

NATIONAL TRANSFER ACCOUNTS: PRIVATE TRANSFERS

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1 - INTRODUCTION

The objective of this paper is to estimate income and consumption age profiles for Brazil in 1996. The estimation of these profiles is the first step into the National Transfer Account system that will help to study and understand the economic aspects (and impacts) of population aging.

The profiles were estimated using micro-data from the *Pesquisa de Padroes de Vida* (PPV, 1996). Consumption profiles were estimated based on the Engel's method when only household expenditures were available and on direct information when possible (education and health). Income profiles were estimated using the PPV and *Pesquisa Nacional de Amostra Domiciliares* (PNAD), income from employment and self-employment were considered.

The next section describes the demographic transition in Brazil and aging process. The following one describes the data and methods used in this analysis and present the results and discuss some problems and issues observed during the summer workshop.

2 – DEMOGRAPHIC TRANSITION

The Brazilian population, according to Carvalho (1997/1988), is undergoing major transformations in the last few decades, those changes are going to have significant impacts in social and economic variables.

From 1940 to 1970, the Brazilian population could be characterized for being *quasi-stable*, that is the fertility rate was relatively high and constant what maintained a young age structure for the population. During this period, the population under 20 years old represented 52% of the total population, without changes in the composition of the population over time (Carvalho, 1997/1998; Martine & Carvalho, 1989).

In the 1970's it is verified a process of decline of the fertility rates, mainly in the most developed regions of the country and among the wealthier families. The clearest

effects of this trend are: the decline in the population growth rate and the change in the population age structure (Carvalho, 1997/1998).

During the 1990's it is observed, in the country, the simultaneous existence of two-age structure completely different from each other. This means that the population leaves its scenario of *quasi-stability* and can, now, be characterized by its instability, represented by the gradual shift of the large bottom part of the pyramid towards its top.

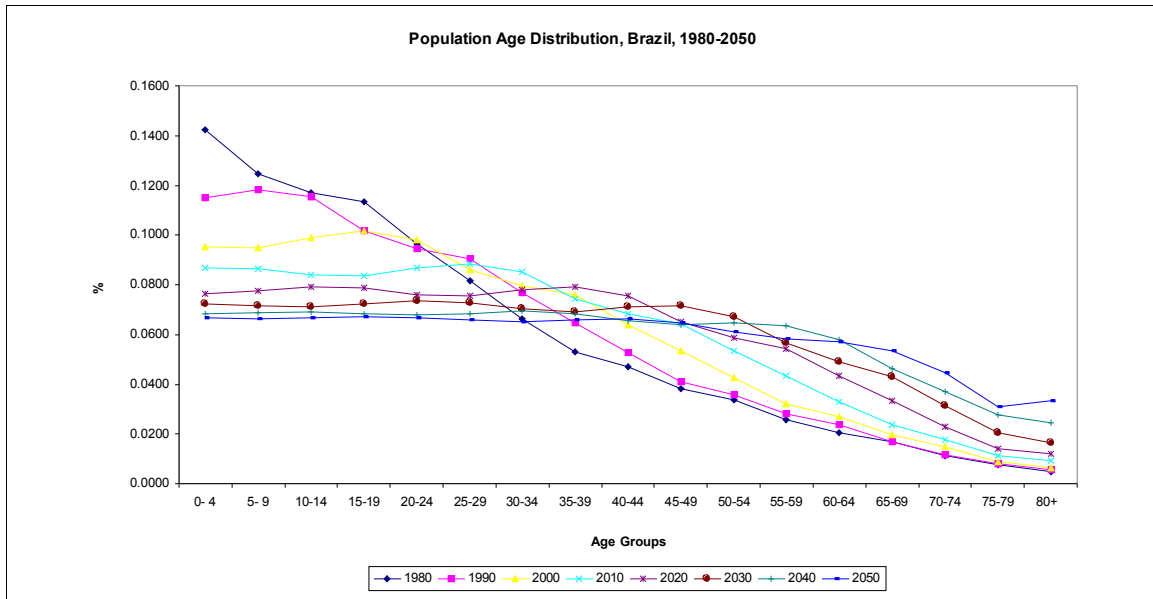
This phenomenon, according to Carvalho (1997/1998), is going to be observed for a certain period of time due to the population momentum. This means that the population today brings with it the results of past schedules of fertility and mortality, the one prevalent between the 1940's and 1970's, characterized by high fertility and declining mortality.

