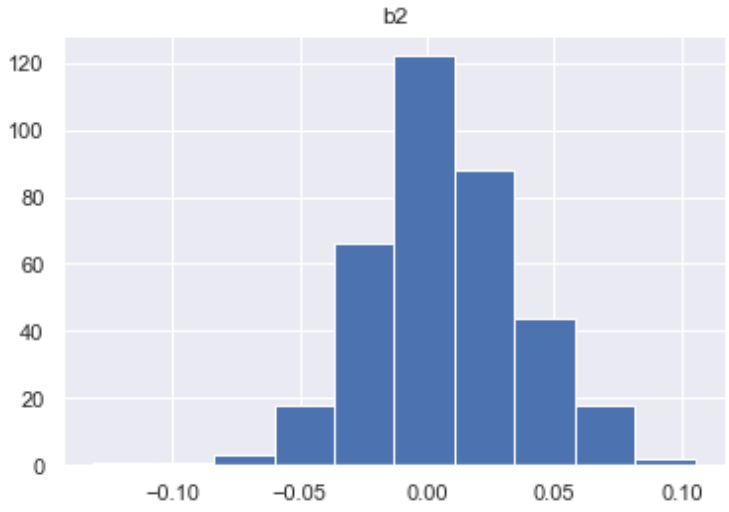
Rural:

	β_i
count	1,127.00
mean	0.01
std	0.04
min	-0.23
25%	-0.01
50%	0.01
75%	0.02
max	0.40



Urban:

	β_i
count	363
mean	0.01
std	0.03
min	-0.13
25%	-0.01
50%	0.00
75%	0.02
max	0.11



B) Conclusion

There is a concentration of household in rural areas, as expected. In both urban and rural locations, agents are not fully insured. However, results suggest that urban individual are better insured.

5 Relationship between Insurance and Household Income

Rural: There are 1227 households in the rural area. Below are their characteristics.

	$\bar{y}_i$	$\bar{c}_i$	β_i	ϕ_i
mean	7.67	7.13	0.03	0.01
std	0.50	0.55	0.59	0.04
min	5.74	5.25	-5.30	-0.23
25%	7.36	6.76	-0.17	-0.01
50%	7.67	7.12	0.03	0.01
75%	8.00	7.47	0.24	0.02
max	9.41	9.23	7.03	0.40

Urban: There are 363 households in the rural area. Below are their characteristics.

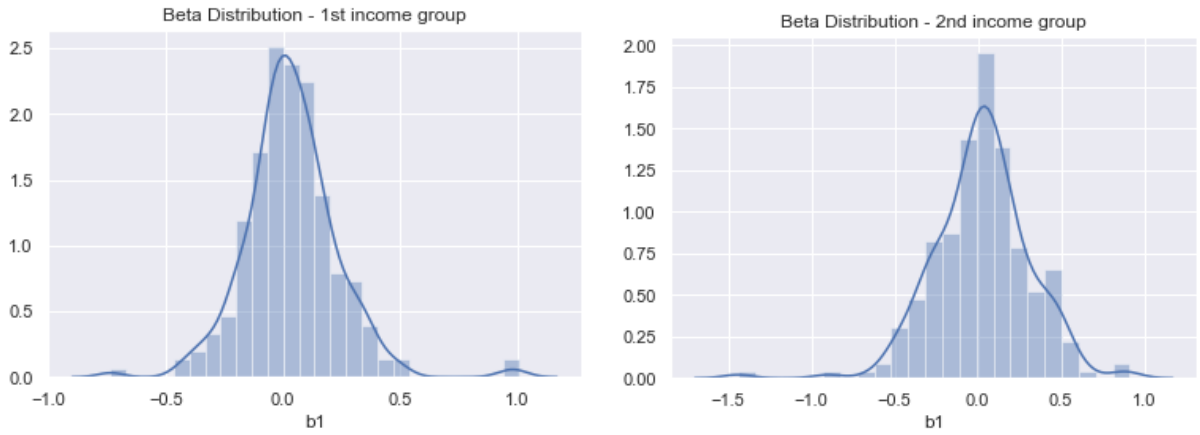
	$\bar{y}_i$	$\bar{c}_i$	β_i	ϕ_i
mean	7.70	7.66	0.00	0.01
std	0.62	0.67	0.70	0.03
min	5.11	6.05	-5.42	-0.13
25%	7.33	7.22	-0.14	-0.01
50%	7.67	7.63	0.04	0.00
75%	8.09	8.11	0.23	0.02
max	9.57	9.63	4.46	0.11

