An Econometric Analysis of Cohort Data from Household Savings in Japan[1]

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(preliminary)

Abstract

It is important to distinguish interegenerational and intragenerational equity when we are concerned with public policies such as social security, environmental protection and saving promotion. Nevertheless, aspects of intergenerational and intragenerational distribution of income, consumption and saving are not investigated well in Japan. This paper sheds light on the household saving behavior by different cohorts with various household characteristics in Japan. In fact, new analytical techiniques of cohort analysis is introduced and proved to be useful. Pooling the National Survey of Family Income and Expenditure in 1984, 1989 and 1994, the cohort analysis finds substantial behavioral differences among cohorts, in particular, the baby-boomer generation in Japan after 1989. As this generation is the largest demographic group, this finding provides valuable information to policy makers, especially in terms of intergenerational equity.

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1 Introduction

Many papers have been written on the topic of Japanese household savings. Indeed, this topic is one of the most active research areas in empirical economic works. Contributions from the authors in Japan are not negligible, including Hayashi (1997), Hayashi, Ando and Ferris (1988), Hayashi, Ito and Slemrod (1988), Horioka (1990, 1993), Horioka and Watanabe (1997), Kitamura, Takayama, Arita (2001a,b), Ohtake (1991), Ohtake and Horioka (forthcoming), Takayama, Funaoka, Ohtake, Sekiguchi and Shibuya (1989), Takayama and Kitamura (1994) among many others. They are mainly concerned with various motivations for savings, namely housing, bequest, precaution, liquidity constraints, among others. On the other hand, relatively little contributions are made in the area of generational or cohort analysis. Takayama, Kitamura, and Yoshida (1999) and Takayama and Kitamura (1999) provide the first complete and internationally comparable calculation of generational accounting in Japan. Ban and Takagi (2000) and Kitamura Takayama and Arita (2001a) conduct cohort analysis using repeated cross-section data, the National Survey of family Income and Expenditure (hereafter NSFIE).

Recently, new analytical technique of cohort analysis is developed and extended by many authors including Alessie, Devereux, Webber (1997), Attanasio (1998), Attanasio, Banks, Meghir and Weber (1999), Deaton and Paxson (1994b), Denton, Mountain and Spencer (1999), Gokhale, Kotlikoff and Sebelhaus (1996), Gosling, Machin and Meghir.(2000), among others. Their main contributions are (1) to show a method of constructing cohort data and to identify age, cohort and time effects separately, (2) to identify the heterogeneity among households and (3) to demonstrate more robust and efficient estimation method, namely quantile regression.

This paper adopts the above mentioned new approach and explores the Japanese household saving behavior from the new perspective. In this paper I do not test explicitly any specific economic model, however, the extended life-cycle hypothesis provides the conceptual framework for the Japanese saving behavior. For most of the interesting questions about saving and the life-cycle, it is necessary to track individuals over time and to observe the changes in consumption, income, and savings as people age. Of course, the best possible data set for such analysis is the panel data in which each individual household can be tracked over time. But such data are rarely available in Japan, especially for an economy-wide official survey. As a second-best solution, we can construct cohort data from an independent survey such as the NSFIE. In this paper, cohorts are grouped into five-year intervals of birth. Since the NSFIE itself is surveyed every five years, this grouping is done for the sake of convenience. In other words, the 25-29 age bracket in 1984 for example, is linked with the 30-34 age bracket in 1989 and the 35-39 age bracket in 1994 to form the cohort of

1955-1959 birth year. Longitudinal profiles created this way are called synthetic cohorts or pseudo panel.

Within the framework of a life cycle model, or whenever age is an important factor, it is natural to divide the sample according to the year of birth of the individual (or the household head) and follow the resulting cohorts as they age. The use of average cohort techniques, proposed by Browning, Deaton and Irish (1985), overcomes the difficulty of studying the life-cycle dynamics of variables such as consumption and income caused by the nonavailability of observations on the same individuals at different times.

For the purpose of identifying life-cycle profiles, the snapshot offered by a single cross-section can be quite misleading. If there are strong cohort effects, a cross-section age profile may be very different from the age profile of any individual. This leads to another question how to specify the measure of location which is used to construct synthetic cohorts. With empirical evidences against the use of arithmetic mean, we use the median and other quantile as the measure of location.

From empirical points of view, we can identify several interesting aspects. Fig.1 illustrates time series of household saving rates in 1965-1998. It is apparent that the saving rate in Family Income and Expenditure Survey has been increasing recent years while that in National Accounts has been declining at the same period. The gap between the two series now exceeds 10%. We need to fill these gaps by means of detailed statistical adjustment. In fact, Takayama, Funaoka, Ohtake, Sekiguchi and Shibuya (1989), Takayam and Kitamura (1994), and Kitamura, Takayama and Arita (2001b) spend mostly on this adjustment. Ultimate questions in this figure are to identify whether the Japanese household saving has been decreasing or increasing and to find what factors contribute mostly to the dynamics of household saving rate.

Fig.2 shows the distribution of disposable income, consumption and saving rate for the pooled NSFIEs 1984-1994. In case of disposable income and consumption both of which take positive values, it is easy to transform these values into logarithmic values to obtain normal distributions. After that, classical regression models can be applied to these variables. In case of saving rate which contains negative values, logarithmic transformation can not be used. Alternative estimation method is used to obtain robust and efficient parameters. In other words, it is necessary to introduce new statistical approach to analyze the data with asymmetric distribution.

Fig.3 illustrates the age profile of mean saving rates over four cross section surveys, NSFIEs 1979-1994, taken from Kitamura, Takayama and Arita (2001b). This figure shows that the age profile of saving rates increases over life cycle and that mean saving rate at age 80 is as high as 30%. Fig.4 alternatively shows the age profile of median saving rate over the same NSFIEs. Two figures display, more or less, the same pattern until age 65, then diverge, namely upward direction in case of mean saving rate and downward direction in case of median saving rate. Which reflects the truth? It is often argued that sample selection bias among the elderly may exist in NSFIEs. If the sample households do not represent the total population in the elderly, then the mean saving rate may not

reflect the true mean saving rate of the total population. In case of median saving rate, presence of the sample selection bias may not affect the true median saving rate as much. If income and wealth distributions are skewed and/or the sample selection bias is present, the median may be the better choice to reflect the truth of the household saving behavior.

Organization of the paper is as follows. Section 2 argues econometric issues of cohort-specific saving behavior. In particular, methods of decomposition of age, cohort and year dummies and quantile regression are extensively discussed. Section 3 explains the nature of the data set used in this paper. Section 4 reports the main results of this paper. Brief conclusion is given in section 5.

2 Econometrics of Cohort-Specific Saving Behavior

Having estimated the average saving rate of a given cohort at a given point in time, one can think of several factors that are likely to affect it. Age (life cycle) effects, time (business cycle) effects, cohort (year of birth) effects are all likely to be important. In general, we define the following saving pattern.

$$S_{it} = f(age_{it}, cohort_i, year) + g(X_{it}) + \varepsilon_{it} \tag{1}$$

where S_{it}=savings and X_{it}= a vector of dependent variables, including disposable income, financial assets, social security contributions, social security benefits, debt, and other household characteristics. Although age, cohort and year are interdependent, we cannot decide which variables must be omitted *a priori*. Following MaCurdy and Mroz (1991), Deaton and Paxson (1994a,b),Gosling, Machin and Meghir (2000), we define both $f(.)$ and $g(.)$ to have the additively separable structure,

$$f(.) = A(age_{it}) + C(cohort_i) + y(year) \tag{2}$$

where $C(.)$ and $y(.)$ are given as dummies. $A(.)$ can be either dummies or a polynomial in age.

$$g(.) = \sum g_i X_{it} + \sum h_i Z_{it} \tag{3}$$

where X_{it}=economic variables and Z_{it}=household characteristics.

Inserting (2)(3) into (1), the concrete functional form of saving model is obtained[3].

[3]In fact, this specification is similar to Deaton and Paxson (1994b). Attanasio (1998), following Deaton and Paxson, treats year (time) dummy to sum to zero, being orthogonal to a time trend. As we are interested in the year effect before and after the bubble economy, we do not follow the Deaton and Paxson method and use unrestricted model instead.

$$S_{it} = l(Age)_{it} + \beta(Cohortdummy)_i + \gamma(Yeardummy)_t + \sum g_i X_{it} + \sum h_i Z_{it} + \varepsilon_{it} \quad (4)$$

In order to reduce the heteroskedasticity problem, both side of eq.(4) are divided by disposable income, except dummies and household characteristics.

$$(S/DisposableIncome)_{it} = l(Age)_{it} + \beta(Cohortdummy)_i + \gamma(Yeardummy)_t + \sum g_i (X/DisposableIncome)_{it} + \sum h_i Z_{it} + \varepsilon_{it} \quad (5)$$

This is our basic empirical model of saving behavior.

We estimate eq.(5) by quantile regression because of high heterogeneity among the sample and of truncated nature of saving rate from the above (i.e. $(S/DisposableIncome)_{it} < 1$)[4]. According to Buchinsky (1998), useful features of the quantile regression can be summarized as follows: (1) the model can be used to characterize the entire conditional distribution of a dependent variable given a set of regressors; (2) the quantile regression model has a linear programming representation which makes estimation easy; (3) the quantile regression objective function is a weighted sum of absolute deviations, which gives a robust measure of location, so that the estimated coefficient vector is not sensitive to outlier observations on the dependent variable; (4) when the error term is non-normal, quantile regression estimators be more efficient than least squares estimators; (5) potentially different solutions at distinct quantiles may be interpreted as differences in the response of the dependent variable to changes in the regressors at various points in the conditional distribution of the dependent variable; (6) L-estimators, based on a linear combination of quantile estimators are, in general, more efficient than least squares estimators.

Quantile regression is a location model and can be described as the least-absolute deviations (LAD) estimator. According to Horowitz (1998), a linear quantile regression model has the form,

$$\mathbf{Y} = \mathbf{X}'\boldsymbol{\beta}_\theta + u_\theta \qquad \text{Quant}_\theta(\mathbf{Y}|\mathbf{X}) = \mathbf{X}'\boldsymbol{\beta}_\theta \quad (6)$$

where $\text{Quant}_\theta(\mathbf{Y}|\mathbf{X})$ denotes the conditional quantile of $\mathbf{Y}$, $\mathbf{X}$ is an observed vector, β is a vector of constant parameters, and u_θ is an unobserved random variable that satisfies $\text{Quant}_\theta(u_\theta|\mathbf{X}) = 0$ almost surely. The parameters β are estimated by the method of least absolute deviations (LAD)[5]. That is to minimize $\sum_i |u_i|\, h_i$ where the multiplier $h_i = \begin{cases} 2\theta & if \quad u_i > 0 \\ 2(1-\theta) & otherwise \end{cases}$ and θ as the quantile to be estimated, the median is $\theta = 0.50$. Quantiles other than the

[4] Robust regression is an attempt to correct the outlier sensitivity deficiency in ordinary regression.

[5] Bassett and Koenker (1978, 1982) give conditions under which the LAD estimator is $n^{1/2} - consistent$ and asymptotically normal and show the robustness properties of the LAD estimator. Buchinsky (1995) and Horowitz (1998) provide numerical evidence on the accuracy of first-order asymptotic approximations.

median are estimated by weighting the residuals. We first sort the residuals and locate the observation in the residuals corresponding to the quantile in question. We then calculate w_n, the square root of the sum of the weights. We locate the closest observation in each direction such that the sum of weights for all closer observations is w_n. If we run off the end of the dataset, we stop[6]. We calculate w_s, the sum of weights for all observations in this middle space. Typically, w_s is slightly greater than w_n.

How can the quantile's coefficients be interpreted? Consider the partial derivative of the conditional quantile of y with respect to one of the regressors, say j, namely, $\partial \text{Quant}_\theta(y_i|x_i)/\partial x_{ij}$. This derivative is to be interpreted as the marginal change in the θth conditional quantile due to marginal change in the jth element of x. If x contains K distinct variables, then this derivative is given simply by β_{θ_j}, the coefficient on the jth variable.

The variances are estimated using a method suggested by Koenker and Bassett (1982). This method can be put into a form where

$$cov(\boldsymbol{\beta}) = \mathbf{R}_2^{-1}\mathbf{R}_1\mathbf{R}_2^{-1}$$

and $\mathbf{R} = \mathbf{XWWX}$ and $\mathbf{W}$ is a diagonal matrix with elements

$$\mathbf{W}_{ii} = \begin{cases} \theta/f_{residuals}(0) & if \quad r > 0 \\ (1-\theta)/f_{residuals}(0) & if \quad r < 0 \\ 0 & otherwise \end{cases}$$

and $\mathbf{R}_2$ is the design matrix $\mathbf{XX}$.

While this method seems adequate for homoskedastic errors, it appears to understate the standard errors for heteroskedastic errors. The irony is that exploring heteroskedastic errors is one of the major benefits of quantile regression. Gould (1992, 1997) introduced generalized versions of quantile regression that obtain estimates of the standard errors using bootstrap resampling. That is, under the independence assumption it is possible to perform the bootstrap estimation procedure by resampling from the marginal empirical distributions F_{nx} and $F_{n\widehat{u}_\theta}$. Let $u^*_\theta = (u^*_{\theta_1}, .., u^*_{\theta_n})'$ be a randomly drawn sample of size n from the empirical distribution $F_{n\widehat{u}_\theta}$ and let $\mathbf{X}^* = (x^*_1, ..., x^*_n)'$ be a randomly drawn sample from the empirical distribution F_{nx}. Define $Y^* = X^*\widehat{\beta}_\theta + u^*_\theta$. This standard data is then used to solve the quantile regression problem, the solution of which is a bootstrap estimator, say $\widehat{\beta}^*_\theta$. This is repeated B times,

[6] This is set up a linear programming problem and solved via linear programming techniques. The definition of convergence is exact in the sense that no amount of added interactions could improve the solution. Each step is described by a set of observations through which the regression plane passes, called the basis. A step is taken by replacing a point in the basis if the sum of weighted absolute deviations can be improved. The linear programming method is started by doing a weighted least squares (WLS) regression to identify a good set of observations to use as a starting basis.

to yield B bootstrap estimators $\widehat{\beta}^*_{\theta j}(j = 1, ...B)$. The asymptotic covariance matrix of $\widehat{\beta}_\theta$ is then obtained.

The residuals obtained after quantile regression have the property that if there are k parameters, then exactly k of the residuals must be zero. Thus, we calculate an adjusted weight $w_a = w_s - k$. The density estimate is the distance spanned by these observations divided by w_a. Because the distance spanned by this mechanism converges toward zero, this estimate of density converges in probability to the true density. The pseudo R^2 is calculated as

$$1 - \frac{sum \quad of \quad weighted \quad deviations \quad \text{about} \quad estimated \quad quantile}{sum \quad of \quad weighted \quad deviations \quad \text{about} \quad raw \quad quantile}$$

This is based on the likelihood for a double exponential distribution $e^{h_i|u_i|}$.

So far we have discussed the estimation of a single quantile regression for a specific value of θ. In practice one would like to estimate several quantile regressions at distinct points of the conditional distribution of the dependent variable. Because these quantile regressions are estimated using the same data with different weighting schemes, they ought to be correlated. We can estimate the equations for different quantiles simultaneously and obtain an estimate of the entire variance-covariance matrix of the estimators by bootstrapping. Thus, one can perform hypothesis tests concerning coefficients both within and across equations. Namely, the test for parameter constancy (i.e. test for equality of the coefficients or test for homoskedasticity) via F-statistics.

3 The Data

Since 1959, the NSFIE has been conducted every five years to reveal levels of income, consumption and household assets, their structure and distribution, as well as the differences among regions. All these analyses are done through the investigation of two key areas: family income and expenditure, and assets and liabilities in Japanese households. This survey is designed to sample over 50,000 households (54,000 in 1984, 59,100 in 1989, and 56,000 in 1994). Survey items include (1) family income and expenditure, (2) annual income, financial assets and liabilities, (3) major durable goods, and (4) attributes of households and their members, including housing conditions.

With a large sample size and wide coverage in items, the NSFIE is a treasure trove of information. It enables researchers to make detailed analyses according to various household characteristics .

The data we use here are taken from the 1984, 1989, and 1994 NSFIEs for two-or-more person households[7]. The data cleaning processes are as follows. (1) If head age is recorded as zero, then delete. (2) If disposable income is zero or negative, then delete. (3) If both saving and disposable income are negative, then delete (because saving rate cannot be defined properly). (4) If saving rate is less than –10000(%), then delete. (5) If values of disposable income, consumption, saving and saving rate are beyond 4 times of standard deviation of respective variables from its means, then delete (elimination of outliers).

Table 1 shows number of households by cohort over the different surveys. Except for a very old cohort (i.e. Cohort 1) and very young cohorts (i.e. Cohorts 8 and 9), population in each survey remains, more or less, constant which reflects the demographic distribution of total population in Japan.

Table 2 reports the average number of household and working members by cohorts. It is necessary to check whether the basic household characteristics remain stable.

Average number of household members decreases over time for the older cohorts (i.e. cohorts1-6) and increases over time for the younger cohorts (i.e. cohorts 7-9). Apart from differences in the sample base, it seems quite natural that members of older cohorts decrease as their children become independent and spouses pass away, and that members of younger cohorts increase as the couple has children and their parents merge in. But, in general, Table 2 implies that the average Japanese household is nuclear family, not extended family (e.g. three generations cohabitation). The lower panel of Table 2 shows the average number of working members. Up to cohorts 1 to 3, the average working members decrease due to the fact that their children become independent and spouses pass away. But as to cohort 4 to cohort 6, average working members increase while average household members decrease in the upper panel. It may be the case that more house wives keep working at the their age of 30s and 40s in recent years.