In this sense, it is expected that between 1990 and 2050 the age distribution of the Brazilian population will present the following scenario: the age group under 14 years old growing at slow rates or even negative rates; the group between 15 and 64 years growing above the average level with a declining trend; and the group age 65 and over growing above the average and with an increasing trend.

The following figure summarizes the consequences of the demographic changes in the Brazilian population during the last decades. The population aged 0-14 will show an impressive decline, in the meanwhile the working age group will stabilize its size around 60% of the population, the major change will be observed for the elderly population that will increase from about 3% in 1970 to almost 15% in 2050, according to the IBGE projections.¹

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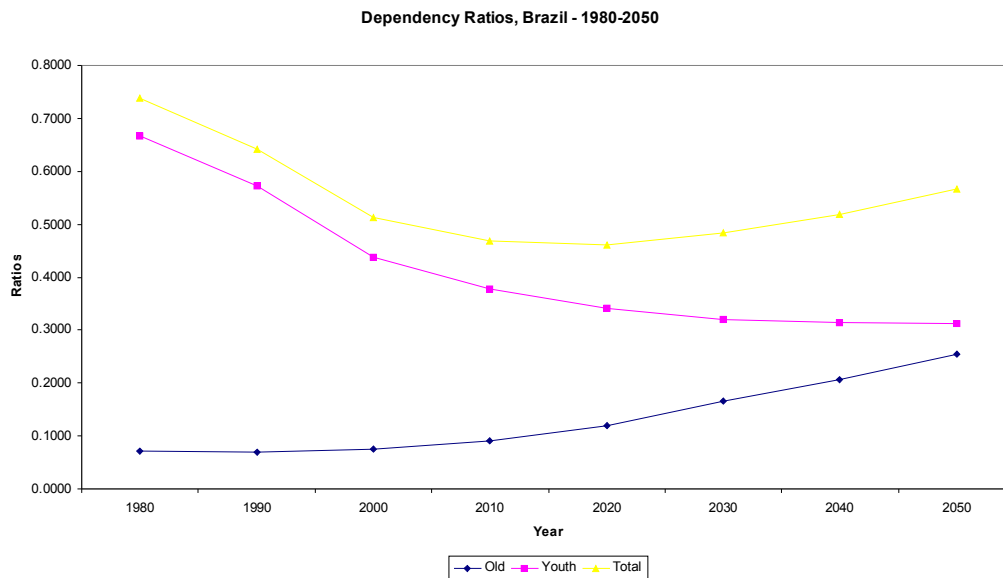
Turra (2001) and Carvalho (1996) show the same scenario using the population projections prepared by CEDEPLAR/UFMG.



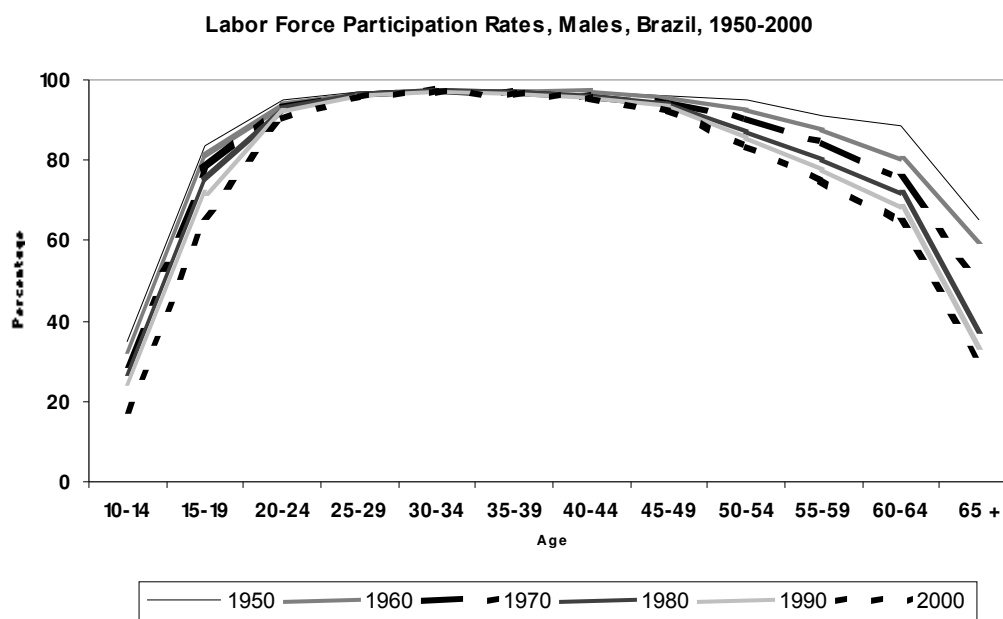
Source: Brazilian Demographic Censuses and Projections (IBGE, 2002)