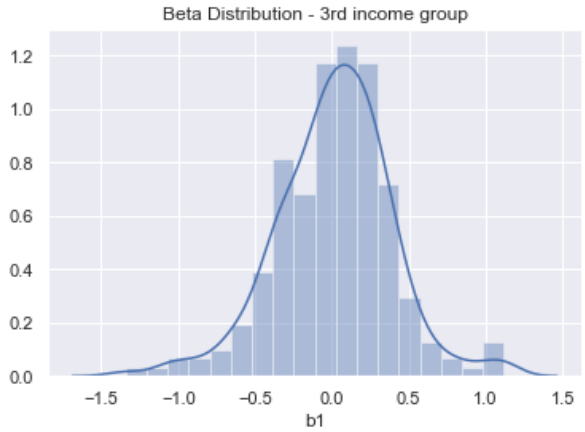
A) Income Ranking

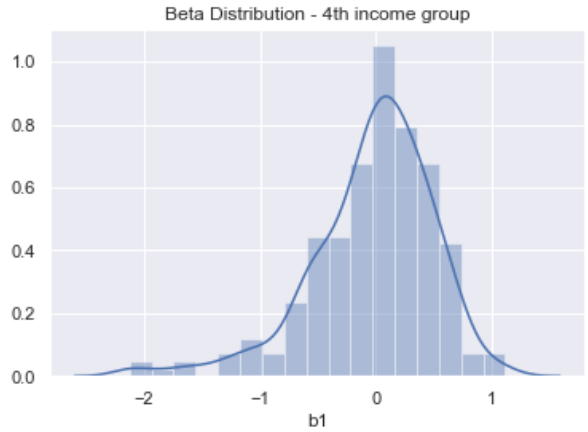
Rural:

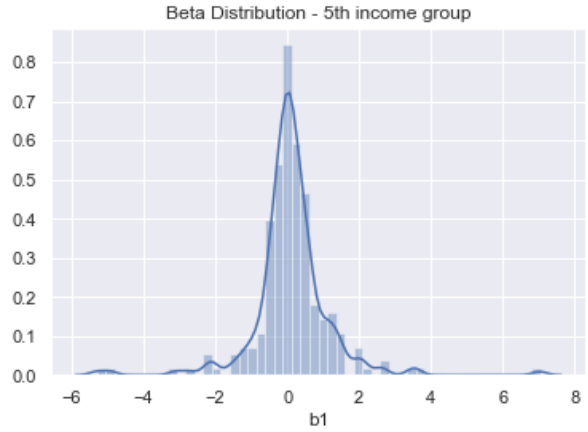
Income percentiles: 20%= 7.270, 40%= 7.553, 60%= 7.793, 80% =8.066.

%	β_i mean	β_i median
≤ 20	0.04	0.03
$(20, 40]$	0.02	0.03
$(40, 60]$	0.01	0.03
$(60, 80]$	-0.03	0.03
$(80, 100]$	0.11	0.06