Table 3 shows summary statistics by cohort. Both mean of disposable income and savings are higher than median of these for almost all cohorts. On the other hand, median saving rate becomes higher than mean saving rate in many cohorts. Fig.5 illustrates the mean saving rates by cohort over time in two series; mean of individual saving rates and mean saving/mean disposable income. As is clear from Fig.5, the former drops much more sharply after age 60 than the latter. Median saving rates by cohort in Fig.6 do not differ much between the median of individual saving rates and median saving/median disposable income. What we learn from these figures is that the mean saving rate is sensitive to the different definitions, while the median saving rate is insensitive. This fact implicitly implies that the median is a more robust measure of location such that the estimated coefficient vector is not sensitive to outlier observations on the dependent variable.

With a closer look at Fig.5 and Fig.6, cohort 6 behaves somehow differently.

[7] There is another set of survey for single-person households. The sample size is about 4900.

This is the main focal point in our empirical investigation below.

4 Results

The first result is given in Table 4[8]. All data in 1984, 1989 and 1994 are pooled and estimated in the cases of total, positive and negative savings. There are some asymmetries in coefficients between positive and negative savings. Both year and age dummies have apparently opposite signs. Cohort dummies in the total sample estimate show negative signs except cohorts 6 and 8[9]. With this result, cohort 6, the baby boomer generation, turns out to behave differently. Number of working members and home ownership dummies are highly significant in both cases with opposite signs. In case of negative savings, cohort dummies are insignificant and age dummies, especially those in age 50-54, age 55-59, and age 60-64 are significantly negative compared with other age groups.

In case of total sample estimate, t-values of coefficients in the estimated models are significant in most cases, there seems to exist heterogeneity among the sample population. In particular, cohort 6 behaves as outlier. If we consider the positive and negative saving sample estimates, some parameters in the models are neither stable nor significant. We then decompose the sample into smaller groups.

Table 5 conducts quantile regression for each cohort. In this model, we insert age and age squared as additional explanatory variables. It is clear that coefficient values and its significance levels vary from cohort to cohort, although the general trend might be similar among cohorts. The number of working members is significantly positive for all cohorts, except, here again, cohort 6. Age and age squared variables are significant for most cohorts but with different signs. Cohorts 1,2,5 and 9 drop their saving rates in 1989 and 1994 via-à-vis 1984, while cohorts 4,7, and 8 increase their saving rates in the same period. We can identify some important stylized facts from this table; (1) significantly positive (because of inverse of disposable income) income effect except cohorts 4(insignificant) and 6, (2) significantly negative wealth effect (wealth adjustment mechanism) except cohorts 4, 5, and 7, and (3) home ownership dummy is positively significant, except cohorts 1(insignificant),4 and 7. In addition, as is evident from Fig.5 and Fig.6, cohort 4, to large extent, (birth year 1935-39) and cohorts 5 and 7, to lesser extent, experience increases in saving rates during this

[8] As is clear from its construction, once the birth year (cohort) and calendar year (time) are known, the age can be identifiable. We have to drop some of age, cohort and year dummies to avoid collinearity problems. In this exercise, we drop dumcoh9 (cohort dummy for the birth year 1960-64), dum1984 (year dummy for 1984), dum2024 (age dummy for the age between 20 and 24), and dum7500 (age dummy for the age above 75). As we discussed in footnote 3, we do not set year dummy to sum to zero, being orthogonal to a time trend.

[9] Note that cohort 9 (1960-64) is dropped due to collinearity. In other words, cohort 9 is a reference group.

period. This is partly because these cohorts reach the prime earning period, i.e. age 40-60. Surprising outlier is cohort 6. The saving rate of this cohort did not increase as their neighboring cohorts did.

Table 6 estimates saving rates by income decile. Fig.7 illustrates heterogeneity of saving behavior among different income deciles. Table 6 shows contradicting evidences to the stylized facts from Table 5. That is, significant positive income effect disappears (becomes insignificant and negative) in income decile 3 and above. On the other hand, significantly negative wealth effect holds for the most deciles except decile 10. Debt effect is positive on the saving rate for the most deciles except decile 1. In this table, cohort, age and year dummies become insignificant for the most deciles except deciles 9 and 10.

Natural extension is to divide households into (cohort $\times$ income decile)-cells. Table 7 shows the number and share of households by (cohort $\times$ income decile)-cells. The highest share cell in the same cohort are highlighted by shadow. Cohorts 1 and 2, the oldest cohorts after retirement tend to fall into the lower income decile, in particular, decile 1. Cohorts 3-5, the senior workers, earn the highest income in their life-cycle as well as among different cohorts. Cohort 6, the boomer generation, remains in their middle age and the middle income deciles. Cohorts 7-9, the younger cohorts, earn low income.

Fig.8-16 show the distribution of saving rate by income decile within the same cohort. In general, distribution of saving rate becomes wider as income increases. But the magnitude of dispersion differs from cohort to cohort. Cohorts 1 and 9 seem to be most dispersed and cohort 6 seems to be well behaved as a whole[10]. This is partly because cohort 6 remains in the middle age and middle income deciles and partly because of the nature of their own, i.e. the largest demographic cohort. Contrary to the general belief, cohort 6 does not seem a source of heterogeneity, but that of homogeneity.

In order to contrast a special nature of cohort 6, Fig.16 illustrates saving behavior of the youngest cohort 9. The pattern of distribution on saving rates is closer to cohort 1 (Fig.8) than to cohort 6 (Fig.13) whose age is much closer to cohort 9.

Table 8 presents the results of quantile regression with different quantiles, i.e. 0.10, 0.25, 0.50., 0.75, and 0.90 using the same set of independent variables in each regression. Unlike Table 6, cohort, age and year dummies become significant for the most quantiles across different cohorts with exception of cohorts 3 and 9. After obtaining estimates for the coefficient vectors from the five regressions for each cohort, we can compare whether they are statistically different from each other. If the model is truly a location model, all the slope coefficients would be the same. Apparently from Table 8, the null hypothesis of equality among the slope coefficients seems to be rejected (note, however, that we conduct parameter constancy test in Table 10 below).

Table 9 tries to capture the evolution of saving rate across the different quantiles for the various age groups. Formally this effect can be identified as the

[10] As Table 1 shows, the number of households in cohorts 1 and 9 are relatively small, while that in cohort 6 is the largest. So differences in distributional bahavior may simply reflect differences in the sample size.

derivative of the conditional quantile with respect to age, $\partial \text{Quant}_\theta(y|x)/\partial age = \alpha_\theta + 2\beta_\theta age$, as we assume a 2nd degree polynomial in age. Table 9 simply reports the coefficient values of age and age squared obtained from Table 8. Take the median quantile ($\theta = 0.50$), parameter values are insignificant for cohorts 1-3. For cohort 4-5, $\alpha_\theta < 0$ and $\beta_\theta > 0$, the saving rate tends to increase, for cohort 6-7, $\alpha_\theta > 0$ and $\beta_\theta < 0$, the saving rate tends to decrease, and for cohort 8-9, $\alpha_\theta < 0$ and $\beta_\theta > 0$, the saving rate tends to increase. In short, the parameter values are not stable. As an overall effect, it seems that the age effect within the same cohort is arguably small or at least indeterminate.

Table 10 conducts the parameter constancy tests after estimating three quantiles (0.25, 0.50, 0.75) simultaneously. In this case, we use bootstrapping standard errors to calculate standard errors and thus t-values. The results turn out to be phenomenal because all significant values of age, age squared and year dummies in Table 8 become insignificant after standard error adjustments. They indicate that it is important to adjust heteroskedastic errors by means of bootstrapping method[11]. The fourth column in each cohort reports OLS estimation. In general, parameter values and its significance levels are quite different from those in quantile regressions. As we have discussed in section 2, the quantile regression is more efficient and robust in the presence of heterogeneity and outliers. Parameter constancy test is rejected in most cases. Exceptions are as follows; the parameter constancy of 1/Disposable Income cannot be rejected for cohort 1, 2, and 9 and that of dummy 1994 cannot be rejected for cohort 7. Overall results from Table 10 demonstrate that the quantile regression is the method to be used in the presence of heteroskedasticity and the age and year effects disappear within the same cohort.

5 Conclusion

This paper demonstrates an econometric method how cohort data can be analyzed, using National Survey of Family Income and Expenditure in 1984, 1989 and 1994. It turns out that the quantile regression method is quite useful in case of household saving behavior, partly because the sample contains heterogeneous households and partly because the saving rate itself is truncated from the above (i.e. 1), while there is no lower limit. After controlling the household characteristics, the cohort is proved to be the useful unit of analysis, although the cohort itself is heterogenous enough. Further decomposition of the cohort is needed if we want to obtain a homogeneous unit.

Future works remain in many areas. First, although the quantile regression method has been used extensively in microeconometric analysis recent years, many statistical aspects are to be improved.

Second, the baby-boomer generation has behaved differently from the other cohorts so far. It is of great interest to examine whether this cohort will start

[11] Cohort 8 could not achieve convergenace after 1000 bootstrapping replications.

earning the highest income when they become the mid-50s of age. This analysis can be done by using the 1999 NSFIE which is now available. Indeed, we plan to add the 1999 NSFIE to our data set and examine the development of household saving behavior in the latter part of the 1990s.

Third, another extension can be made to examine the relationship among different cohorts, say, cohort 1 and cohort 6, cohort 2 and cohort 7, cohort 3 and cohort 8, and cohort 4 and cohort 9. This is because these couples can be regarded as parents-children generations. Although these may not be real parent-children couples in the sample, the higher correlation between the couple generations can be found. Intergenrational equity issues can be analyzed from this perspective.

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Table 1 Number of Households by Cohort

Birth Year		1984	1989	1994	Total
Cohort 1	(1920-24)	1,514	1,520	2,352	5,386
Cohort 2	(1925-29)	2,940	2,783	2,797	8,520
Cohort 3	(1930-34)	3,705	3,748	3,394	10,847
Cohort 4	(1935-39)	4,557	4,443	4,142	13,142
Cohort 5	(1940-44)	5,775	5,575	5,468	16,818
Cohort 6	(1945-49)	6,363	6,682	6,326	19,371
Cohort 7	(1950-54)	4,934	6,356	6,560	17,850
Cohort 8	(1955-59)	2,067	4,230	5,527	11,824
Cohort 9	(1960-64)	347	1,974	4,115	6,436
Total		32,202	37,311	40,681	110,194

Table 2 Average Number of Household Member and Working Member

Average Number of Household Members by Cohort

Birth Year		1984	1989	1994	Total
Cohort 1	(1920-24)	2.82	2.57	2.26	2.51
Cohort 2	(1925-29)	3.24	2.79	2.48	2.84
Cohort 3	(1930-34)	3.54	3.19	2.75	3.17
Cohort 4	(1935-39)	4.05	3.58	3.12	3.60
Cohort 5	(1940-44)	4.32	4.07	3.54	3.98
Cohort 6	(1945-49)	4.28	4.38	4.04	4.24
Cohort 7	(1950-54)	3.91	4.32	4.32	4.21
Cohort 8	(1955-59)	3.14	3.81	4.20	3.87
Cohort 9	(1960-64)	2.73	3.15	3.59	3.41
Total		3.86	3.79	3.58	3.73

Average Number of Working Members by Cohort

Birth Year		1984	1989	1994	Total
Cohort 1	(1920-24)	1.19	0.74	0.34	0.69
Cohort 2	(1925-29)	1.86	1.18	0.70	1.26
Cohort 3	(1930-34)	2.00	1.92	1.27	1.74
Cohort 4	(1935-39)	1.79	2.08	2.02	1.96
Cohort 5	(1940-44)	1.56	1.78	2.11	1.81
Cohort 6	(1945-49)	1.49	1.55	1.80	1.61
Cohort 7	(1950-54)	1.40	1.47	1.59	1.50
Cohort 8	(1955-59)	1.38	1.38	1.47	1.42
Cohort 9	(1960-64)	1.38	1.38	1.37	1.37
Total		1.60	1.58	1.54	1.57

Table 3 Summary Statistics by Cohort

Disposable Income

Birth Year		MEAN	SDV	MEDIAN
Cohort 1	(1920-24)	257,359.93	155,272.01	218,549.2
Cohort 2	(1925-29)	320,134.65	169,163.16	290,870.5
Cohort 3	(1930-34)	375,652.20	174,291.09	353,978.3
Cohort 4	(1935-39)	421,403.00	178,372.00	392,146.8
Cohort 5	(1940-44)	412,563.81	168,466.23	381,991.5
Cohort 6	(1945-49)	374,860.17	149,107.87	347,546.0
Cohort 7	(1950-54)	345,371.33	135,226.91	324,120.7
Cohort 8	(1955-59)	325,974.60	127,818.33	306,913.5
Cohort 9	(1960-64)	313,509.52	115,111.54	294,210.2

Savings

Birth Year		MEAN	SDV	MEDIAN
Cohort 1	(1920-24)	18,978.59	137,521.9	12,119.16
Cohort 2	(1925-29)	38,664.14	147,334.8	36,005.00
Cohort 3	(1930-34)	57,203.87	156,680.3	57,882.34
Cohort 4	(1935-39)	80,977.46	154,844.1	73,493.16
Cohort 5	(1940-44)	71,406.68	144,317.7	65,578.17
Cohort 6	(1945-49)	62,327.43	124,557.3	59,338.00
Cohort 7	(1950-54)	63,391.69	112,468.1	56,910.00
Cohort 8	(1955-59)	60,046.07	112,634.5	55,218.66
Cohort 9	(1960-64)	55,879.52	115,773.6	54,213.67

Saving Rate

Birth Year		MEAN	MEDIAN
Cohort 1	(1920-24)	7.3743	5.5453
Cohort 2	(1925-29)	12.0775	12.3784
Cohort 3	(1930-34)	15.2279	16.3519
Cohort 4	(1935-39)	19.2162	18.7412
Cohort 5	(1940-44)	17.3080	17.1674
Cohort 6	(1945-49)	16.6268	17.0734
Cohort 7	(1950-54)	18.3546	17.5583
Cohort 8	(1955-59)	18.4205	17.9916
Cohort 9	(1960-64)	17.8239	18.4268

Note: Mean saving rate is calculated by mean saving divided by mean disposable income. Median saving rate is calculated by median saving divided by median disposable income.

Table 4 Effects of Cohort, Age and Time on Saving Rate by Quantile Regression with Age dummies (Median)

Dependent variable: Saving Rate	Total		Saving>=0		Saving<0	
	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-2.406	-27.99	-2.450	-35.35	-0.635	-4.12
Number of Working Members	11.237	88.65	5.574	53.22	-0.973	-4.08
Home Ownership Dummy	-5.074	-22.45	3.077	16.54	-1.754	-4.54
1 / Disposable Income	43,117	1.43	51,438	0.84	-6,317,836	-215.45
Financial Assets / Disposable Income	-992.868	-51.35	-490.332	-18.25	-1,566.993	-78.54
Debt / Disposable Income	-644.993	-13.04	600.965	13.71	-860.495	-12.05
dumcoh1	-47.107	-31.46	7.425	5.65	2.444	1.06
dumcoh2	-41.033	-29.08	5.436	4.40	4.815	2.21
dumcoh3	-42.770	-34.42	7.440	6.86	3.098	1.60
dumcoh4	-41.924	-38.86	3.462	3.71	2.357	1.37
dumcoh5	-11.208	-12.31	1.450	1.85	0.814	0.55
dumcoh6	11.534	15.37	2.452	3.86	0.096	0.08
dumcoh7	-2.358	-3.95	-1.641	-3.31	0.616	0.59
dumcoh8	12.346	24.50	1.423	3.49	0.448	0.50
dum1989	1.868	6.43	3.981	16.25	-3.250	-6.73
dum1994	3.297	7.72	9.689	25.96	-6.224	-9.22
dum2529	-25.379	-16.70	4.087	3.27	-4.714	-1.88
dum3034	1.042	0.78	4.776	4.32	-5.660	-2.55
dum3539	-12.387	-9.93	9.804	9.43	-5.381	-2.61
dum4044	-4.761	-4.13	5.592	5.73	-7.722	-4.10
dum4549	-13.831	-12.78	3.018	3.21	-13.762	-8.00
dum5054	12.191	11.76	5.691	6.14	-18.306	-11.55
dum5559	38.395	37.93	3.731	3.99	-16.689	-11.27
dum6064	35.622	36.28	1.865	1.98	-15.777	-11.82
dum6569	59.680	57.18	7.760	7.63	-12.256	-8.95
dum7074	27.257	22.14	-0.306	-0.25	-4.531	-3.01
constant	20.629	12.82	13.271	9.73	25.801	9.78
Diagnostic Test						
Number of Observation	110,194		81,721		28,473	
Pseudo R2	0.1303		0.0682		0.1521	
Raw sum of deviations	2,914,772		1,097,926		946,237	
Min sum of deviations	2,534,961		1,023,038		802,272	

Note: dumcoh9, dum1984, dum2024 and dum7500 are dropped due to collinearity.