The socioeconomic impacts of this new demographic scenario can also be seen in the dependency ratio trend from 1980 to 2050, based on IBGE population projections. The graph shows that the dependency ratio will change from a youth based dependence ratio to an elderly dependency ratio in the XXI century. As we can see, in 1980 the total dependency ratio was 73.7% (being the old dependency ratio 7.06% and the youth dependency ratio 66.6%, in 2050 the total dependency ratio declines to 56.7% (but the old dependency ratio increases to 25.45 whereas the youth dependency ratio declines to 31.3%)².

² The dependency ratio was calculated dividing the population aged 0-14 plus 65 and over divided by the group 15-64.



Source: Brazilian Demographic Census and Projections (IBGE, 2002)



The impacts of population aging in Brazil co-exist with a decline in the age of retirement. In 2000 the labor force participation of men 65+ was half of the one observed in 1950. The same rhythm of decline is observed for age groups 55-59 and 60-64. The main explanation for this rapid decline in labor force participation at older ages is the universalization and generosity of the Brazilian social security system.

3 – DATA AND METHODS

3.1 - Consumption

The collection of detailed household consumption-expenditures surveys in Brazil is rare, normally taking place every 10 years. The first survey to collect information on household expenditures was made in 1974. The National Study on Family Expenditures (ENDEF) was carried out in all urban and rural areas of the country and collected a comprehensive array of variables on household expenditures. The *Pesquisa de Orcamentos Familiares* (POF) is the ENDEF's main successor. POF is carried out every 10 years, the first one in 1985/1986 and the last wave in 1995/1996. Its main advantage is the level of desegregation of the questionnaire, but it is very limited since it covers only 11 metropolitan areas. The *Pesquisa de Padroes de Vida* (PPV) was the last survey carried out to collect this type of information, covering urban and rural areas in the southeast and northeast of the country. It is the most recent survey to cover regions outside of the metropolitan areas with a relatively complete questionnaire on household consumption and expenditures.

The principal source of data in this paper is the *Pesquisa de Padroes de Vida* (PPV). PPV was developing under the project “Living Standards and Measurement Survey”, sponsored by the World Bank. The sample comprises 4940 households and 19409 individuals. The study has detailed information on demographic (fertility, mortality and migration) and socioeconomic variables (labor force, income), household expenditures, wealth and transfers³.

Expenditures with non-durable and services are the main component of the household, and individual, consumption profile. The PPV collects household monthly expenditures divided in specific groups: food, health, education, transport, clothing, housing and housing services, general and personal services, and others. The data are collected at the household level but for education and health expenditures. In addition, specific consumption items such as clothing, tobacco and alcohol can be allocated to specific age groups, mainly adult and children.

The main task, when using consumption data, is to allocate household consumption to individuals. In our case, education and health were directly allocated to the individual who receive the service since the information is available in the survey, for

³ Several authors evaluate the quality of the PPV. Population by sex and age are similar to estimates from Brazilian census and other surveys. Labor market outcomes are robust and similar to other surveys.

the other goods and services we estimate consumption shares based on Engel method.

Deaton (1997) describes and discusses the method developed by Engel to allocate household consumption to individuals. The basic assumption of the model is that the household relative expenditure with food is a good estimator of household well being. The Engel's Law also suggests that as the household increases its total level of consumption the share of expenditure on food decreases and given the amount of total expenditures a larger household will have a larger share of food consumption. Based on this assumptions it is possible to estimate the cost of adding a additional member to the household, based on their age group, that will maintain the household well-being constant.