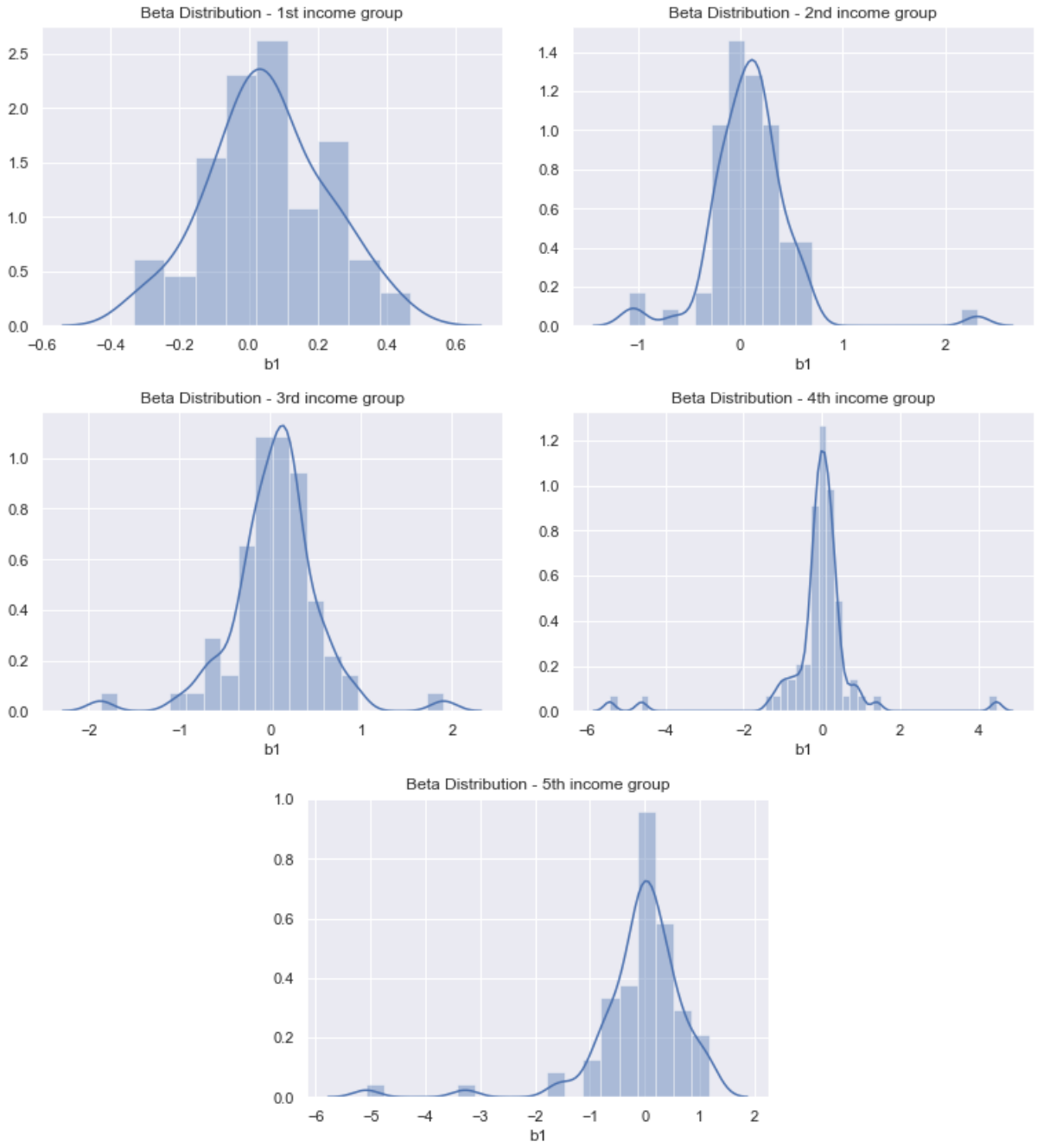




Urban:

Income percentiles: 20%= 7.221, 40%= 7.533, 60%= 7.807, 80% =8.178.

%	β_i mean	β_i median
≤ 20	0.05	0.04
$(20, 40]$	0.10	0.11
$(40, 60]$	0.06	0.09
$(60, 80]$	-0.09	0.00
$(80, 100]$	-0.10	0.00