Table 5 Saving Rate of Individual Cohorts by Quantile Regression (Median)

Dependent Variable : Saving Rate	Cohort 1		Cohort 2		Cohort 3	
	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-5.222	-7.61	-5.416	-13.16	-4.384	-14.44
Number of Working Members	3.014	3.51	4.894	9.36	5.587	14.13
Home Ownership Dummy	-0.454	-0.28	0.948	0.75	2.989	3.30
1 / Disposable Income	-9,208,181	-103.52	-8,723,327	-150.59	-8,510,637	-70.57
Financial Assets / Disposable Income	-1,295.089	-25.39	-1,672.764	-36.61	-2,201.621	-40.35
Debt / Disposable Income	367.592	0.92	-924.250	-3.15	622.651	3.42
Age	2.080	0.77	9.556	2.26	0.539	0.18
Age * Age	-0.775	-0.43	-6.691	-1.96	0.029	0.01
dum1989	-3.710	-1.42	-6.884	-3.65	2.125	1.46
dum1994	-14.259	-3.51	-16.209	-5.47	-0.807	-0.35
constant	-29.115	-0.29	-265.075	-2.03	19.304	0.23
Diagnostic Test						
Number of Observation	5,386		8,520		10,847	
Pseudo R2	0.2416		0.2216		0.1697	
Raw sum of deviations	265,057		356,877		366,319	
Min sum of deviations	201,026		277,788		304,142	

Dependent Variable : Saving Rate	Cohort 4		Cohort 5		Cohort 6	
	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-11.169	-48.43	-5.485	-27.89	-4.937	-27.48
Number of Working Members	26.635	89.66	4.198	15.09	-0.510	-1.74
Home Ownership Dummy	-8.478	-13.22	0.417	0.79	16.317	35.18
1 / Disposable Income	60,533	0.62	-10,800,000	-86.40	832,790	6.87
Financial Assets / Disposable Income	1,484.129	26.26	645.670	10.10	-1,230.749	-16.01
Debt / Disposable Income	72.555	0.50	305.575	2.42	-2.841	-0.03
Age	-32.238	-15.29	-1.688	-1.03	13.533	9.52
Age * Age	28.764	14.18	2.239	1.29	-15.541	-9.20
dum1989	12.424	11.12	-14.133	-14.64	-5.179	-5.54
dum1994	22.841	12.92	-23.849	-15.75	1.355	0.93
constant	899.994	16.50	103.766	2.72	-260.449	-8.81
Diagnostic Test						
Number of Observation	13,142		16,818		19,371	
Pseudo R2	0.1014		0.0772		0.0798	
Raw sum of deviations	334,624		389,110		411,783	
Min sum of deviations	300,692		359,067		378,905	

Dependent Variable : Saving Rate	Cohort 7		Cohort 8		Cohort 9	
	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-2.509	-13.92	-2.847	-13.16	-3.021	-10.56
Number of Working Members	27.039	85.23	2.847	7.08	1.859	3.40
Home Ownership Dummy	-22.022	-49.02	8.426	15.29	9.183	12.43
1 / Disposable Income	-1,234,673	-11.03	-7,439,725	-48.83	-7,613,166	-37.66
Financial Assets / Disposable Income	3,897.619	42.62	-1,291.691	-12.60	-1,416.304	-9.74
Debt / Disposable Income	10,263.770	116.99	174.404	1.42	210.262	1.46
Age	2.951	2.28	-23.254	-15.31	-0.854	-0.38
Age * Age	-5.097	-2.97	30.267	13.51	0.284	0.08
dum1989	22.487	23.68	23.029	17.92	-4.157	-1.75
dum1994	30.052	20.88	30.149	16.88	-2.884	-0.97
constant	-66.318	-2.76	464.061	18.56	78.813	2.41
Diagnostic Test						
Number of Observation	17,850		11,824		6,436	
Pseudo R2	0.1018		0.1090		0.0927	
Raw sum of deviations	373,368		258,950		147,032	
Min sum of deviations	335,368		230,737		133,404	

Note: dum1984 is dropped due to collinearity.

Table 6 Saving Rate by Income Decile by Quantile Regression (Median)

Dependent Variable : Saving Rate	Decile 1		Decile 2		Decile 3		Decile 4		Decile 5	
	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-7.184	-14.18	-4.060	-15.98	-4.150	-14.59	-4.667	-17.80	-3.185	-13.75
Number of Working Members	4.216	5.66	3.103	7.44	2.699	5.80	7.021	16.34	4.243	11.30
Home Ownership Dummy	3.740	3.60	5.279	9.27	5.802	8.92	9.563	15.18	6.297	10.85
1 / Disposable Income	-8,681,219	-154.48	-4,775,002	-5.87	302,277	0.18	1,572,267	0.69	1,138,894	0.45
Financial Assets / Disposable Income	-2,576.980	-67.02	-1,227.332	-23.50	-1,149.417	-13.45	-861.834	-9.26	-973.445	-10.42
Debt / Disposable Income	-1,213.214	-7.83	653.477	4.35	1,633.715	10.08	1,737.353	10.97	666.712	5.02
dumcoh1	9.425	2.66	-3.363	-1.18	-1.260	-0.27	0.221	0.04	5.999	1.09
dumcoh2	0.812	0.22	-9.392	-3.32	-9.114	-2.03	-2.894	-0.59	-2.294	-0.45
dumcoh3	-4.466	-1.21	-13.935	-5.29	-8.850	-2.22	-3.018	-0.70	-3.880	-0.87
dumcoh4	-2.480	-0.66	-9.276	-3.79	-6.428	-1.84	1.329	0.36	0.781	0.21
dumcoh5	-5.659	-1.55	-11.900	-5.56	1.343	0.46	0.262	0.09	1.972	0.63
dumcoh6	-2.942	-0.87	-9.531	-5.42	0.503	0.22	-1.248	-0.52	1.624	0.66
dumcoh7	-4.323	-1.46	-5.361	-3.94	1.047	0.61	-0.867	-0.48	-0.038	-0.02
dumcoh8	-2.591	-0.99	-2.753	-2.52	-1.148	-0.87	0.410	0.30	0.297	0.22
dum1989	-2.603	-2.22	-2.741	-4.03	-0.777	-0.87	3.272	3.56	1.038	1.14
dum1994	-10.157	-7.03	-6.123	-6.45	0.261	0.19	3.948	2.69	1.622	1.07
dum2529	-2.137	-0.54	-2.699	-1.00	-4.086	-0.92	7.638	1.63	1.355	0.26
dum3034	5.227	1.32	1.936	0.77	-3.412	-0.85	6.498	1.55	-0.334	-0.07
dum3539	6.090	1.52	5.869	2.37	-5.727	-1.52	4.069	1.03	-0.758	-0.18
dum4044	4.804	1.22	6.859	2.79	-6.576	-1.83	4.117	1.10	-3.527	-0.89
dum4549	2.958	0.77	4.617	1.88	-5.315	-1.52	0.834	0.23	-8.540	-2.25
dum5054	6.467	1.79	7.705	3.20	-0.320	-0.09	-1.923	-0.52	-7.375	-1.99
dum5559	-1.282	-0.41	6.003	2.59	2.718	0.79	3.024	0.80	-0.910	-0.24
dum6064	-13.193	-5.12	-0.099	-0.05	-0.087	-0.03	4.794	1.24	-0.781	-0.21
dum6569	-10.784	-4.16	-1.974	-0.90	-5.593	-1.56	0.274	0.07	-4.790	-1.17
dum7074	-4.636	-1.70	-7.504	-2.99	-12.026	-2.87	1.757	0.35	-7.566	-1.53
constant	80.774	21.18	47.056	9.62	27.384	3.32	6.824	0.72	19.311	1.97
Diagnostic Test										
Number of Observation	11,020		11,018		11,021		11,018		11,020	
Pseudo R2	0.2388		0.0394		0.0410		0.0332		0.0352	
Raw sum of deviations	656,549		273,942		241,775		227,671		226,337	
Min sum of deviations	499,797		263,137		231,856		220,102		218,375	

Note: dumcoh9, dum1984, dum2024 and dum7500 are dropped due to collinearity.

Dependent Variable : Saving Rate	Decile 6		Decile 7		Decile 8		Decile 9		Decile 10	
	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-3.635	-16.71	-2.602	-13.59	-1.884	-7.85	-2.705	-11.88	-2.921	-12.86
Number of Working Members	4.440	12.76	4.488	14.75	5.191	13.89	5.488	15.79	6.069	19.01
Home Ownership Dummy	5.556	9.57	5.292	10.01	7.258	9.87	2.544	3.41	-9.841	-11.36
1 / Disposable Income	451,960	0.16	709,267	0.29	618,027	0.20	1,359,605	0.55	-2,147,665	-1.73
Financial Assets / Disposable Income	-990.256	-11.37	-1,056.725	-13.24	-583.742	-5.55	-240.951	-2.37	213.309	2.05
Debt / Disposable Income	971.398	6.63	1,021.702	9.50	449.347	2.57	628.744	3.59	566.907	3.50
dumcoh1	0.200	0.03	16.826	1.84	2.852	0.24	-32.414	-6.36	-13.024	-2.55
dumcoh2	-5.349	-0.83	13.747	1.69	2.156	0.21	-28.668	-5.94	-5.048	-1.04
dumcoh3	-6.345	-1.14	11.263	1.61	1.670	0.19	-23.621	-5.54	-2.192	-0.50
dumcoh4	-0.760	-0.16	9.892	1.68	8.675	1.15	-21.010	-5.62	2.689	0.69
dumcoh5	0.673	0.18	9.164	1.92	3.081	0.50	-17.747	-5.46	2.872	0.82
dumcoh6	-0.816	-0.27	6.713	1.83	2.293	0.48	-15.464	-5.46	11.217	3.53
dumcoh7	-0.410	-0.19	4.630	1.77	2.198	0.63	-11.028	-4.43	1.945	0.66
dumcoh8	-0.058	-0.04	0.589	0.35	0.241	0.10	-10.960	-4.82	6.653	2.41
dum1989	0.730	0.69	2.514	1.98	-1.499	-0.91	-3.211	-3.17	-2.867	-2.49
dum1994	0.298	0.16	5.085	2.16	1.503	0.50	-6.608	-4.43	-7.774	-4.90
dum2529	-5.299	-0.76	9.018	0.92	1.102	0.09	-25.544	-6.97	-37.161	-7.34
dum3034	-4.984	-0.81	6.051	0.70	-6.006	-0.54	-17.810	-9.07	-29.422	-13.13
dum3539	-4.489	-0.80	4.222	0.55	-8.630	-0.87	-9.613	-3.46	-34.540	-11.16
dum4044	-7.187	-1.42	-3.443	-0.51	-12.415	-1.43	-10.130	-3.16	-36.662	-10.69
dum4549	-12.354	-2.64	-10.054	-1.71	-20.336	-2.71	-16.559	-4.47	-50.505	-13.17
dum5054	-11.429	-2.58	-12.060	-2.34	-21.267	-3.29	-14.968	-3.53	-40.915	-9.50
dum5559	-4.871	-1.13	-8.385	-1.83	-15.534	-2.79	-6.031	-1.25	-40.937	-8.48
dum6064	-2.794	-0.64	-3.292	-0.78	-12.467	-2.53	2.099	0.39	-26.011	-4.85
dum6569	-1.779	-0.38	-6.818	-1.62	-6.493	-1.36	16.874	2.81	-27.714	-4.63
dum7074	1.054	0.18	-1.866	-0.37	-7.236	-1.10	14.154	1.98	-16.759	-2.39
constant	30.764	2.80	13.426	1.08	28.106	1.81	53.662	10.40	86.552	36.80
Diagnostic Test										
Number of Observation	11,019		11,020		11,020		11,018		11,020	
Pseudo R2	0.0386		0.0359		0.0395		0.0378		0.0382	
Raw sum of deviations	222,863		222,366		223,384		222,535		214,287	
Min sum of deviations	214,270		214,392		214,560		214,124		206,094	

Note: dumcoh9, dum1984, dum2024 and dum7500 are dropped due to collinearity.

Table 7 Number and Share of Households by Cohort x decile

	cohort 1	cohort 2	cohort 3	cohort 4	cohort 5	cohort 6	cohort 7	cohort 8	cohort 9	Total
decile 1	2,079 (1.89)	2,014 (1.83)	1,375 (1.25)	762 (0.69)	747 (0.68)	1,012 (0.92)	1,364 (1.24)	1,111 (1.01)	556 (0.50)	11,020 (10.00)
decile 2	916 (0.83)	1,077 (0.98)	906 (0.82)	688 (0.62)	971 (0.88)	1,685 (1.53)	2,130 (1.93)	1,690 (1.53)	955 (0.87)	11,018 (10.00)
decile 3	486 (0.44)	750 (0.68)	845 (0.77)	915 (0.83)	1,298 (1.18)	2,040 (1.85)	2,146 (1.95)	1,518 (1.38)	1,023 (0.93)	11,021 (10.00)
decile 4	349 (0.32)	665 (0.60)	892 (0.81)	1,022 (0.93)	1,531 (1.39)	2,126 (1.93)	2,029 (1.84)	1,452 (1.32)	952 (0.86)	11,018 (10.00)
decile 5	280 (0.25)	617 (0.56)	926 (0.84)	1,172 (1.06)	1,712 (1.55)	2,123 (1.93)	1,978 (1.80)	1,419 (1.29)	793 (0.72)	11,020 (10.00)
decile 6	271 (0.25)	626 (0.57)	982 (0.89)	1,329 (1.21)	1,735 (1.57)	2,151 (1.95)	1,980 (1.80)	1,283 (1.16)	662 (0.60)	11,019 (10.00)
decile 7	252 (0.23)	624 (0.57)	1,106 (1.00)	1,499 (1.36)	1,885 (1.71)	2,129 (1.93)	1,873 (1.70)	1,135 (1.03)	517 (0.47)	11,020 (10.00)
decile 8	232 (0.21)	689 (0.63)	1,154 (1.05)	1,596 (1.45)	2,071 (1.88)	2,112 (1.92)	1,800 (1.63)	926 (0.84)	440 (0.40)	11,020 (10.00)
decile 9	250 (0.23)	736 (0.67)	1,258 (1.14)	1,857 (1.69)	2,270 (2.06)	2,113 (1.92)	1,441 (1.31)	753 (0.68)	340 (0.31)	11,018 (10.00)
decile 10	271 (0.25)	722 (0.66)	1,403 (1.27)	2,302 (2.09)	2,598 (2.36)	1,880 (1.71)	1,109 (1.01)	537 (0.49)	198 (0.18)	11,020 (10.00)
Total	5,386 (4.89)	8,520 (7.73)	10,847 (9.84)	13,142 (11.93)	16,818 (15.26)	19,371 (17.58)	17,850 (16.20)	11,824 (10.73)	6,436 (5.84)	110,194 (100.00)

Note: Shadow indicates the highest share in the same cohort.

Table 8 Quantile Regression on Saving Rate (Various Quantiles)

Cohort 1	Quantile 0.10		Quantile 0.25		Quantile 0.50		Quantile 0.75		Quantile 0.90	
Dependent Variable : Saving Rate	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-5.609	-3.40	-5.777	-6.18	-5.222	-7.61	-4.366	-6.99	-3.776	-5.75
Number of Working Members	1.596	0.71	2.685	2.20	3.014	3.51	3.693	4.85	3.318	3.99
Home Ownership Dummy	-10.160	-2.46	-7.415	-3.29	-0.454	-0.28	1.088	0.77	3.348	2.25
1 / Disposable Income	-17,500,000	-81.13	-12,900,000	-110.21	-9,208,181	-103.52	-6,268,212	-69.53	-4,543,204	-42.04
Financial Assets / Disposable Income	-2,926.372	-24.58	-2,076.587	-30.11	-1,295.089	-25.39	-858.633	-16.82	-693.195	-11.77
Debt / Disposable Income	-2,305.830	-2.32	-193.407	-0.33	367.592	0.92	-159.431	-0.45	-272.716	-1.09
Age	11.858	1.74	5.758	1.56	2.080	0.77	0.079	0.03	-0.509	-0.22
Age * Age	-6.763	-1.51	-3.169	-1.30	-0.775	-0.43	0.549	0.36	0.911	0.60
dum1989	-14.406	-2.20	-6.076	-1.66	-3.710	-1.42	-0.506	-0.22	1.061	0.45
dum1994	-33.951	-3.34	-17.624	-3.10	-14.259	-3.51	-9.191	-2.59	-6.182	-1.67
constant	-406.944	-1.63	-163.234	-1.20	-29.115	-0.29	42.459	0.51	67.067	0.79
Diagnostic Test										
Number of Observation	5,386		5,386		5,386		5,386		5,386	
Pseudo R2	0.4690		0.3457		0.2416		0.1826		0.1452	
Raw sum of deviations	228,459		285,958		265,057		170,370		80,937	
Min sum of deviations	121,320		187,093		201,026		139,268		69,181	

Cohort 2	Quantile 0.10		Quantile 0.25		Quantile 0.50		Quantile 0.75		Quantile 0.90	
Dependent Variable : Saving Rate	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-10.812	-5.51	-5.239	-8.08	-5.416	-13.16	5.534	16.12	-2.562	-5.72
Number of Working Members	83.476	30.43	5.307	6.31	4.894	9.36	-1.433	-3.00	4.133	7.23
Home Ownership Dummy	149.883	49.54	-0.875	-0.43	0.948	0.75	-7.124	-7.23	3.001	2.26
1 / Disposable Income	1,336,147	3.06	-12,200,000	-173.80	-8,723,327	-150.59	3,779,300	108.70	-3,411,025	-25.62
Financial Assets / Disposable Income	-6,115.346	-39.06	-2,502.936	-32.70	-1,672.764	-36.61	-1,450.962	-38.14	-844.456	-15.81
Debt / Disposable Income	-8,010.390	-5.60	-943.347	-2.09	-924.250	-3.15	-1,440.000	-6.19	218.195	0.85
Age	67.105	3.34	9.142	1.34	9.556	2.26	-12.967	-3.33	-2.261	-0.52
Age * Age	-37.666	-2.31	-5.942	-1.08	-6.691	-1.96	14.678	4.66	2.528	0.72
dum1989	-124.148	-15.04	-6.933	-2.26	-6.884	-3.65	-2.349	-1.48	3.357	1.75
dum1994	-88.332	-6.75	-18.450	-3.87	-16.209	-5.47	-53.561	-20.47	-2.650	-0.87
constant	-2,879.670	-4.67	-273.600	-1.30	-265.075	-2.03	282.334	2.35	104.052	0.78
Diagnostic Test										
Number of Observation	8,520		8,520		8,520		8,520		8,520	
Pseudo R2	0.4289		0.3205		0.2216		0.1489		0.1073	
Raw sum of deviations	295,629		379,267		356,877		230,656		110,023	
Min sum of deviations	168,845		257,717		277,788		196,308		98,223	