As the PPV records expenditure at the household level, it is necessary to calculate individual equivalent expenditures for each person in the household. Following Workings specification of Engel's Model, equivalence scales can be calculated by estimating;

$$w_i = \alpha_i + \beta_i \ln(x)$$

As elaborated by Deaton (1997), Workings model can be extended to incorporate household demographic composition;

$$fs_i = \beta_0 + \beta_1 \ln\left(\frac{X_i}{N_i}\right) + \beta_2 \ln(N_i) + \sum_{j=1}^{j-1} \gamma_j \left(\frac{N_{ji}}{N_i}\right) + \tau z_i + \varepsilon_i ; \text{ where:}$$

β_1 is the parameter related to household per capita consumption, β_2 is the parameter is the parameter related to household size, and γ are the parameter related to the distribution of the household composition by age. It is expected that the first two parameters to be negative indicating economy of scale effects, that is, larger households behave as if they were better off than smaller households with similar levels of per capita consumption.

3.2 Labor Income

Data for our study come from the *Pesquisa Nacional por Amostra de Domicilios (PNAD)*, a large data set comprising about 90,000 households, sample represents 97% of the Brazilian population, does not include the rural north. The PNAD consists of cross-sections collected annually since 1971 except in 1994 and in the census years 1980, 1991 and 2000 The data contain a comprehensive and comparable set of demographic and

economic variables, including detailed information on economic activities.

Information on labor earnings is collected for all individuals' ages 10 and older who worked for pay during the survey's reference week. Labor earnings are self-reported and include income before taxes from all jobs held during the reference week as well as the value of fringe benefits. To estimate labor earnings we include both employment and self-employment income. To what extent self-employment income collected directly in the PNAD provide an accurate picture of labor earnings is not known. Respondents are likely to confuse capital and labor returns in household surveys (Corder 1991; Deaton 1994) and thus, the estimates may be inaccurate.

We calculate average labor earnings of all those aged 10 and older by five-year age groups in the years 1978 to 2001. Because the Brazilian economy was characterized by high inflation rates and several changes in currency during the period of analysis, we calculate inflation adjustments using the monthly consumer price index estimated by Corseuil and Fogel (1999). The authors construct a price index specifically to adjust labor income estimates, based on data collected by the Census Bureau in the 10 largest metropolitan areas and the Federal District of Brazil. We present inflation-adjusted labor earnings in 1998 Brazilian Reais (R\$).

In addition to that, we also calculate labor earnings using the PPV for 1996. The information on earnings available in the PPV is similar to the PNAD. Monthly labor earning is informed for all individuals who worked during the week of reference. Labor earning is self-reported and includes income before taxes from all jobs held during the week of reference. Information is available for all employed and self-employed workers (entrepreneur). As discussed above, it is not possible to separate capital returns from the labor income reported by self-employed workers. We adopt a simple rule of allocating 2/3 of the income to labor and 1/3 to capital returns.

Labor income age profiles for previous years (before 1979) can be estimated using the Brazilian Census. Microdata are available since 1950 from IPUMS. Brazilian censuses are decenal and are considered to be of good quality.