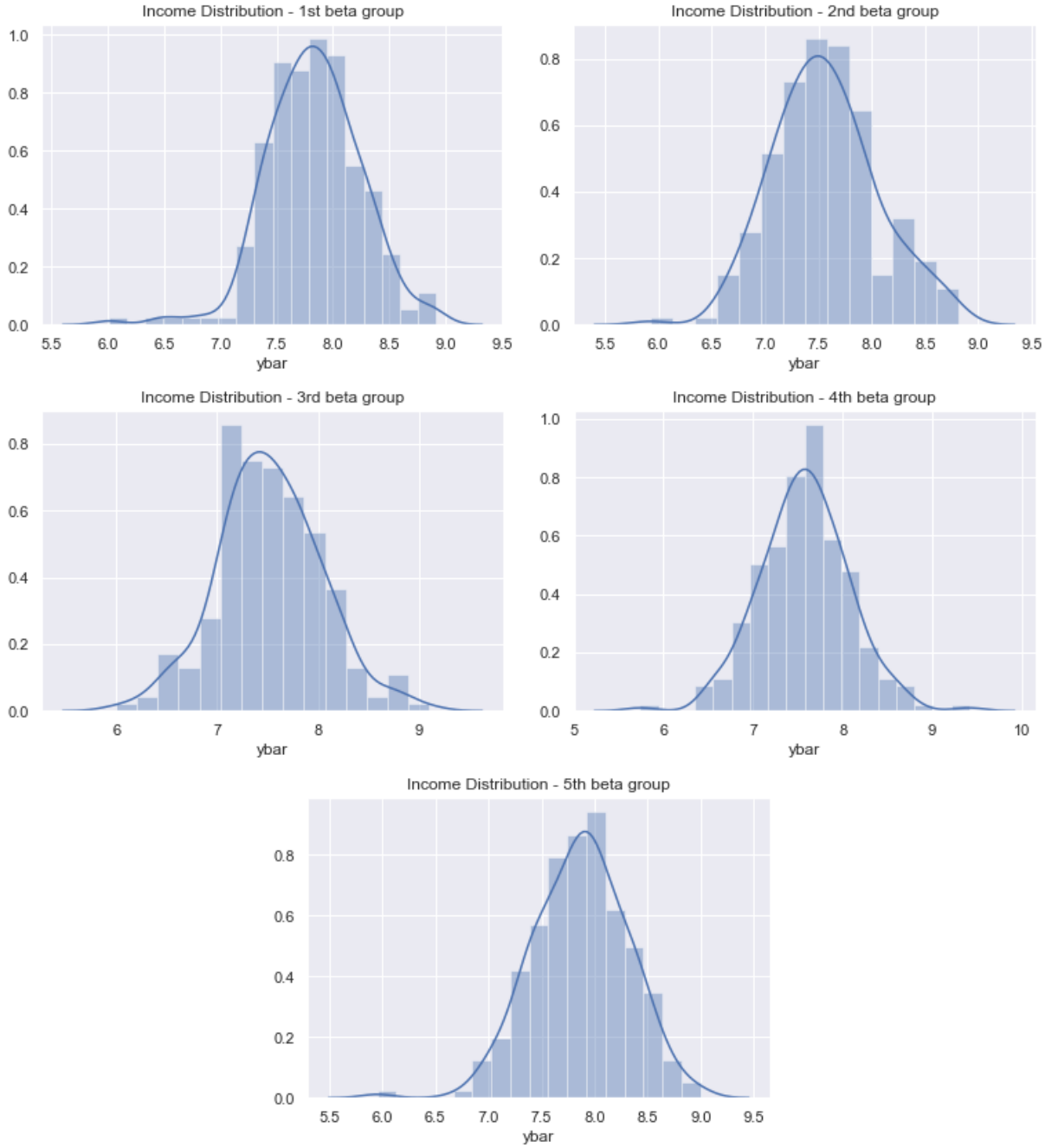


B) Beta Ranking

Rural:

β-percentiles: 20%= -0.244, 40%= -0.026, 60%= 0.102, 80%= 0.304.