Cohort 3	Quantile 0.10		Quantile 0.25		Quantile 0.50		Quantile 0.75		Quantile 0.90	
Dependent Variable : Saving Rate	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-5.965	-6.71	-5.935	-12.51	-4.384	-14.44	-3.968	-12.43	-15.725	-22.85
Number of Working Members	9.543	8.26	7.868	12.14	5.587	14.13	4.938	12.36	14.082	18.47
Home Ownership Dummy	-0.933	-0.35	40.121	31.87	2.989	3.30	4.678	5.09	31.047	15.99
1 / Disposable Income	-16,600,000	-48.66	-1,556,411	-5.46	-8,510,637	-70.57	-6,472,687	-55.13	2,799,016	21.51
Financial Assets / Disposable Income	-3,118.656	-22.72	-5,095.556	-59.55	-2,201.621	-40.35	-1,482.792	-26.07	-1,548.853	-19.36
Debt / Disposable Income	-211.347	-0.41	2,209.403	5.42	622.651	3.42	200.268	1.14	944.686	3.98
Age	-7.925	-0.89	-14.295	-2.96	0.539	0.18	7.918	2.57	59.124	13.12
Age * Age	8.225	1.05	13.105	3.12	0.029	0.01	-6.635	-2.45	-47.952	-12.22
dum1989	-3.652	-0.87	0.839	0.34	2.125	1.46	1.800	1.21	-70.701	-27.20
dum1994	-16.026	-2.38	-30.689	-8.47	-0.807	-0.35	2.822	1.19	-40.580	-10.11
constant	221.709	0.88	371.402	2.69	19.304	0.23	-177.119	-2.03	-1,739.417	-13.44
Diagnostic Test										
Number of Observation	10,847		10,847		10,847		10,847		10,847	
Pseudo R2	0.3487		0.2556		0.1697		0.1228		0.0980	
Raw sum of deviations	284,776		379,201		366,319		243,757		119,282	
Min sum of deviations	185,476		282,266		304,142		213,835		107,591	

Cohort 4	Quantile 0.10		Quantile 0.25		Quantile 0.50		Quantile 0.75		Quantile 0.90	
Dependent Variable : Saving Rate	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-26.875	-20.98	-3.660	-9.80	-11.169	-48.43	-4.995	-17.36	-2.824	-9.56
Number of Working Members	7.987	4.78	6.453	13.14	26.635	89.66	8.368	24.43	4.974	14.76
Home Ownership Dummy	64.083	21.46	0.187	0.18	-8.478	-13.22	3.798	5.08	3.032	4.22
1 / Disposable Income	-6,928,572	-14.65	-9,242,289	-60.18	60,533	0.62	-2,971,944	-32.28	-3,598,021	-36.03
Financial Assets / Disposable Income	-10,647.100	-63.12	-2,873.505	-36.25	1,484.129	26.26	-1,169.320	-18.83	-932.036	-14.24
Debt / Disposable Income	29.527	0.04	551.218	2.32	72.555	0.50	555.565	3.84	171.422	1.30
Age	-204.287	-15.94	-16.730	-4.79	-32.238	-15.29	-12.324	-4.91	-1.709	-0.70
Age * Age	182.597	15.06	15.536	4.62	28.764	14.18	12.275	5.09	1.979	0.84
dum1989	98.392	14.84	0.766	0.42	12.424	11.12	5.495	4.14	3.594	2.83
dum1994	100.205	10.37	5.473	1.88	22.841	12.92	3.317	1.58	6.632	3.25
constant	5,671.204	16.85	478.358	5.30	899.994	16.50	348.218	5.36	88.491	1.40
Diagnostic Test										
Number of Observation	13,142		13,142		13,142		13,142		13,142	
Pseudo R2	0.2114		0.1339		0.1014		0.0987		0.1001	
Raw sum of deviations	230,325		322,492		334,624		236,802		121,612	
Min sum of deviations	181,639		279,324		300,692		213,429		109,434	

Cohort 5	Quantile 0.10		Quantile 0.25		Quantile 0.50		Quantile 0.75		Quantile 0.90	
Dependent Variable : Saving Rate	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-1.962	-4.12	-2.353	-8.17	-5.485	-27.89	-2.826	-12.67	-2.344	-9.12
Number of Working Members	7.286	10.65	6.779	16.37	4.198	15.09	5.379	17.55	6.305	19.14
Home Ownership Dummy	-0.925	-0.73	1.485	1.90	0.417	0.79	3.479	6.04	1.177	1.89
1 / Disposable Income	-15,100,000	-41.90	-8,865,819	-43.50	-10,800,000	-86.40	-4,521,216	-35.81	-2,101,387	-18.14
Financial Assets / Disposable Income	-3,745.492	-29.72	-2,361.839	-25.61	645.670	10.10	-886.322	-11.08	-466.114	-5.29
Debt / Disposable Income	-83.317	-0.25	573.102	2.80	305.575	2.42	527.313	4.13	1,541.344	12.98
Age	-13.724	-3.55	-10.972	-4.59	-1.688	-1.03	-6.923	-3.85	7.882	3.92
Age * Age	13.412	3.27	10.639	4.19	2.239	1.29	7.648	4.00	-8.122	-3.82
dum1989	-10.761	-4.85	-3.594	-2.58	-14.133	-14.64	-1.417	-1.32	-3.217	-2.74
dum1994	-20.905	-5.80	-5.651	-2.54	-23.849	-15.75	-1.474	-0.89	5.650	3.18
constant	380.011	4.21	307.599	5.51	103.766	2.72	201.608	4.79	-144.252	-3.05
Diagnostic Test										
Number of Observation	16,818		16,818		16,818		16,818		16,818	
Pseudo R2	0.1603		0.0959		0.0772		0.0814		0.0902	
Raw sum of deviations	256,695		367,474		389,110		280,211		146,349	
Min sum of deviations	215,541		332,251		359,067		257,392		133,151	

Cohort 6	Quantile 0.10		Quantile 0.25		Quantile 0.50		Quantile 0.75		Quantile 0.90	
Dependent Variable : Saving Rate	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	0.247	0.45	-2.850	-11.15	-4.937	-27.48	-3.141	-17.86	0.131	0.54
Number of Working Members	4.734	5.33	3.298	7.91	-0.510	-1.74	2.984	10.62	1.925	4.93
Home Ownership Dummy	18.006	13.56	4.922	7.36	16.317	35.18	6.505	14.90	5.419	9.65
1 / Disposable Income	3,886,792	5.30	-9,356,628	-46.62	832,790	6.87	-5,506,729	-47.78	594,417	5.58
Financial Assets / Disposable Income	-4,398.175	-17.25	-2,140.913	-19.42	-1,230.749	-16.01	-767.222	-9.94	-771.641	-7.02
Debt / Disposable Income	126.433	0.39	223.213	1.36	-2.841	-0.03	-83.071	-0.93	-465.766	-3.24
Age	-30.243	-7.06	5.380	2.67	13.533	9.52	-3.479	-2.59	-4.720	-2.84
Age * Age	35.476	7.02	-7.804	-3.27	-15.541	-9.20	3.721	2.33	7.568	3.74
dum1989	15.396	5.79	-1.187	-0.89	-5.179	-5.54	1.720	1.91	-6.580	-6.25
dum1994	-3.377	-0.82	-5.386	-2.60	1.355	0.93	1.481	1.07	-14.157	-7.93
constant	596.291	6.63	-46.919	-1.12	-260.449	-8.81	131.785	4.71	106.818	3.14
Diagnostic Test										
Number of Observation	19,371		19,371		19,371		19,371		19,371	
Pseudo R2	0.1436		0.0984		0.0798		0.0783		0.0818	
Raw sum of deviations	270,543		387,628		411,783		297,235		156,272	
Min sum of deviations	231,682		349,503		378,905		273,967		143,491	

Cohort 7	Quantile 0.10		Quantile 0.25		Quantile 0.50		Quantile 0.75		Quantile 0.90	
Dependent Variable : Saving Rate	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-9.666	-16.40	3.242	14.84	-2.509	-13.92	-2.855	-14.97	-3.540	-13.97
Number of Working Members	6.709	6.53	-2.774	-7.18	27.039	85.23	2.789	8.80	9.870	25.94
Home Ownership Dummy	-10.046	-6.04	-15.843	-26.56	-22.022	-49.02	6.618	14.86	17.061	26.22
1 / Disposable Income	-533,047	-0.80	-12,100,000	-89.78	-1,234,673	-11.03	-5,834,442	-49.22	-1,083,053	-8.95
Financial Assets / Disposable Income	-4,763.571	-14.92	-1,155.929	-9.99	3,897.619	42.62	-1,000.201	-10.63	-1,354.949	-9.45
Debt / Disposable Income	331.715	0.77	2,032.904	14.36	10,263.770	116.99	197.918	2.66	-812.297	-6.24
Age	59.874	14.14	-1.531	-0.96	2.951	2.28	3.138	2.44	-2.594	-1.58
Age * Age	-67.777	-11.96	2.399	1.13	-5.097	-2.97	-4.704	-2.76	-1.266	-0.57
dum1989	-49.564	-15.34	-5.516	-4.71	22.487	23.68	-0.068	-0.07	19.268	15.76
dum1994	-67.146	-13.70	-12.805	-7.26	30.052	20.88	2.261	1.57	34.853	18.45
constant	-1,200.970	-15.49	76.098	2.56	-66.318	-2.76	4.226	0.18	137.320	4.59
Diagnostic Test										
Number of Observation	17,850		17,850		17,850		17,850		17,850	
Pseudo R2	0.1651		0.1218		0.1018		0.0905		0.0761	
Raw sum of deviations	249,180		350,495		373,368		270,551		141,481	
Min sum of deviations	208,035		307,805		335,368		246,069		130,716	

Cohort 8	Quantile 0.10		Quantile 0.25		Quantile 0.50		Quantile 0.75		Quantile 0.90	
Dependent Variable : Saving Rate	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-2.959	-5.90	-7.346	-24.38	-2.847	-13.16	-3.213	-13.32	2.340	5.88
Number of Working Members	0.889	0.92	2.725	4.80	2.847	7.08	-21.185	-43.69	5.875	8.90
Home Ownership Dummy	7.791	5.94	19.238	23.96	8.426	15.29	11.822	20.99	7.501	8.00
1 / Disposable Income	-14,600,000	-31.45	-1,172,262	-3.94	-7,439,725	-48.83	-1,770	-0.01	1,204,283	6.28
Financial Assets / Disposable Income	-2,795.253	-15.99	-1,457.452	-7.78	-1,291.691	-12.60	2,004.563	25.46	-3,573.774	-15.80
Debt / Disposable Income	-427.188	-1.33	343.395	1.71	174.404	1.42	6,937.010	74.33	-2,935.916	-9.82
Age	7.984	2.24	-50.943	-20.24	-23.254	-15.31	39.513	21.33	14.519	5.65
Age * Age	-11.573	-2.20	67.215	18.23	30.267	13.51	-52.733	-19.59	-22.920	-5.84
dum1989	-13.042	-4.38	51.741	28.66	23.029	17.92	-8.271	-5.52	2.723	1.54
dum1994	-13.253	-3.21	93.794	37.07	30.149	16.88	-23.961	-12.20	4.425	1.68
constant	-77.488	-1.31	899.185	21.48	464.061	18.56	-654.664	-21.21	-204.140	-4.93
Diagnostic Test										
Number of Observation	11,824		11,824		11,824		11,824		11,824	
Pseudo R2	0.1506		0.1195		0.1090		0.1045		0.0926	
Raw sum of deviations	172,014		242,650		258,950		187,290		97,470	
Min sum of deviations	146,105		213,661		230,737		167,714		88,448	

Cohort 9	Quantile 0.10		Quantile 0.25		Quantile 0.50		Quantile 0.75		Quantile 0.90	
Dependent Variable : Saving Rate	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-1.441	-1.77	-11.631	-29.57	-3.021	-10.56	-0.882	-2.26	-4.142	-7.95
Number of Working Members	3.030	1.92	14.513	18.34	1.859	3.40	-6.429	-8.15	-1.933	-1.83
Home Ownership Dummy	4.191	2.03	17.112	16.25	9.183	12.43	30.418	33.42	8.700	7.32
1 / Disposable Income	-13,400,000	-15.29	-533,122	-1.41	-7,613,166	-37.66	474,644	2.19	-3,920,912	-11.43
Financial Assets / Disposable Income	-4,085.366	-11.97	-2,325.746	-11.50	-1,416.304	-9.74	-1,306.705	-6.88	-727.689	-3.03
Debt / Disposable Income	462.076	1.05	51.848	0.24	210.262	1.46	-376.142	-2.30	-188.395	-0.84
Age	0.470	0.07	-37.772	-9.97	-0.854	-0.38	24.048	7.31	7.123	1.89
Age * Age	-1.570	-0.15	59.746	9.70	0.284	0.08	-37.057	-6.85	-13.292	-2.16
dum1989	-11.295	-1.76	22.985	6.09	-4.157	-1.75	-14.786	-4.62	-5.971	-1.65
dum1994	-11.419	-1.40	41.431	8.95	-2.884	-0.97	-29.225	-7.34	0.727	0.16
constant	48.128	0.53	579.541	10.50	78.813	2.41	-329.879	-6.94	-16.778	-0.31
Diagnostic Test										
Number of Observation	6,436		6,436		6,436		6,436		6,436	
Pseudo R2	0.1275		0.1004		0.0927		0.0861		0.0782	
Raw sum of deviations	100,492		139,356		147,032		105,854		55,023	
Min sum of deviations	87,679		125,368		133,404		96,737		50,720	

Note: dum1984 is dropped due to collinearity.

Table 9 Quantile Estimates of the Age Effects

Dependent Variable : Saving Rate	Quantile									
	0.10		0.25		0.50		0.75		0.90	
	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Cohort 1										
Age	11.858	1.74	5.758	1.56	2.080	0.77	0.079	0.03	-0.509	-0.22
Age * Age	-6.763	-1.51	-3.169	-1.30	-0.775	-0.43	0.549	0.36	0.911	0.60
Cohort 2										
Age	67.105	3.34	9.142	1.34	9.556	2.26	-12.967	-3.33	-2.261	-0.52
Age * Age	-37.666	-2.31	-5.942	-1.08	-6.691	-1.96	14.678	4.66	2.528	0.72
Cohort 3										
Age	-7.925	-0.89	-14.295	-2.96	0.539	0.18	7.918	2.57	59.124	13.12
Age * Age	8.225	1.05	13.105	3.12	0.029	0.01	-6.635	-2.45	-47.952	-12.22
Cohort 4										
Age	-204.287	-15.94	-16.730	-4.79	-32.238	-15.29	-12.324	-4.91	-1.709	-0.70
Age * Age	182.597	15.06	15.536	4.62	28.764	14.18	12.275	5.09	1.979	0.84
Cohort 5										
Age	-13.724	-3.55	-10.972	-4.59	-1.688	-1.03	-6.923	-3.85	7.882	3.92
Age * Age	13.412	3.27	10.639	4.19	2.239	1.29	7.648	4.00	-8.122	-3.82
Cohort 6										
Age	-30.243	-7.06	5.380	2.67	13.533	9.52	-3.479	-2.59	-4.720	-2.84
Age * Age	35.476	7.02	-7.804	-3.27	-15.541	-9.20	3.721	2.33	7.568	3.74
Cohort 7										
Age	59.874	14.14	-1.531	-0.96	2.951	2.28	3.138	2.44	-2.594	-1.58
Age * Age	-67.777	-11.96	2.399	1.13	-5.097	-2.97	-4.704	-2.76	-1.266	-0.57
Cohort 8										
Age	7.984	2.24	-50.943	-20.24	-23.254	-15.31	39.513	21.33	14.519	5.65
Age * Age	-11.573	-2.20	67.215	18.23	30.267	13.51	-52.733	-19.59	-22.920	-5.84
Cohort 9										
Age	0.470	0.07	-37.772	-9.97	-0.854	-0.38	24.048	7.31	7.123	1.89
Age * Age	-1.570	-0.15	59.746	9.70	0.284	0.08	-37.057	-6.85	-13.292	-2.16

Table 10 Quantile Regression on Saving Rate with Bootstrapping t-statistics and Parameter Constancy Test