4 – RESULTS⁴

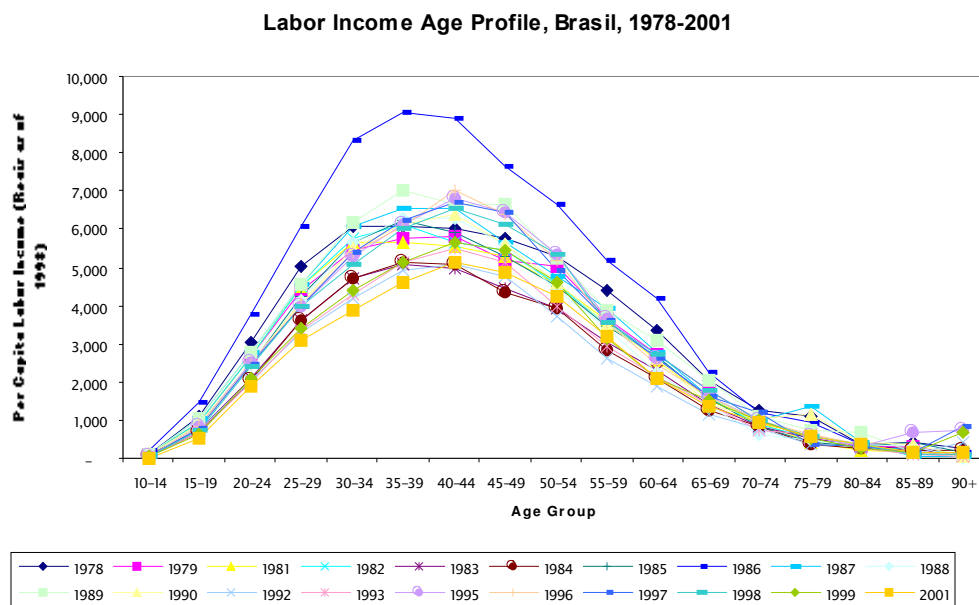
4.1 Labor Income

Labor income age profile from 1978 to 2001 is presented in the following graph.

⁴ It is not corrected by the National Accounts not weighted by population size.

The trend over time of labor income profile in Brazil shows individuals going into the labor market at older ages, hence accumulating more human capital, and leaving the labor market at younger ages, indicating early retirement. The mean age is around 40 for all years, but the peak as younger cohorts, who accumulated more human capital, command higher wages.

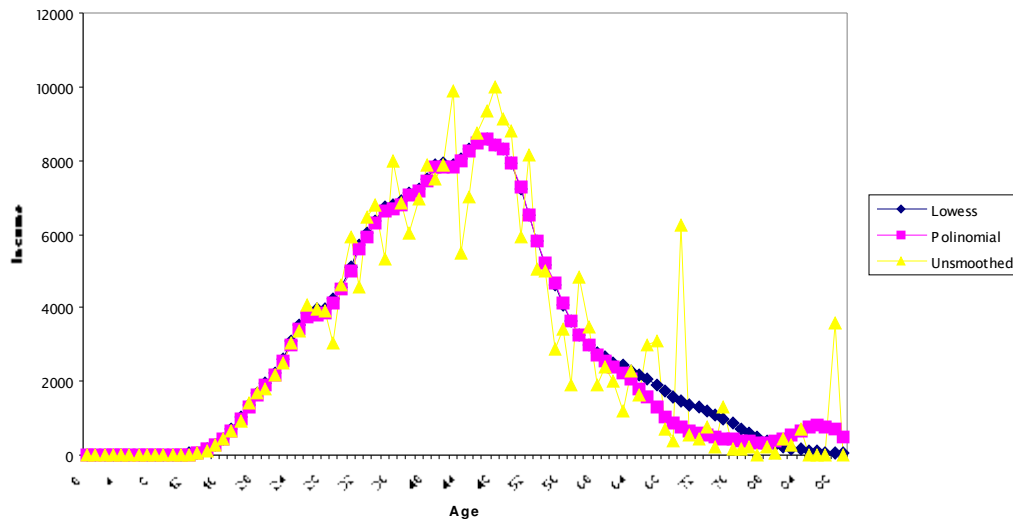
We do not present here income separated by employees and self-employed. In addition to different levels, self-employed have lower average income; the shape of the profile is different. Self-employed income profile peaks at older ages, but also indicates the easiest port of entry to the labor market (we observe higher income for young self-employed than employed).



The following graph shows the 1996 age income labor profile. This profile is used to compute lifetime deficit. The shape of the profile is similar to what is observed in other periods. In comparison with developed countries, France and Australia, we see a much smoother exit from the labor force and a higher percentage of children in the work force. It was estimated that around 4% of lifetime income is made before age 20 and 8% after age 65, values two times larger than what was observed to the two developed countries⁵.