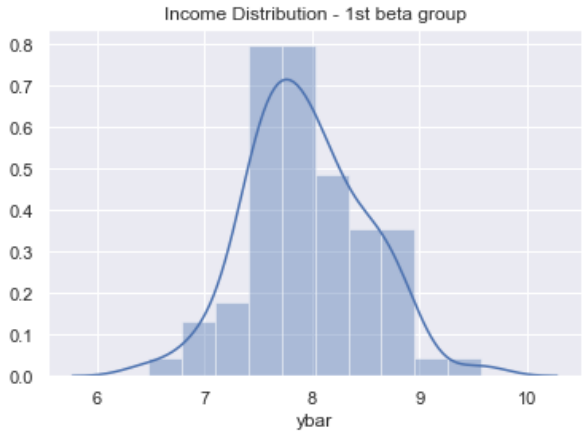
%	$_i$ mean	$_i$ median
≤ 20	7.83	7.82
$(20, 40]$	7.56	7.53
$(40, 60]$	7.52	7.51
$(60, 80]$	7.57	7.59
$(80, 100]$	7.87	7.88

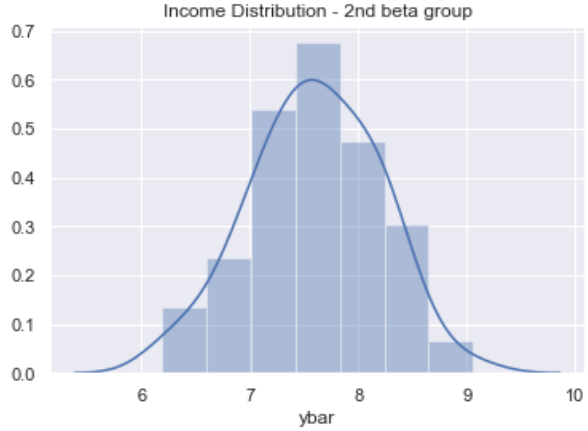


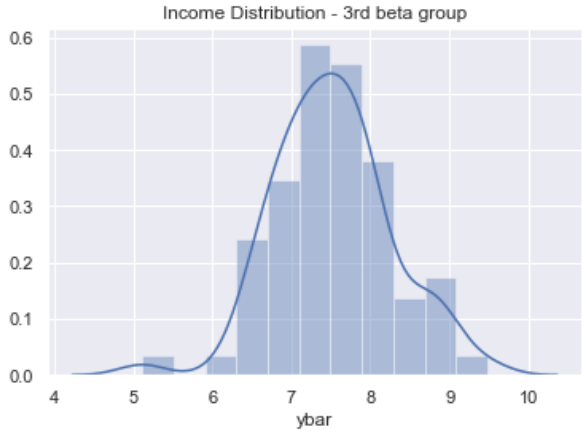
Urban:

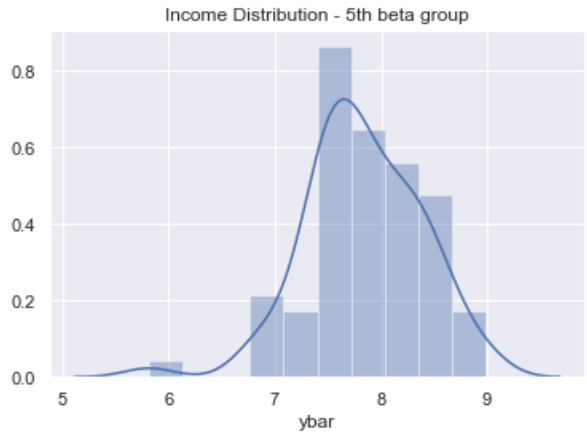
β-percentiles: 20%= -0.207, 40%= -0.0121, 60%= 0.124, 80%= 0.280.

%	$_i$ mean	$_i$ median
≤ 20	7.95	7.89
$(20, 40]$	7.59	7.56
$(40, 60]$	7.52	7.50
$(60, 80]$	7.59	7.54
$(80, 100]$	7.83	7.79









It seems that there is no relation of higher β_i and higher individual income for neither urban nor rural areas. In all β percentiles, the income distribution is dispersed and resembles a normal.

6 Full Insurance Test - Same Coefficients

Rural:

	Δc
Δy	0.0406^{***}
	(0.0062)
$\bar{C}_t$	0.0055^{***}
	(0.0014)

Urban:

	Δc
Δy	0.0578^{***}
	(0.0101)
$\bar{C}_t$	0.0082^{***}
	(0.0026)

Neither urban or rural areas achieve full insurance, as excepted. However, the rural income coefficient is lower what could suggest household are better insured in that area.

These results corroborate the findings of the previous section.