Cohort 1

Dependent Variable: Saving Rate	Quantile 0.25		Quantile 0.50		Quantile 0.75		OLS	
	Estimated Coefficient	Bootstrap Std. Err. consistent t-value	Estimated Coefficient	Bootstrap Std. Err. consistent t-value	Estimated Coefficient	Bootstrap Std. Err. consistent t-value	Estimated Coefficient	t-value
Number of Household Members	-5.777	-1.11	-5.222	-0.61	-4.366	-2.11	-5.576	-5.08
Number of Working Members	2.685	0.36	3.014	0.67	3.693	1.76	4.528	3.29
Home Ownership Dummy	-7.415	-0.66	-0.454	-0.02	1.088	0.24	-2.659	-1.04
1 / Disposable Income	-12,900,000	-5.12	-9,208,181	-3.44	-6,268,212	-3.67	-9,488,757	-66.65
Financial Assets / Disposable Income	-2,076.587	-2.96	-1,295.089	-1.18	-858.633	-4.81	-1,685.478	-20.65
Debt / Disposable Income	-193.407	-0.02	367.592	0.12	-159.431	-0.15	-1,277.627	-1.97
Age	5.758	0.52	2.080	0.07	0.079	0.01	2.065	0.48
Age * Age	-3.169	-0.46	-0.775	-0.05	0.549	0.14	-0.454	-0.16
dum1989	-6.076	-0.50	-3.710	-0.10	-0.506	-0.06	-10.114	-2.41
dum1994	-17.624	-1.30	-14.259	-0.26	-9.191	-0.92	-16.162	-2.48
constant	-163.234	-0.40	-29.115	-0.03	42.459	0.20	-44.359	-0.28
Diagnostic Test								
Number of Observation	5,386		5,386		5,386		5,386	
Pseudo R2	0.3457		0.2416		0.1826			
R-squared							0.5486	
Adj R-squared							0.5477	
Parameter Consistent Test ($a_{25}=a_{50}=a_{75}$)								
1 / Disposable Income	F (2, 5375)=	3.16	Prov > F =	0.0426				
Age	F (2, 5375)=	0.09	Prov > F =	0.9131				
dum1989	F (2, 5375)=	0.05	Prov > F =	0.9467				
dum1994	F (2, 5375)=	0.08	Prov > F =	0.9240				

Cohort 2

Dependent Variable: Saving Rate	Quantile 0.25		Quantile 0.50		Quantile 0.75		OLS	
	Estimated Coefficient	Bootstrap Std. Err. consistent t-value	Estimated Coefficient	Bootstrap Std. Err. consistent t-value	Estimated Coefficient	Bootstrap Std. Err. consistent t-value	Estimated Coefficient	t-value
Number of Household Members	-5.239	-0.88	-5.416	-1.09	5.534	1.26	-5.858	-8.80
Number of Working Members	5.307	0.74	4.894	0.84	-1.433	-0.71	9.788	11.58
Home Ownership Dummy	-0.875	-0.05	0.948	0.03	-7.124	-1.51	6.782	3.30
1 / Disposable Income	-12,200,000	-2.36	-8,723,327	-1.53	3,779,300	1.74	-5,540,938	-59.15
Financial Assets / Disposable Income	-2,502.936	-4.07	-1,672.764	-1.24	-1,450.962	-1.83	-2,859.741	-38.70
Debt / Disposable Income	-943.347	-0.34	-924.250	-0.13	-1,440.000	-0.45	-874.958	-1.84
Age	9.142	0.21	9.556	0.10	-12.967	-0.61	-1.133	-0.17
Age * Age	-5.942	-0.16	-6.691	-0.09	14.678	0.85	1.866	0.34
dum1989	-6.933	-0.38	-6.884	-0.27	-2.349	-0.49	-2.635	-0.86
dum1994	-18.450	-0.54	-16.209	-0.33	-53.561	-4.15	-8.465	-1.77
constant	-273.600	-0.20	-265.075	-0.09	282.334	0.42	37.196	0.18
Diagnostic Test								
Number of Observation	8,520		8,520		8,520		8,520	
Pseudo R2	0.3205		0.2216		0.1489			
R-squared							0.4741	
Adj R-squared							0.4735	
Parameter Consistent Test ($a_{25}=a_{50}=a_{75}$)								
1 / Disposable Income	F (2, 8509)=	7.31	Prov > F =	0.0007				
Age	F (2, 8509)=	0.10	Prov > F =	0.9028				
dum1989	F (2, 8509)=	0.04	Prov > F =	0.9635				
dum1994	F (2, 8509)=	0.45	Prov > F =	0.6386				

Cohort 3

Dependent Variable: Saving Rate	Quantile 0.25 Estimated Coefficient	Quantile 0.25 Bootstrap Std. Err. consistent t-value	Quantile 0.50 Estimated Coefficient	Quantile 0.50 Bootstrap Std. Err. consistent t-value	Quantile 0.75 Estimated Coefficient	Quantile 0.75 Bootstrap Std. Err. consistent t-value	OLS Estimated Coefficient	OLS t-value
Number of Household Members	-5.935	-1.41	-4.384	-1.23	-3.968	-1.01	-5.376	-12.40
Number of Working Members	7.868	1.03	5.587	1.09	4.938	0.69	5.798	10.27
Home Ownership Dummy	40.121	3.87	2.989	0.28	4.678	0.42	0.510	0.39
1 / Disposable Income	-1,556,411	-0.29	-8,510,637	-2.31	-6,472,687	-3.56	-11,500,000	-66.60
Financial Assets / Disposable Income	-5,095.556	-4.36	-2,201.621	-2.96	-1,482.792	-2.86	-2,357.824	-30.23
Debt / Disposable Income	2,209.403	4.22	622.651	0.21	200.268	0.04	310.088	1.12
Age	-14.295	-0.50	0.539	0.02	7.918	0.50	-5.240	-1.23
Age * Age	13.105	0.51	0.029	0.00	-6.635	-0.47	5.402	1.44
dum1989	0.839	0.05	2.125	0.09	1.800	0.07	-0.870	-0.42
dum1994	-30.689	-0.54	-0.807	-0.02	2.822	0.07	-8.428	-2.56
constant	371.402	0.47	19.304	0.02	-177.119	-0.40	185.793	1.53
Diagnostic Test								
Number of Observation	10,847		10,847		10,847		10,847	
Pseudo R2	0.2556		0.1697		0.1228			
R-squared							0.4631	
Adj R-squared							0.4626	
Parameter Consistent Test ($a_{25}=a_{50}=a_{75}$)								
1 / Disposable Income	F (2, 10836)=	0.54	Prov > F =	0.5833				
Age	F (2, 10836)=	0.28	Prov > F =	0.7548				
dum1989	F (2, 10836)=	0.00	Prov > F =	0.9985				
dum1994	F (2, 10836)=	0.15	Prov > F =	0.8636				

Cohort 4

Dependent Variable: Saving Rate	Quantile 0.25 Estimated Coefficient	Quantile 0.25 Bootstrap Std. Err. consistent t-value	Quantile 0.50 Estimated Coefficient	Quantile 0.50 Bootstrap Std. Err. consistent t-value	Quantile 0.75 Estimated Coefficient	Quantile 0.75 Bootstrap Std. Err. consistent t-value	OLS Estimated Coefficient	OLS t-value
Number of Household Members	-3.660	-1.02	-11.169	-3.44	-4.995	-3.69	-3.808	-12.51
Number of Working Members	6.453	1.86	26.635	6.02	8.368	2.51	6.737	17.18
Home Ownership Dummy	0.187	0.03	-8.478	-1.48	3.798	0.41	0.372	0.44
1 / Disposable Income	-9,242,289	-1.96	60,533	0.02	-2,971,944	-1.33	-7,887,282	-61.63
Financial Assets / Disposable Income	-2,873.505	-1.77	1,484.129	1.34	-1,169.320	-1.79	-2,060.209	-27.63
Debt / Disposable Income	551.218	0.37	72.555	0.06	555.565	0.50	468.425	2.40
Age	-16.730	-0.67	-32.238	-0.98	-12.324	-1.05	-10.672	-3.83
Age * Age	15.536	0.62	28.764	0.88	12.275	1.15	10.133	3.79
dum1989	0.766	0.08	12.424	0.86	5.495	0.20	0.076	0.05
dum1994	5.473	0.39	22.841	0.76	3.317	0.06	1.848	0.79
constant	478.358	0.78	899.994	1.12	348.218	1.00	320.125	4.45
Diagnostic Test								
Number of Observation	13,142		13,142		13,142		13,142	
Pseudo R2	0.1339		0.1014		0.0987			
R-squared							0.3599	
Adj R-squared							0.3594	
Parameter Consistent Test ($a_{25}=a_{50}=a_{75}$)								
1 / Disposable Income	F (2, 13131)=	1.64	Prov > F =	0.1936				
Age	F (2, 13131)=	0.19	Prov > F =	0.8275				
dum1989	F (2, 13131)=	0.27	Prov > F =	0.7653				
dum1994	F (2, 13131)=	0.14	Prov > F =	0.8677				

Cohort 5

Dependent Variable: Saving Rate	Quantile 0.25 Estimated Coefficient	Quantile 0.25 Bootstrap Std. Err. consistent t-value	Quantile 0.50 Estimated Coefficient	Quantile 0.50 Bootstrap Std. Err. consistent t-value	Quantile 0.75 Estimated Coefficient	Quantile 0.75 Bootstrap Std. Err. consistent t-value	OLS Estimated Coefficient	OLS t-value
Number of Household Members	-2.353	-0.61	-5.485	-1.45	-2.826	-0.95	-3.117	-12.63
Number of Working Members	6.779	1.18	4.198	1.13	5.379	1.19	5.961	17.08
Home Ownership Dummy	1.485	0.26	0.417	0.07	3.479	0.61	1.335	2.01
1 / Disposable Income	-8,865,819	-1.78	-10,800,000	-3.79	-4,521,216	-2.24	-9,607,311	-61.15
Financial Assets / Disposable Income	-2,361.839	-1.16	645.670	0.54	-886.322	-0.68	-1,834.889	-22.87
Debt / Disposable Income	573.102	0.36	305.575	0.20	527.313	0.27	-81.583	-0.51
Age	-10.972	-0.61	-1.688	-0.09	-6.923	-0.30	-9.462	-4.61
Age * Age	10.639	0.53	2.239	0.11	7.648	0.30	9.467	4.34
dum1989	-3.594	-0.31	-14.133	-2.02	-1.417	-0.14	-4.119	-3.40
dum1994	-5.651	-0.33	-23.849	-1.85	-1.474	-0.08	-6.451	-3.39
constant	307.599	0.77	103.766	0.25	201.608	0.38	282.654	5.89
Diagnostic Test								
Number of Observation	16,818		16,818		16,818		16,818	
Pseudo R2	0.0959		0.0772		0.0814			
R-squared							0.2661	
Adj R-squared							0.2657	
Parameter Consistent Test ($a_{25}=a_{50}=a_{75}$)								
1 / Disposable Income	F (2, 16807)=	1.34	Prov > F =	0.2627				
Age	F (2, 16807)=	0.04	Prov > F =	0.9584				
dum1989	F (2, 16807)=	0.58	Prov > F =	0.5572				
dum1994	F (2, 16807)=	0.52	Prov > F =	0.5958				

Cohort 6

Dependent Variable: Saving Rate	Quantile 0.25 Estimated Coefficient	Quantile 0.25 Bootstrap Std. Err. consistent t-value	Quantile 0.50 Estimated Coefficient	Quantile 0.50 Bootstrap Std. Err. consistent t-value	Quantile 0.75 Estimated Coefficient	Quantile 0.75 Bootstrap Std. Err. consistent t-value	OLS Estimated Coefficient	OLS t-value
Number of Household Members	-2.850	-0.94	-4.937	-1.13	-3.141	-1.23	-3.247	-15.73
Number of Working Members	3.298	0.47	-0.510	-0.10	2.984	0.66	3.328	9.91
Home Ownership Dummy	4.922	0.59	16.317	2.87	6.505	0.77	5.196	9.75
1 / Disposable Income	-9,356,628	-1.62	832,790	0.21	-5,506,729	-2.30	-9,252,263	-66.40
Financial Assets / Disposable Income	-2,140.913	-1.01	-1,230.749	-1.30	-767.222	-0.58	-1,784.134	-19.95
Debt / Disposable Income	223.213	0.17	-2.841	0.00	-83.071	-0.08	-188.298	-1.63
Age	5.380	0.44	13.533	0.82	-3.479	-0.17	2.190	1.34
Age * Age	-7.804	-0.55	-15.541	-0.76	3.721	0.14	-3.573	-1.84
dum1989	-1.187	-0.07	-5.179	-0.48	1.720	0.14	-1.616	-1.50
dum1994	-5.386	-0.19	1.355	0.06	1.481	0.06	-5.714	-3.42
constant	-46.919	-0.18	-260.449	-0.78	131.785	0.33	24.511	0.72
Diagnostic Test								
Number of Observation	19,371		19,371		19,371		19,371	
Pseudo R2	0.0984		0.0798		0.0783			
R-squared							0.2470	
Adj R-squared							0.2466	
Parameter Consistent Test ($a_{25}=a_{50}=a_{75}$)								
1 / Disposable Income	F (2, 19360)=	1.48	Prov > F =	0.2282				
Age	F (2, 19360)=	0.17	Prov > F =	0.8400				
dum1989	F (2, 19360)=	0.07	Prov > F =	0.9338				
dum1994	F (2, 19360)=	0.03	Prov > F =	0.9721				

Cohort 7

Dependent Variable: Saving Rate	Quantile 0.25		Quantile 0.50		Quantile 0.75		OLS	
	Estimated Coefficient	Bootstrap Std. Err. consistent t-value	Estimated Coefficient	Bootstrap Std. Err. consistent t-value	Estimated Coefficient	Bootstrap Std. Err. consistent t-value	Estimated Coefficient	t-value
Number of Household Members	3.242	1.31	-2.509	-0.50	-2.855	-1.03	-3.119	-15.11
Number of Working Members	-2.774	-0.61	27.039	4.80	2.789	0.92	2.323	6.39
Home Ownership Dummy	-15.843	-2.24	-22.022	-1.57	6.618	1.20	5.537	10.77
1 / Disposable Income	-12,100,000	-4.65	-1,234,673	-0.29	-5,834,442	-1.87	-8,931,192	-69.71
Financial Assets / Disposable Income	-1,155.929	-0.51	3,897.619	2.87	-1,000.201	-1.69	-2,454.736	-23.45
Debt / Disposable Income	2,032.904	0.88	10,263.770	6.36	197.918	0.23	-526.525	-5.24
Age	-1.531	-0.27	2.951	0.16	3.138	0.34	6.292	4.25
Age * Age	2.399	0.30	-5.097	-0.22	-4.704	-0.37	-9.109	-4.64
dum1989	-5.516	-0.95	22.487	1.71	-0.068	-0.01	-2.956	-2.72
dum1994	-12.805	-1.13	30.052	1.39	2.261	0.15	-1.017	-0.62
constant	76.098	0.73	-66.318	-0.20	4.226	0.02	-49.027	-1.78
Diagnostic Test								
Number of Observation	17,850		17,850		17,850		17,850	
Pseudo R2	0.1218		0.1018		0.0905			
R-squared							0.2800	
Adj R-squared							0.2796	
Parameter Consistent Test ($a_{25}=a_{50}=a_{75}$)								
1 / Disposable Income	F (2, 17839)=	2.54	Prov > F =	0.0792				
Age	F (2, 17839)=	0.10	Prov > F =	0.9030				
dum1989	F (2, 17839)=	1.65	Prov > F =	0.1920				
dum1994	F (2, 17839)=	3.03	Prov > F =	0.0486				

Cohort 8

Dependent Variable: Saving Rate	Quantile 0.25		Quantile 0.50		Quantile 0.75		OLS	
	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value	Estimated Coefficient	t-value
Number of Household Members	-7.346	-24.38	-2.847	-13.16	-3.213	-13.32	-3.424	-12.15
Number of Working Members	2.725	4.80	2.847	7.08	-21.185	-43.69	1.295	2.47
Home Ownership Dummy	19.238	23.96	8.426	15.29	11.822	20.99	8.945	12.46
1 / Disposable Income	-1,172,262	-3.94	-7,439,725	-48.83	-1,770	-0.01	-10,200,000	-51.31
Financial Assets / Disposable Income	-1,457.452	-7.78	-1,291.691	-12.60	2,004.563	25.46	-2,495.289	-18.65
Debt / Disposable Income	343.395	1.71	174.404	1.42	6,937.010	74.33	-324.858	-2.03
Age	-50.943	-20.24	-23.254	-15.31	39.513	21.33	1.940	0.98
Age * Age	67.215	18.23	30.267	13.51	-52.733	-19.59	-3.047	-1.04
dum1989	51.741	28.66	23.029	17.92	-8.271	-5.52	-3.875	-2.31
dum1994	93.794	37.07	30.149	16.88	-23.961	-12.20	-3.474	-1.49
constant	899.185	21.48	464.061	18.56	-654.664	-21.21	34.472	1.06
Diagnostic Test								
Number of Observation	11,824		11,824		11,824		11,824	
Pseudo R2	0.1195		0.1090		0.1045			
R-squared							0.2640	
Adj R-squared							0.2633	
Parameter Consistent Test ($a_{25}=a_{50}=a_{75}$)								
1 / Disposable Income								
Age								
dum1989			N. A.					
dum1994								

Note: Convergence is not achieved after 1,000 bootstrapping replication.