The graph presents data for age income profile unsmoothed and smoothed using Lowess (bandwidth = 0.10) and Polynomial Regression (6 degrees). Both procedures to smooth the data provide the exactly same result up to age 60. The exercise shows the importance of considering alternative smoothing techniques, especially for old age workers. In this example, it is clear that the polynomial regression has a better fit to individuals age 60 and plus than lowess, although it is noticeable the problems deriving from the small sample size of the elderly population on this survey. The best alternative seems to be estimating labor income profiles from PNAD (Household survey) and Censuses, and use the PPV solely to estimate consumption profiles and transfers.

Labor Income Age Profile, different procedures of estimation, Brazil, 1996



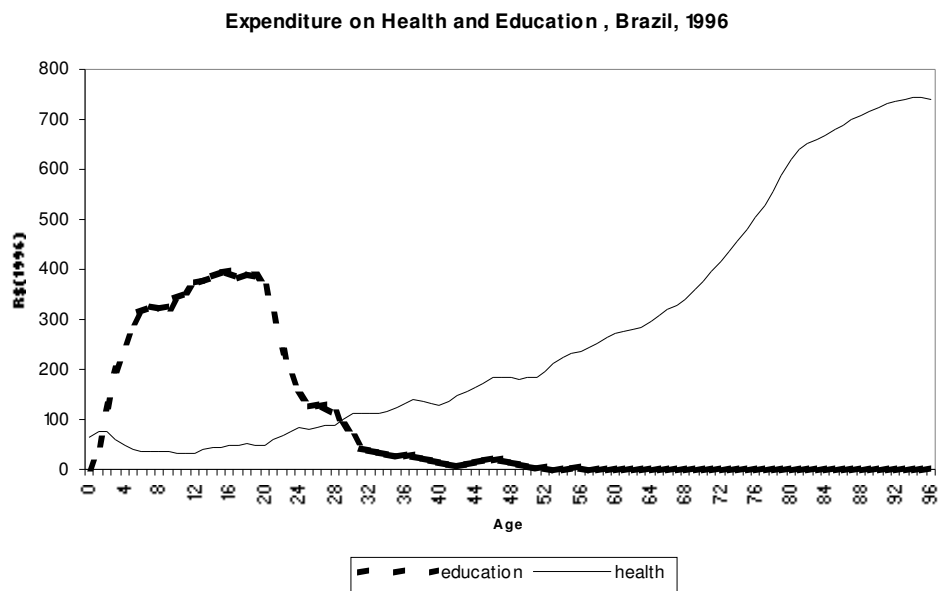
4.2 Consumption

Consumption age profile is presented as they were calculated. We first show and discuss educational and health expenditures, and then we presented and discuss the consumption of other goods and services and the total level of consumption.

It is important before presenting the estimates to present some information about

Estimation presented by Professor Andrew Mason at the 35th Summer Seminar on Population and Health.

the Brazilian educational and health systems. Public and universal health coverage is available to all residents since 1988. Most of the medical expenses are covered by the Unified Health System (SUS); the main exceptions are pharmaceutical and some more specific exams. Therefore, the level of private expenses in health is a small percentage of total private expenditures since most of health consumption is financed by public expenditures, a clear evidence of private-public crowding out. Similarly, public education is available to all children age 5 to 18, and part of higher education is also available at public universities. Education attainment in Brazil is relatively low when compared to more developed countries. In 2000 95% of children aged 7-14 were enrolled in school, only 78% of children 15-17 and less than 40% of individuals aged 18-24 were enrolled in school.



Estimates are based on individual information collected by the survey and will be used to compare with the regression allocation method (not presented in this report). The graph shows higher expenditures on education for children and higher consumption of health by the elderly.

The expenditures on education indicate that college students are more ‘expensive’ than high school and junior high school students. Similar results are observed in the United States, Australia, France, and Taiwan.

The consumption of health is largest for the elderly and lower to all other age groups. Surprisingly, health expenditure on infants is very low when compared to other countries and other age groups in Brazil. It is possible that this consumption is financed by public expenditures; however further research is necessary in this area.

The consumption of other goods and services were collected at the household level and allocated to individuals using the Engel's method. The following table shows the procedure for a hypothetical household composed by a couple and an extra member of different age groups.