Cohort 9

Dependent Variable: Saving Rate	Quantile 0.25		Quantile 0.50		Quantile 0.75		OLS	
	Estimated Coefficient	Bootstrap Std. Err. consistent t-value	Estimated Coefficient	Bootstrap Std. Err. consistent t-value	Estimated Coefficient	Bootstrap Std. Err. consistent t-value	Estimated Coefficient	t-value
Number of Household Members	-11.631	-3.52	-3.021	-1.23	-0.882	-0.42	-2.630	-6.10
Number of Working Members	14.513	5.35	1.859	0.39	-6.429	-1.61	1.004	1.22
Home Ownership Dummy	17.112	2.48	9.183	2.17	30.418	7.97	7.842	7.05
1 / Disposable Income	-533,122	-0.14	-7,613,166	-2.71	474,644	0.19	-11,300,000	-37.23
Financial Assets / Disposable Income	-2,325.746	-1.32	-1,416.304	-1.25	-1,306.705	-3.23	-2,301.191	-10.50
Debt / Disposable Income	51.848	0.04	210.262	0.41	-376.142	-0.49	-47.058	-0.22
Age	-37.772	-2.02	-0.854	-0.06	24.048	0.91	-2.197	-0.64
Age * Age	59.746	1.94	0.284	0.01	-37.057	-0.88	2.405	0.43
dum1989	22.985	1.73	-4.157	-0.29	-14.786	-0.60	-8.610	-2.41
dum1994	41.431	1.86	-2.884	-0.17	-29.225	-0.78	-7.739	-1.73
constant	579.541	2.10	78.813	0.38	-329.879	-0.86	115.120	2.34
Diagnostic Test								
Number of Observation	6,436		6,436		6,436		6,436	
Pseudo R2	0.1004		0.0927		0.0861			
R-squared							0.2299	
Adj R-squared							0.2287	

Parameter Consistent Test ($a_{25}=a_{50}=a_{75}$)				
1 / Disposable Income	F (2, 6425)=	4.18	Prov > F =	0.0154
Age	F (2, 6425)=	2.83	Prov > F =	0.0591
dum1989	F (2, 6425)=	1.53	Prov > F =	0.2174
dum1994	F (2, 6425)=	1.88	Prov > F =	0.1530

Fig. 1 Time Series of Household Saving Rates

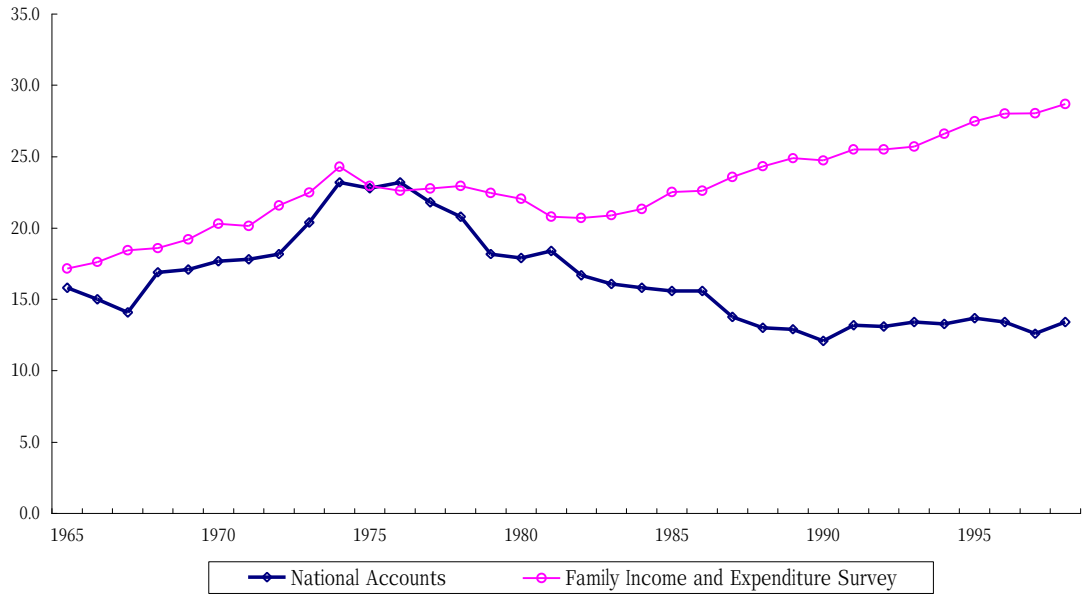
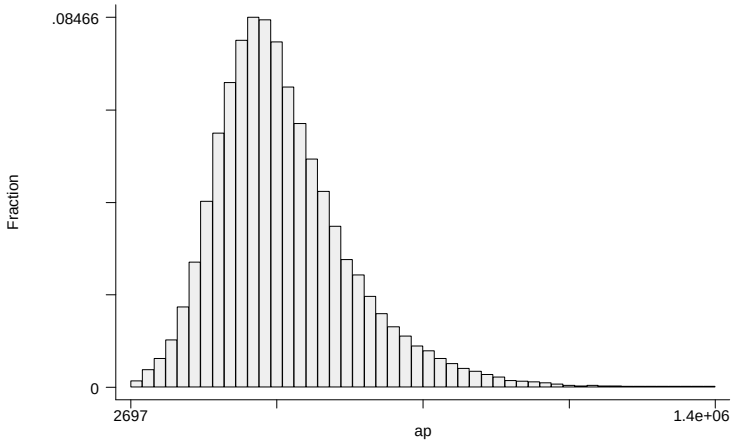
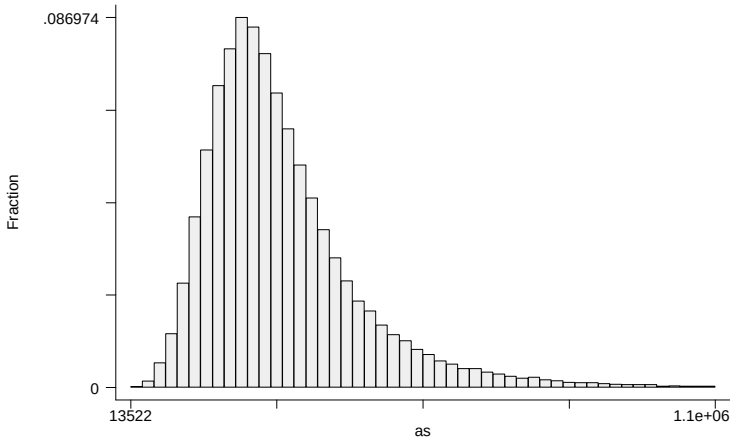


Fig. 2 Histogram of Major Variables

Disposable Income



Consumption



Saving Rate

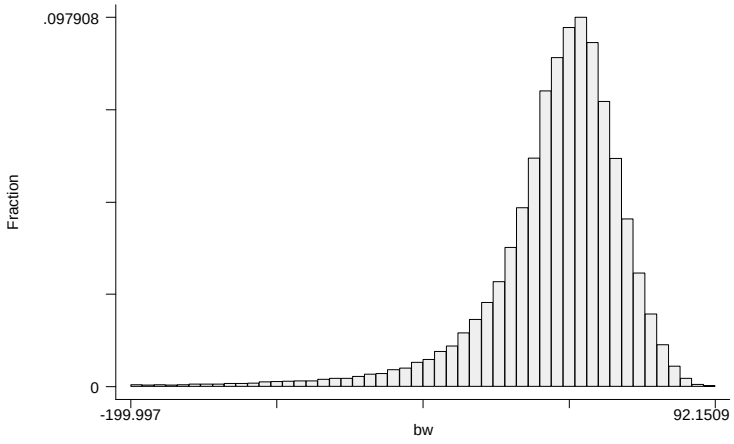


Fig.3　　Age Profile of Mean Saving Rates

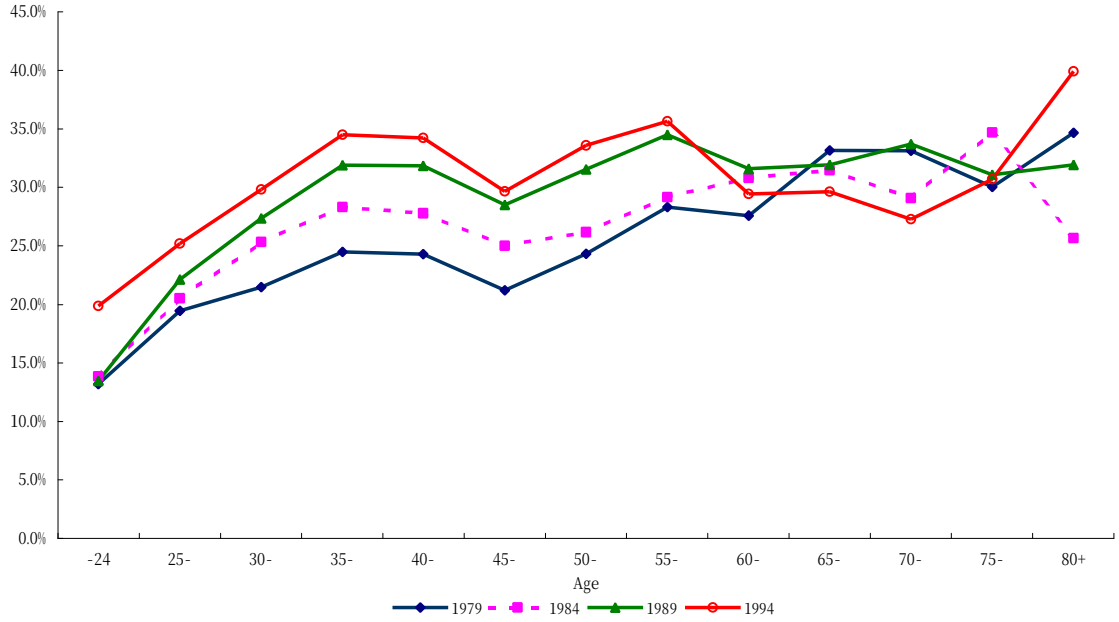


Fig. 4 Age Profile of Median Saving Rates

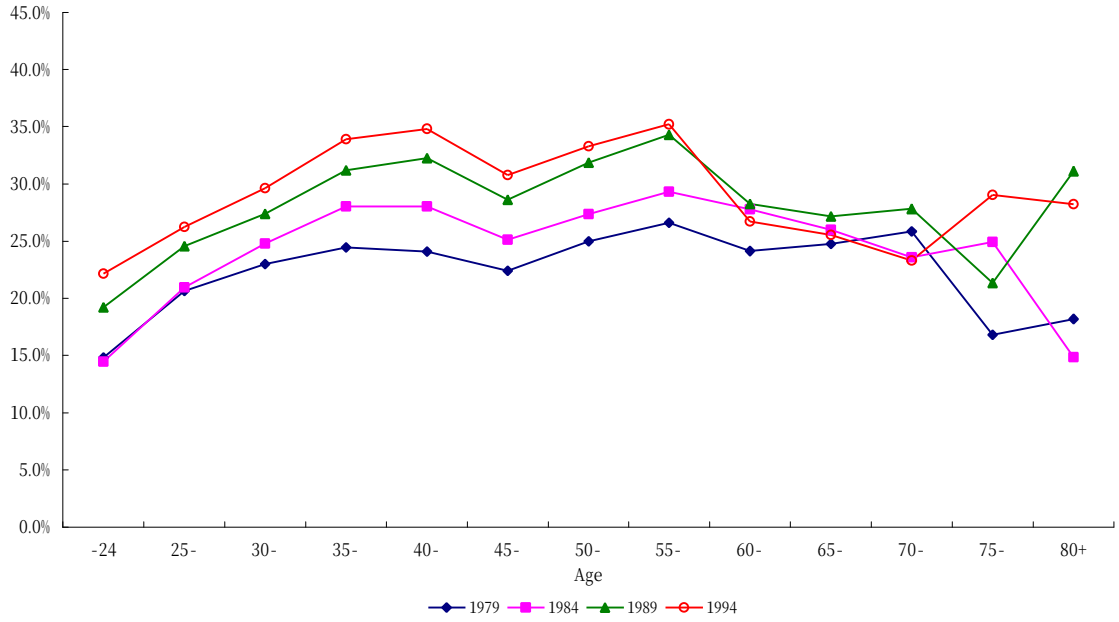


Fig. 5 Mean Saving Rate by Cohort

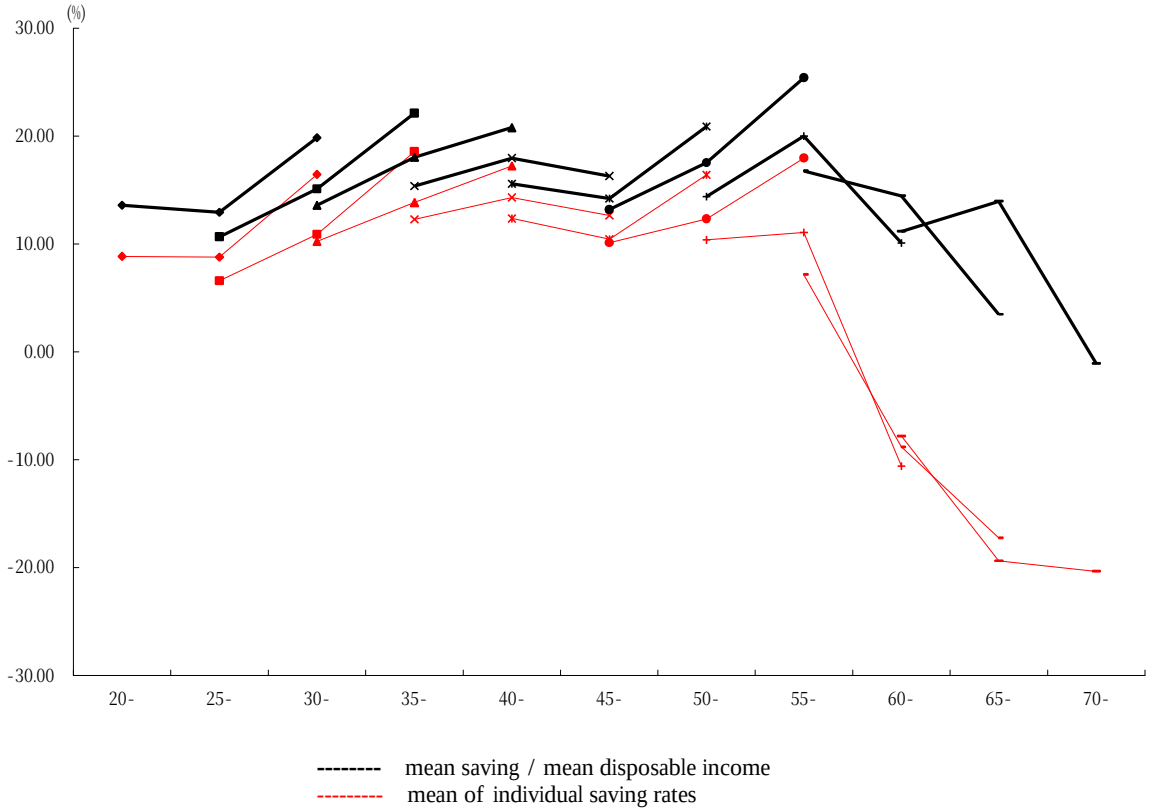


Fig. 6 Median Saving Rate by Cohort

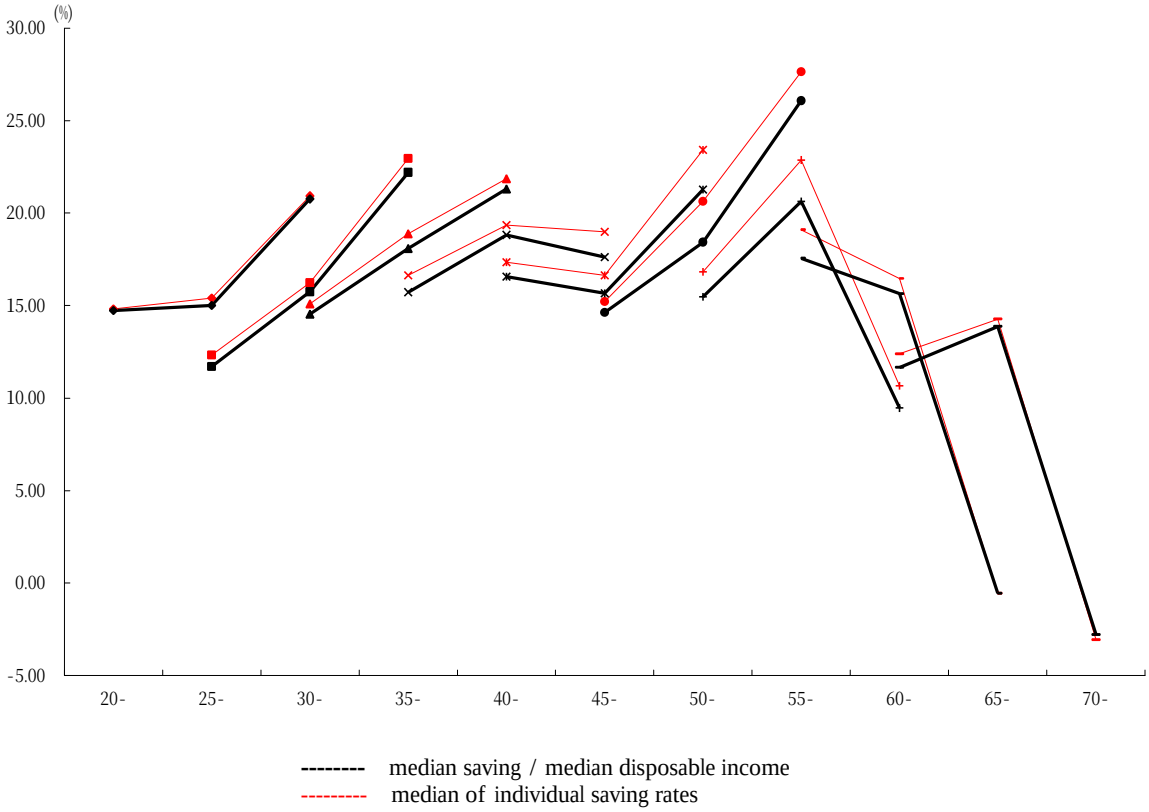


Fig. 7 Distribution of Saving Rate by Income Decile (Total)

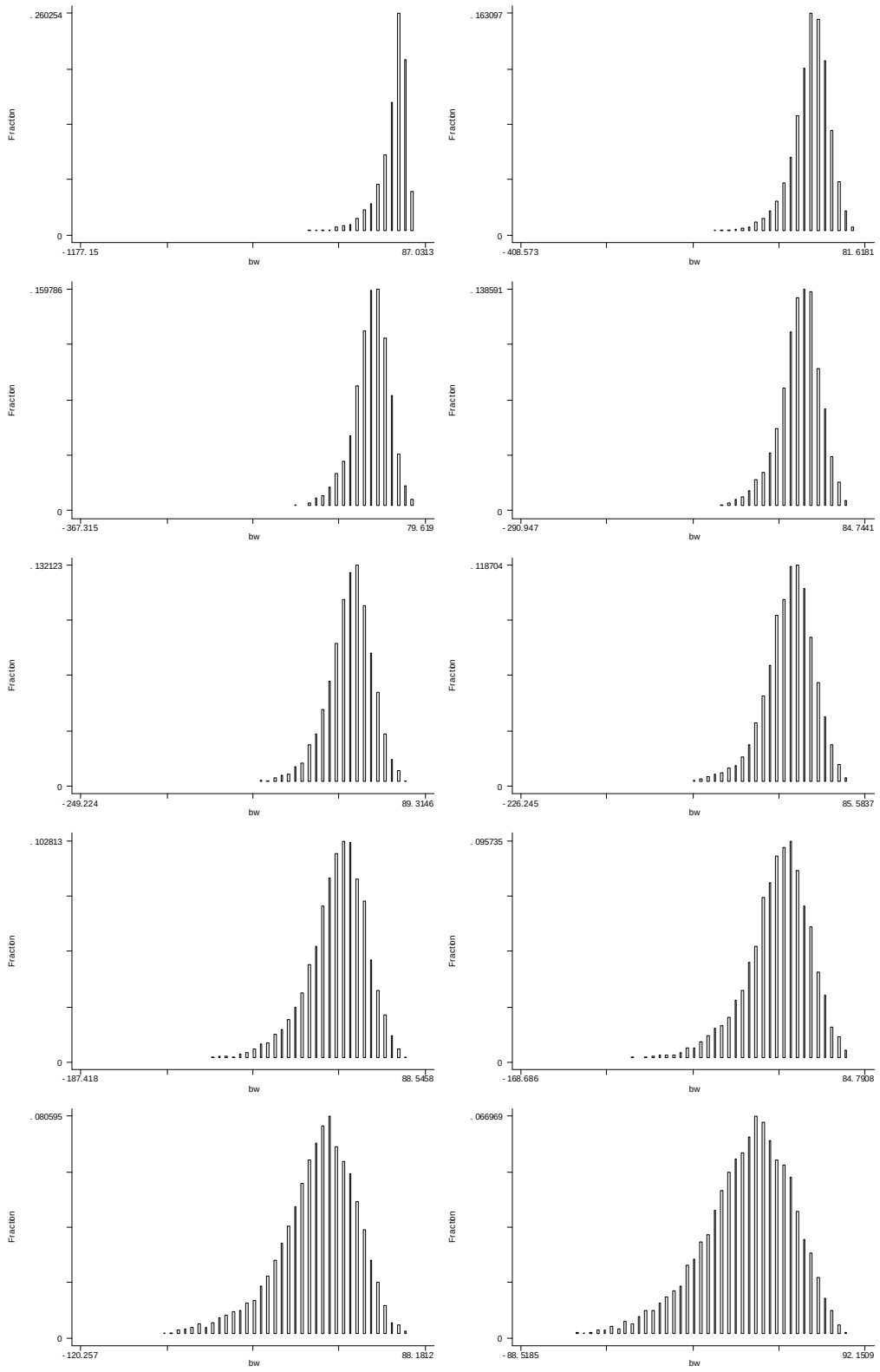


Fig. 8 Distribution of Saving Rate by Income Decile (Cohort 1)

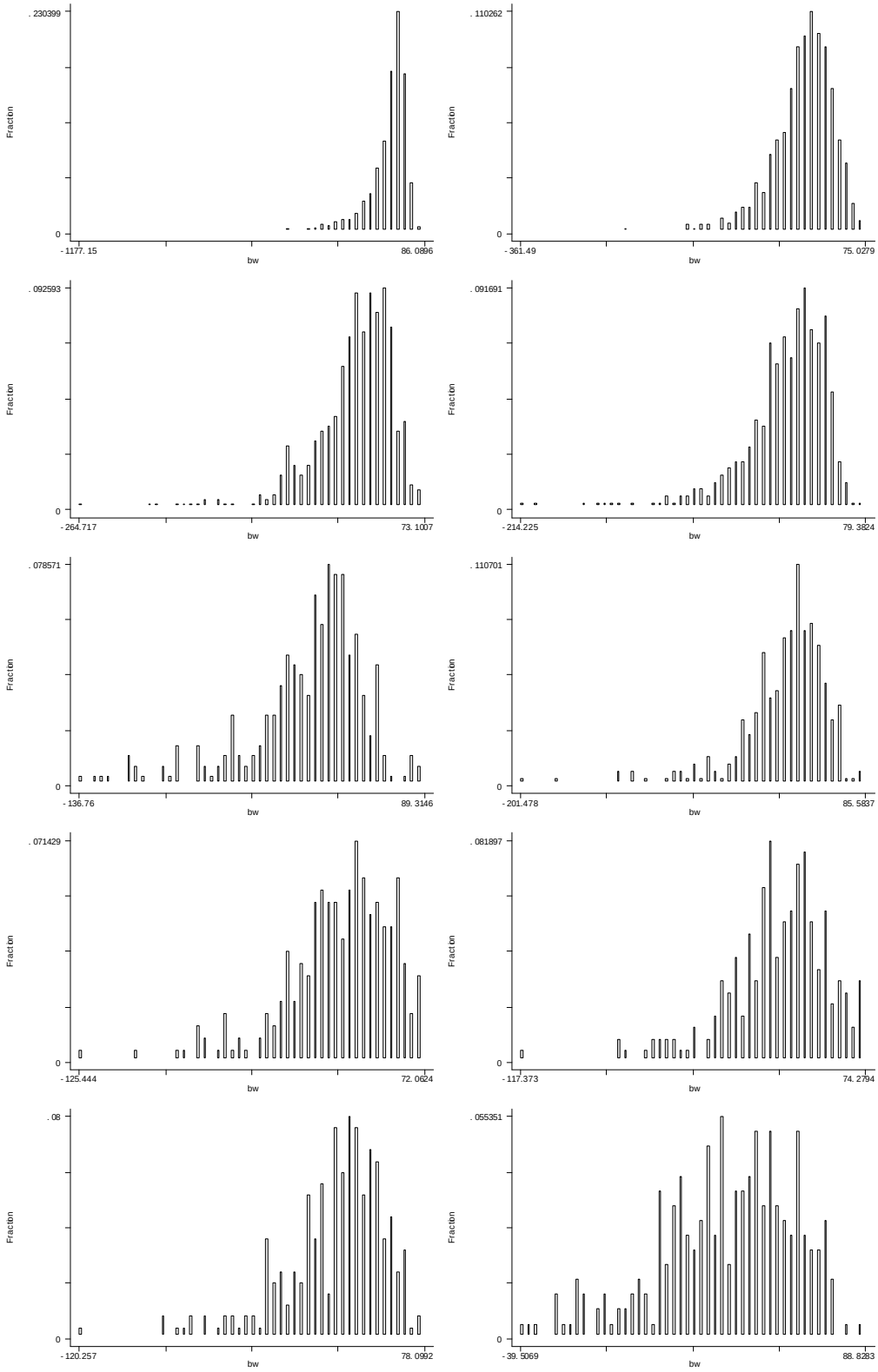


Fig. 9 Distribution of Saving Rate by Income Decile (Cohort 2)

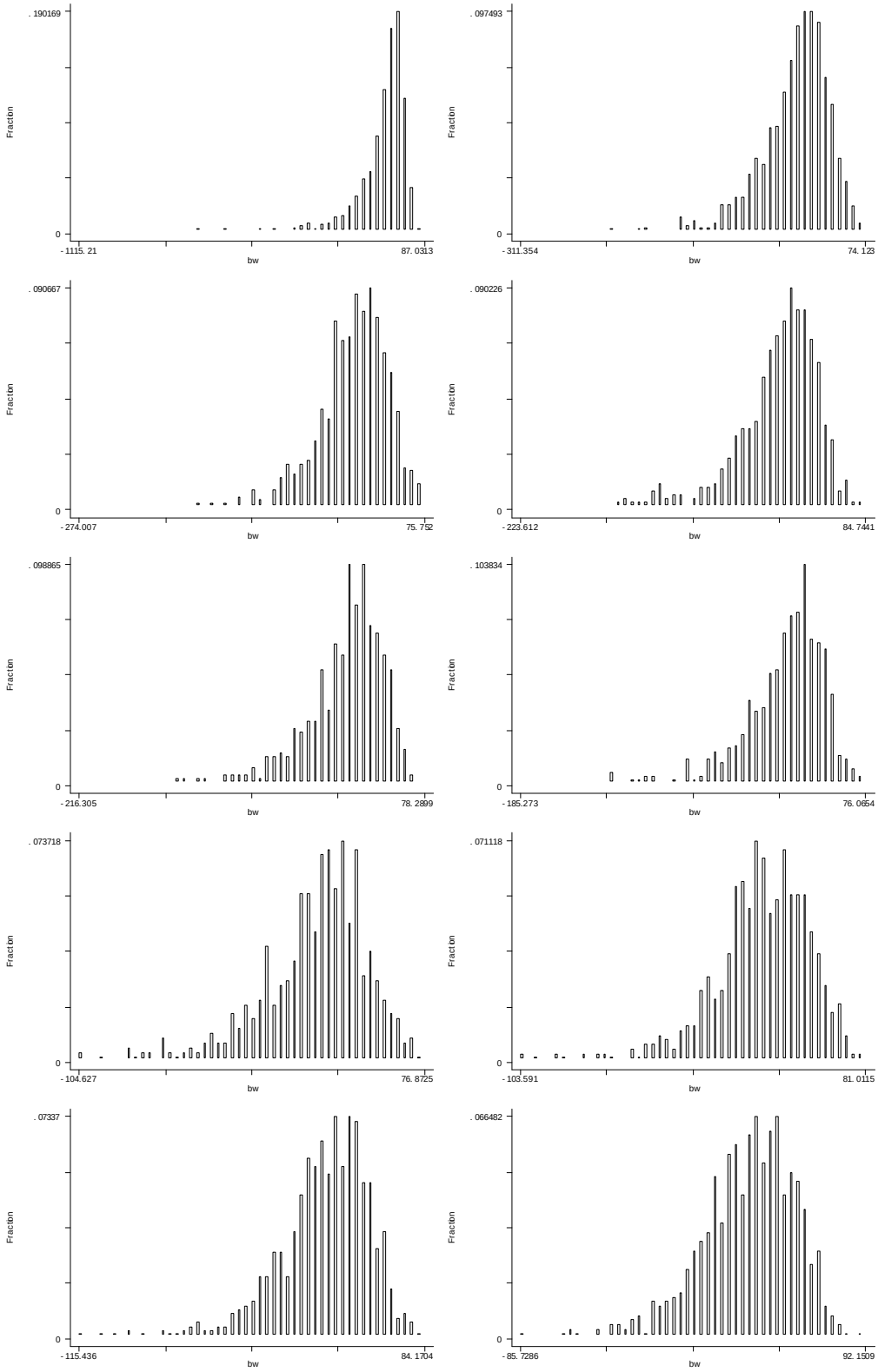


Fig. 10 Distribution of Saving Rate by Income Decile (Cohort 3)

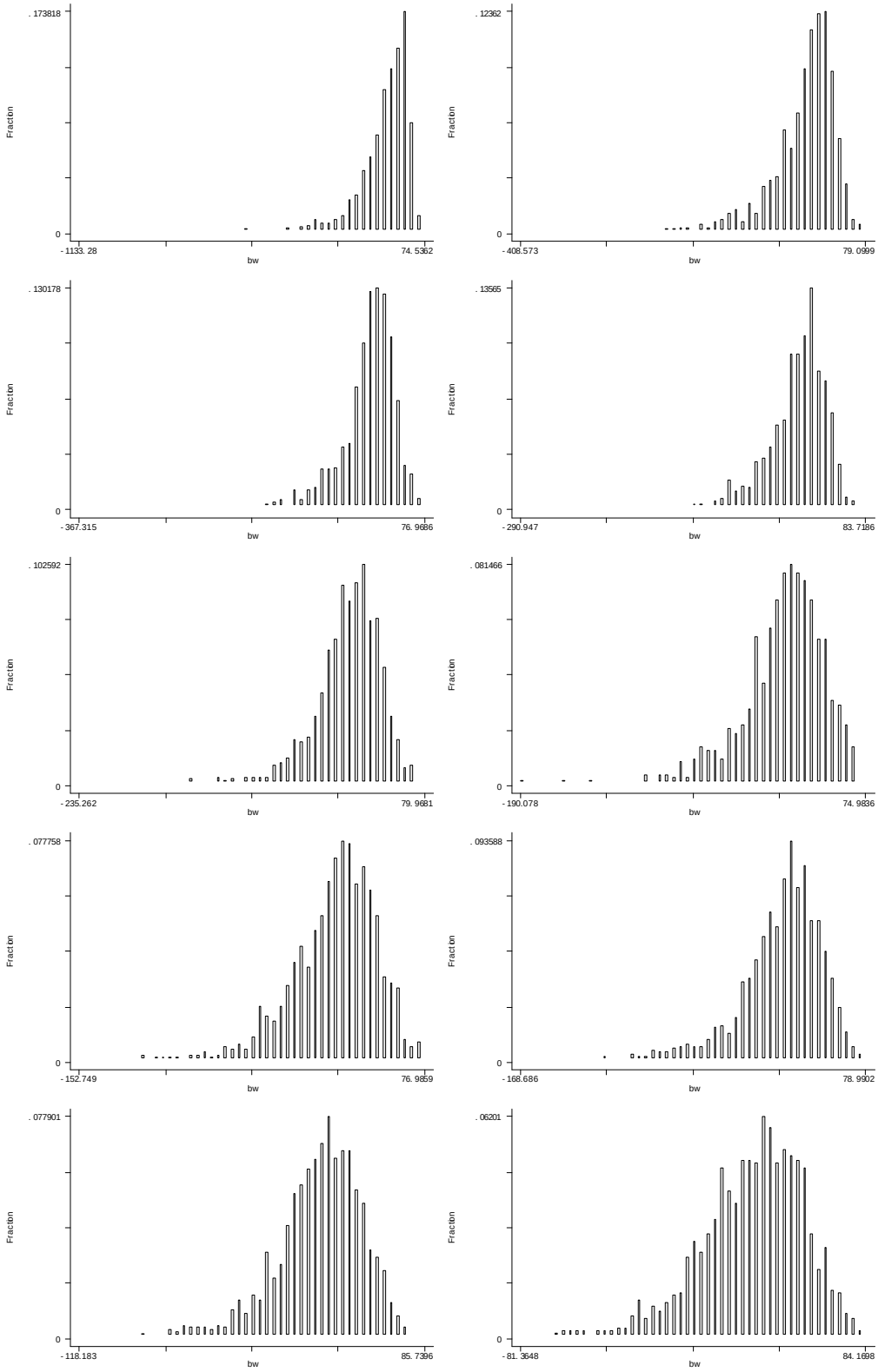


Fig. 11 Distribution of Saving Rate by Income Decile (Cohort 4)