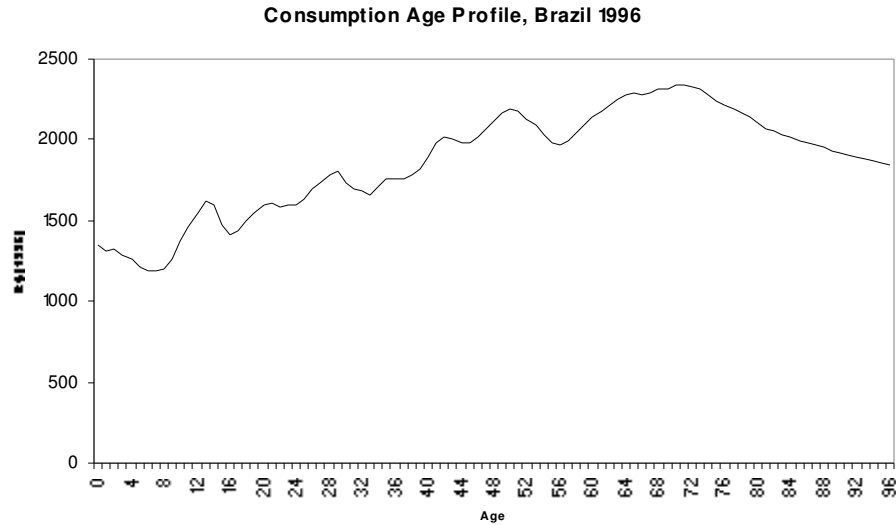
Comparing the Cost of an Extra Member to the

Household

Age Group	Equiv. Scale
0-4	0.8299
5-9	0.7748
10-14	0.8728
15-19	0.7908
20-24	0.7789

The cost of a children aged 0-4 is higher than a kid aged 5-9, a somewhat surprising result when compared to estimates in the literature and other countries presented during the workshop. The equivalence scales estimated using the Engel's method suggests that more research should be done in this area and better estimates should be provided. An interesting idea would be the use of estimation present in the literature and observe how it would affect the consumption profile. Also, regression models other than OLS should be used to estimated Engel's curve in order to compare to original estimates and to give us more support in the development of the project.

The following graph shows the consumption profile for Brazil in 1996. We observe that individuals between the age of 60 and 70 consume more than any other age group in Brazil what is a similar result to previous research using different methodology.



4.3 Life Cycle Deficit

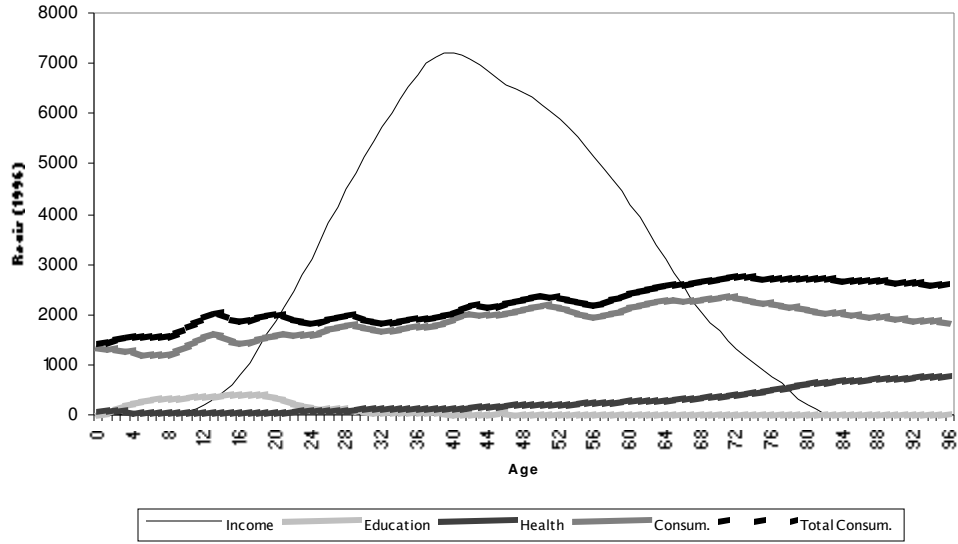
The following figures show income, consumption profiles and the life cycle deficit. The difference between income and consumption by age is the net contribution of each age. Person who consume more than produce ($C > I$) they are referred as dependents on the household economy, individuals who produce more than they consume ($C < I$) are referred as an asset to the household income.