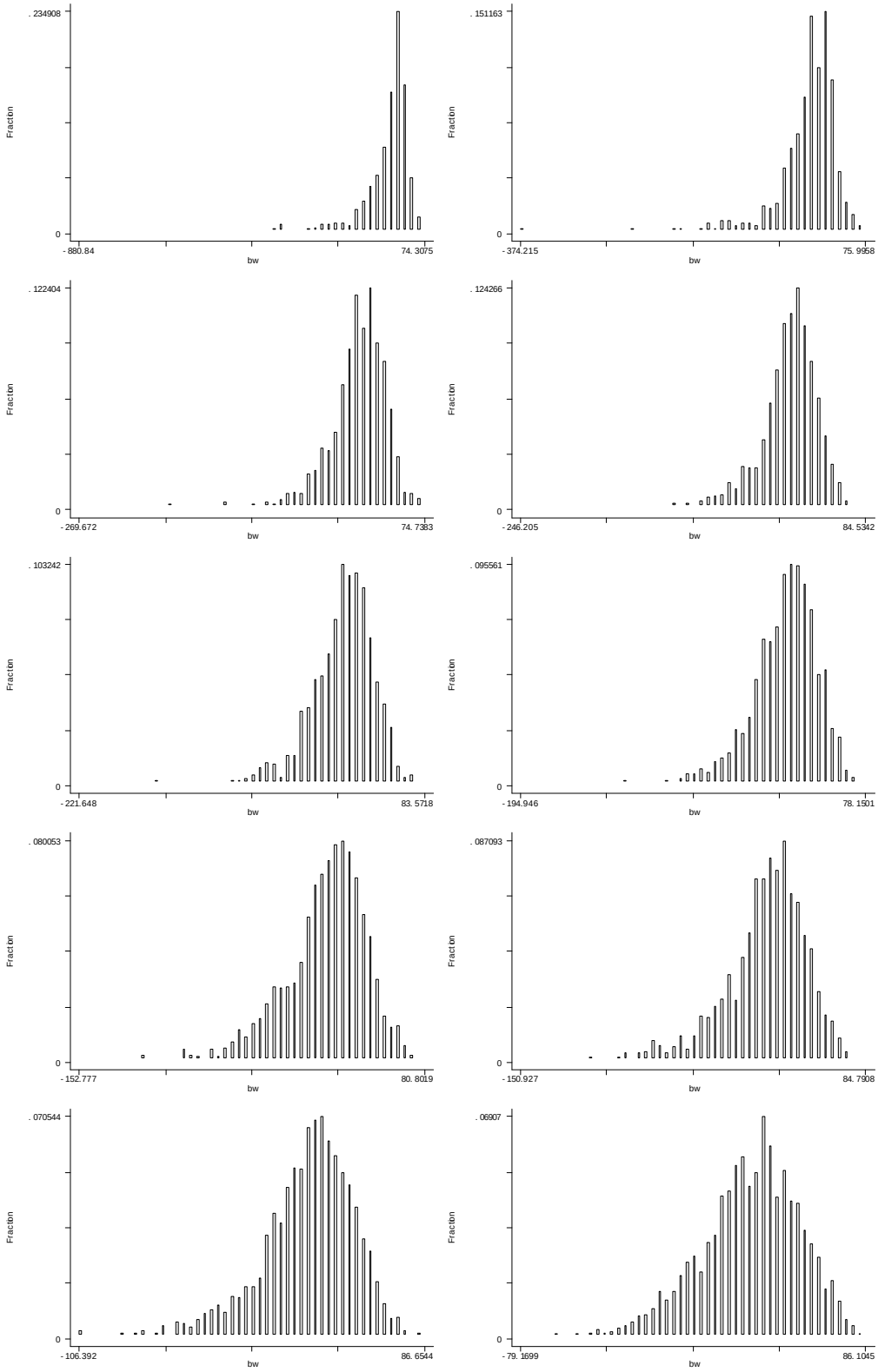


Fig. 12 Distribution of Saving Rate by Income Decile (Cohort 5)

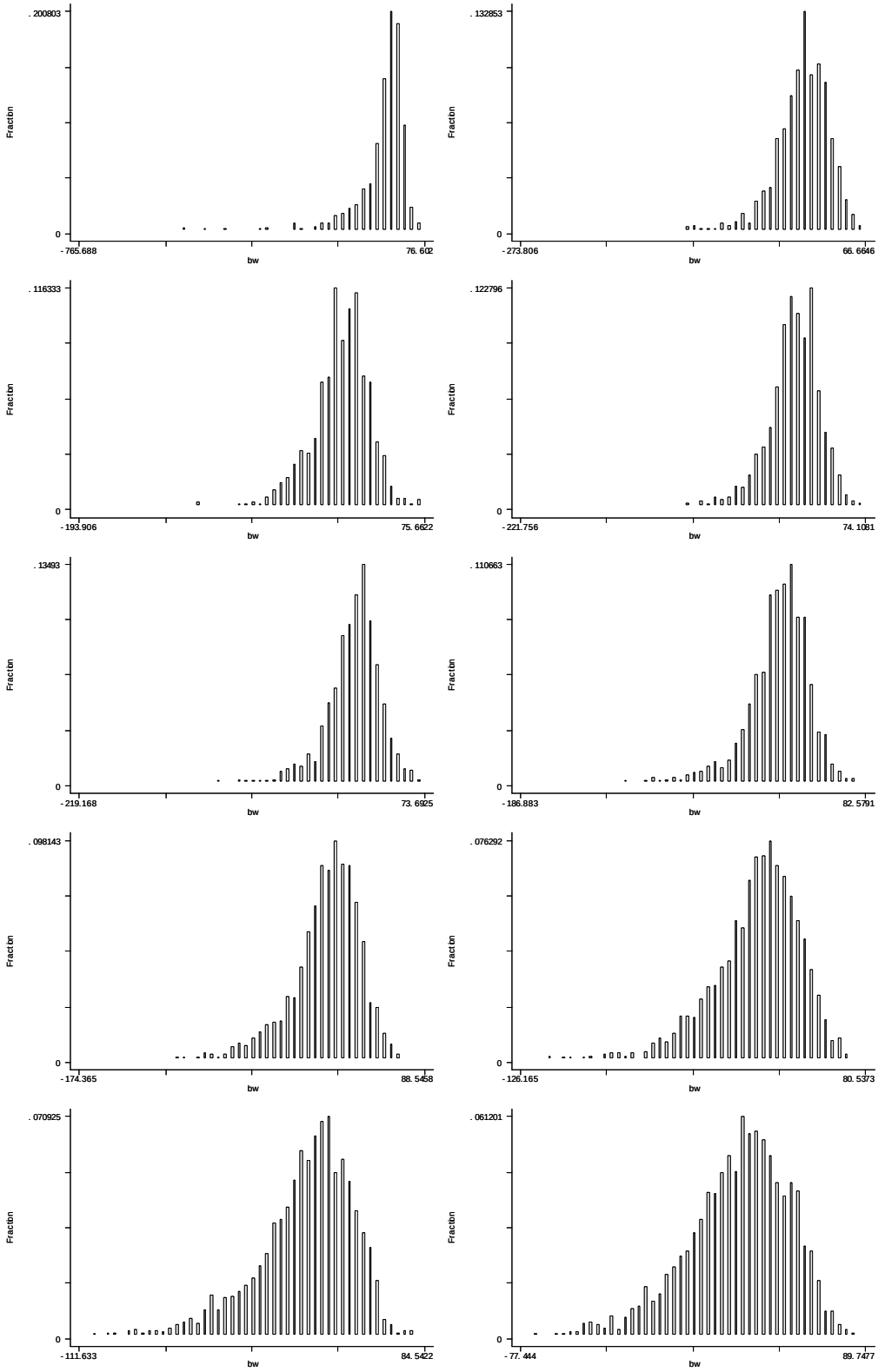


Fig. 13 Distribution of Saving Rate by Income Decile (Cohort 6)

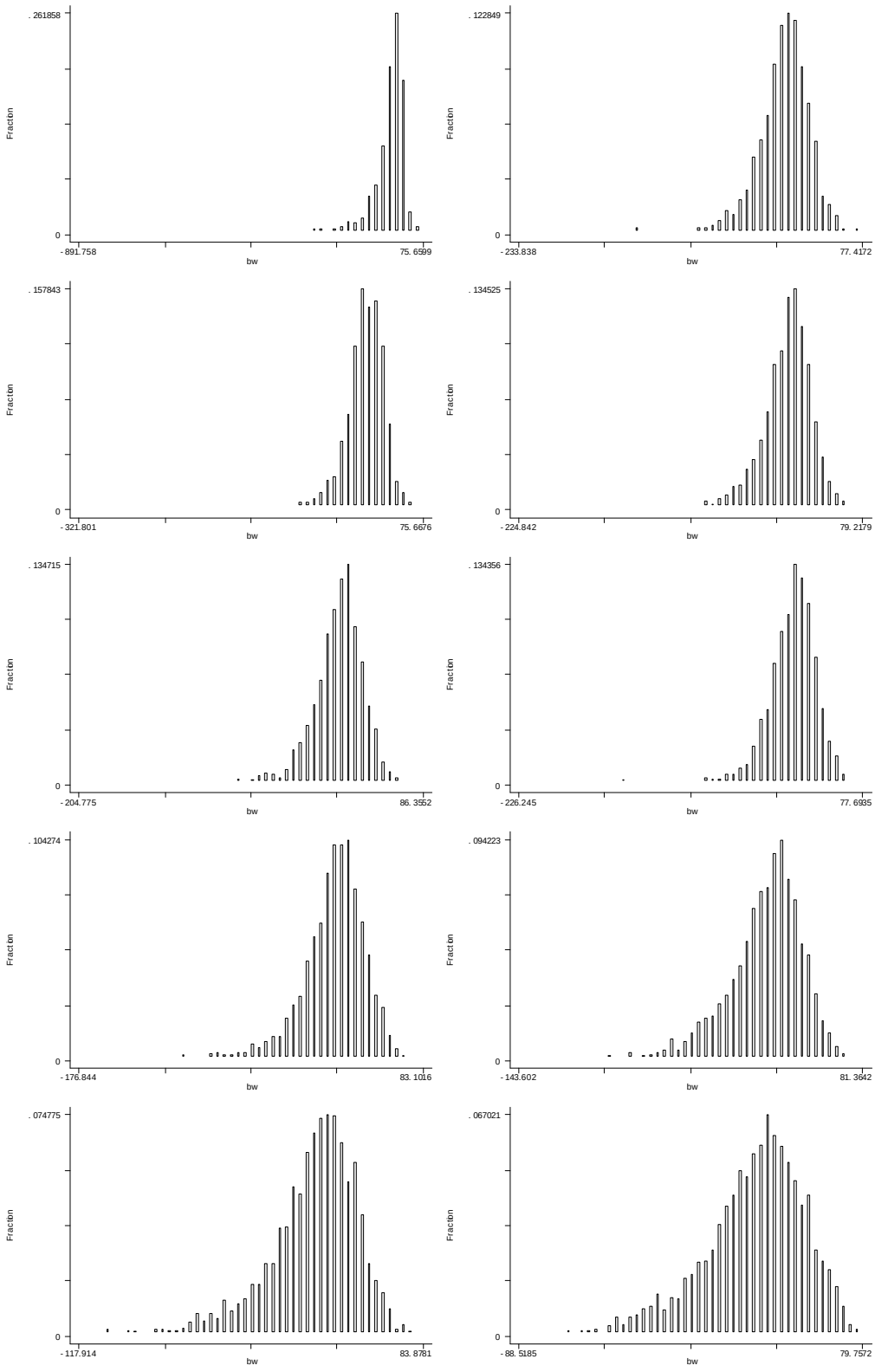


Fig. 14 Distribution of Saving Rate by Income Decile (Cohort 7)

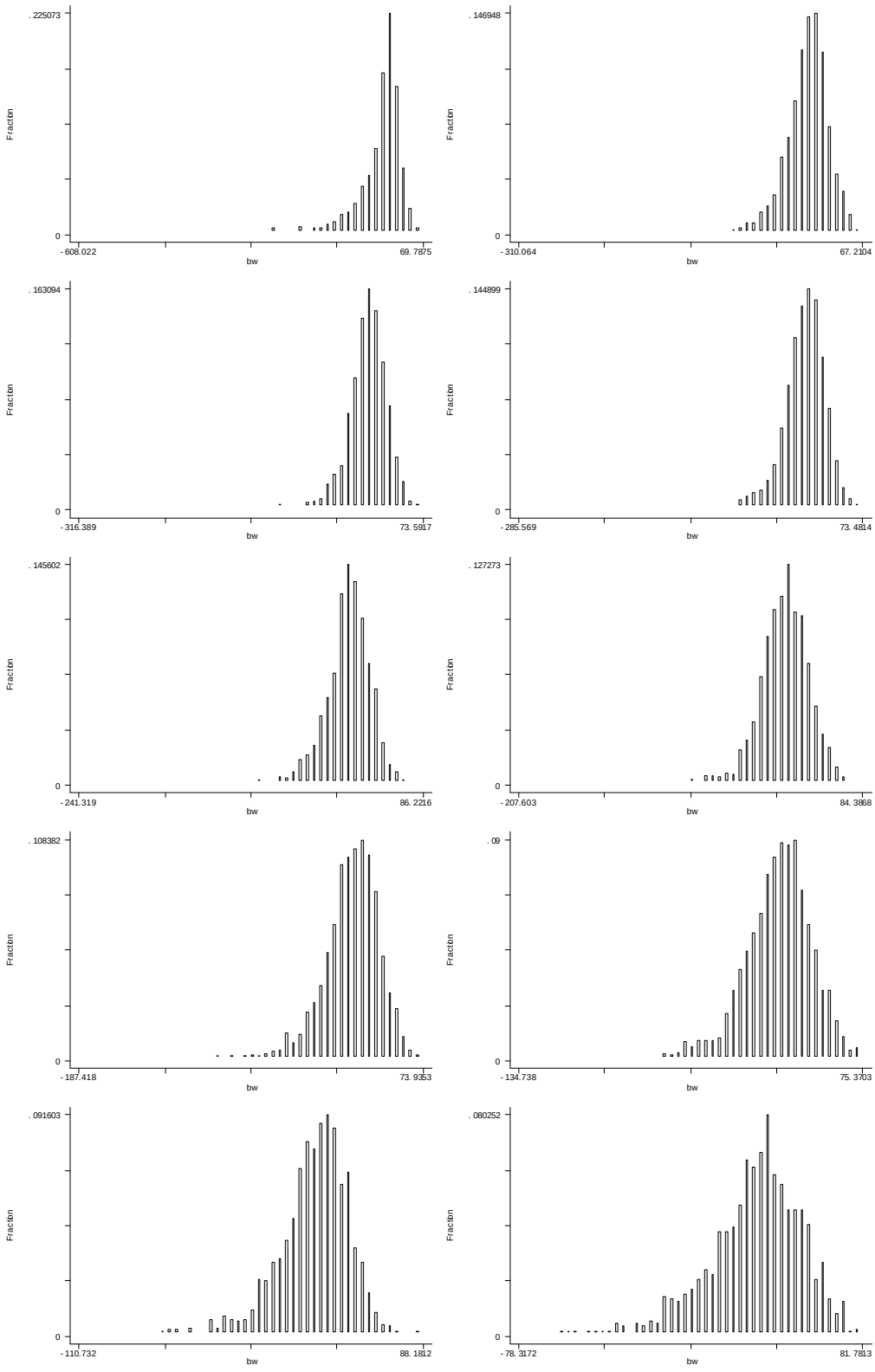


Fig. 15 Distribution of Saving Rate by Income Decile (Cohort 8)

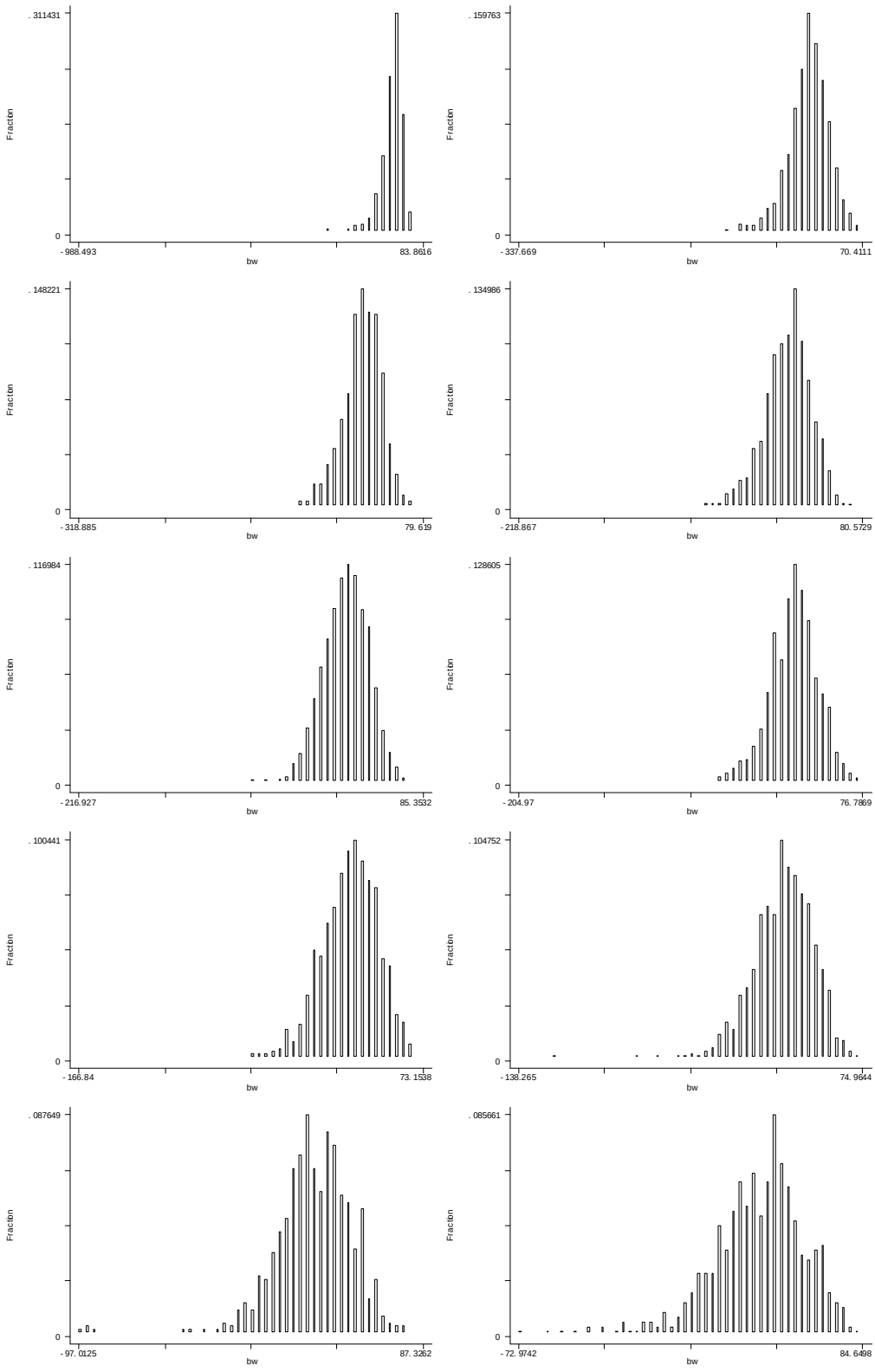


Fig. 16 Distribution of Saving Rate by Income Decile (Cohort 9)