The overall pattern of the net contribution shows two period of dependency and one period of production. In the household, individuals are dependents from age 0 to age 20 and from age 65 and above. This result provides us with a good illustration the possible effects of population aging on the economy the provision of public goods.

This graph shows the relatively small percentage of private expenditures on health on education by the private sector. This figure is likely to change when public expenditures on health and education entered the calculation. As we discuss before, Brazil has universal access to public education and health services.

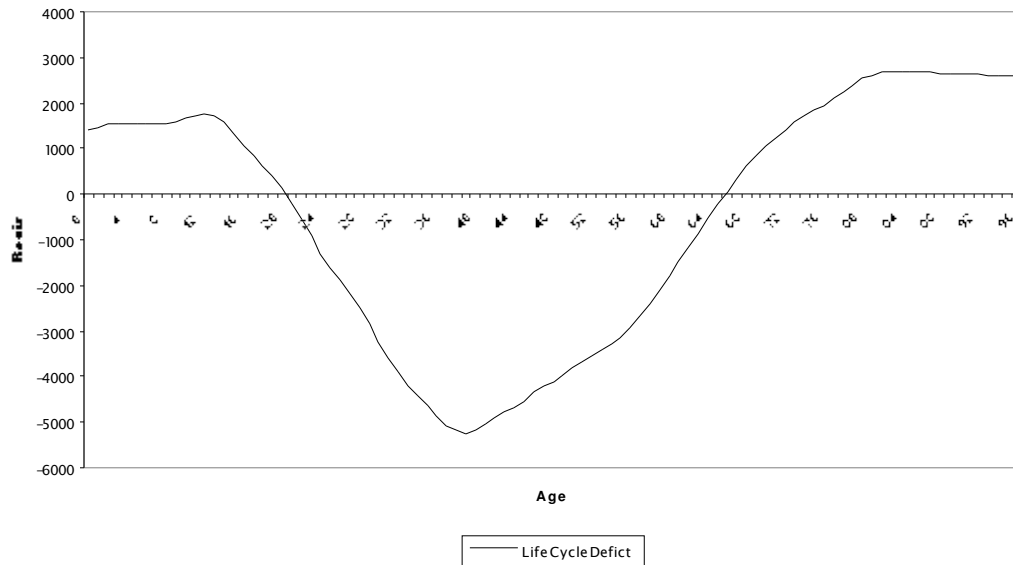
Whereas income varies a lot with age due to differences in human capital, cohort effects, entry and exit from the labor force, consumption profile is fairly flat across age groups.

Labor Income and Consumption Age Profiles, Brazil



The life cycle deficit is more clearly illustrated in the following graph. The graph is constructed by simple subtracting income from consumption. Negative values indicate that individuals are making transfer and positive values indicating that they are receivers of transfers.

Life Cycle Deficit, Brazil, 1996



5 – CONCLUSION

The study of private consumption and income profile is an important and fundamental part of the National Transfer Accounts. This study aimed to estimate labor income profile and consumption profile for Brazil in 1996 using a special edition of a consumer expenditure survey (PPV) and traditional estimating techniques (Engel's Method).

The study shows that elderly in Brazil consume more than any other age group and private health expenditure comprise a significant part of these consumption. The consumption of the elderly might be higher when we add public transfers given the amount of health services consumed by the elderly and the generosity of public pension system in Brazil.

The mean age of production and consumption are very close to each other indicating the size of upward transfer in a country still relatively young. The rapid aging process in Brazil might be accentuated, if compared to other developing countries, given this characteristic.

The exercise has shown the necessity to produce better estimates of individual allocation of household consumption. During the workshop several problems were found and discussed about the use of the Engel's method and simple OLS regression to allocate consumption to household members. Also, it is important to define and homogenize the smoothing procedure since preliminary estimates using Lowess were not very satisfactory.

During the workshop I started to work with public transfers more specific with health, education and public pension. In patient public expenditures resemble the mortality curve to Brazil and this approach can be used to periods when age specific transfers are not available. For education and social security, censuses and surveys provide the numbers of enrollees and retirees (as well as other beneficiaries) and this can be used to estimate transfers.