Health and Labor Supply of the Elderly in the city of São Paulo, Brazil

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Introduction

Brazil is a country in process of rapidly population aging due to a fast decrease of fertility rates and a raise in life expectancy. This process will lead to an increase in the proportion of people aged 60 years or more from 8% in 1996 to 15% in 2020.This perspective implies the doubling of the proportion of the elderly in less than 35 years (Camarano, 2002).

This aging process will be reflected in the labor force, increasing as well the proportion of older workers, given that in Brazil as well as in other developing countries, the age for leaving the labor force is still high. Popolo (2001) points out that one of the possible reasons for such high participation of the elderly in the job market of developing countries might be the low number of beneficiaries of social security or its rather low payment. In Brazil, the social security coverage and the participation levels are not as correlated as in other countries of the region. This happens because the retirement coverage is too broad and the eligibility for receiving retirement benefits has not been conditioned to not being on labor market activity, what leads to an excessive percentage of elderly – retired or not – inserted in the labor force.

Besides, the income of the elderly is an important factor in the reduction of poverty in the Brazilian families (Barros et al, 1999). Their earnings from work, as a part of their total income, are extremely important to the families.

Thus, to study the determinants of labor supply of the elderly is essential, especially in the current context of a raise in the participation of these workers in the total population. Amongt these determinants, health status is vital, given that, in comparison to the rest of the population, people in poor health may leave the labor force more intensively. The study on the relation between health and work is even more important in developing countries, where the elderly have poorer health and less options of financial support.

Having these considerations in mind, this paper will investigate the determinants of the participation of men and women aged 60 years or more in the job market, paying special attention to the relation between health status and labor supply. However, this analysis is subjected to an endogeneity bias that impedes an adequate direct estimate. In order to control this problem, the method of Instrumental Variables (IV) has been used. This method estimates the measures of health by means of a series of variables – called instruments – which only affect health, not the labor force status, avoiding bias in the work model. Different measures of health have been used in order to evaluate the effects of the health status of the elderly upon labor supply.

The source of data used in this paper – *SABE* – is a survey about health, welfare, and aging in Latin America and Caribbean. It was carried out in the year 2000 in several Latin American cities under the coordination of the Pan American Health Organization. In Brazil, the city of São Paulo was chosen and the survey was financed by the Research Support Foundation of São Paulo – *FAFESP*.

An approximation to the determinants of labor supply of the elderly

The interest in labor supply of the elderly begins with the concern about the possible consequences of the raise in the proportion of older people for the retirement systems of developing countries. If population ages, the proportion of beneficiaries may overcome the proportion of workers depending on the older workers' retiring age.

According to Mete & Schultz (2002), when labor supply of the elderly in developed countries is studied, the most important factor to work with is their need for time and income. Because of that, questions such as retirement insurance benefits and disability insurance are taken into account, as they are of great importance in the decision of moving out of the labor force. However, in developing countries, where the income is low and the retirement benefits are poor, the decision of leaving the labor force is related to "a more common context of labor supply, which includes non-work income, wealth, salary offer, family support, and health status of the elderly" (Mete & Schultz, 2002).

Among the determinants investigated in the literature about the work of the elderly, age raise is one that impedes their permanence in the labor force. It happens both because the individual can live with other sources of income – retirement benefits or asset accumulation throughout life –, and because of the decrease in the individual's physical, mental, and social capacity in a way that work income does not compensate for the losses it might undermine. Conversely, education is positively correlated with the permanence of the elderly in the labor force and with more erratic strategies at the end of working life (Blau 1994). Haider & Loughram (2001) identify higher levels of education among working-aged people (over 65 years old) in relation to the total number of the elderly. This behavior is also observed in the level of education in developing countries (Parker, 1999; Mete & Schultz, 2002; Liberato, 2003).

Marital status shows entirely distinct effects on men and women. Married men are more inclined to have a more classic work cycle path – they start working still young in full-time occupations and retire at the end of working life also from full-time occupations (Blau 1994). On the other hand, single women tend to stay longer in labor force than married women do (Perachi & Weltz, 1994).

Non-work income is negatively related to the permanence in full-time occupations, but relates positively to part-time occupations and erratic trajectory (Blau, 1994). According to Benítez-Silva (2000), to receive pension or retirement benefits has a positive impact on the transition from working to non-working life; however, income also has a positive impact on the return to work. This evidence is in accordance with Haider & Loughram (2001), who stated that the individuals over 65 years old who continue to work are the wealthiest ones. On the other hand, in a study about the retirees' labor supply in Brazil, Liberato (2003) shows that, the higher one's retirement benefit, the lower one's probability of being working.

In the literature about developing countries, determinants about family arrangements are also considered. In a study about the elderly in Indonesia, Cameron & Cobb-Clark (2001)

observed that the elderly who are not co-residents[1] are the ones who present lowest salaries and who continue working for longer time and hours. The authors suggest that co-residence might be what allows the elderly to work less hours. In a study for Mexico about the effect of health on the work income of the elderly, Parker (1999) verifies that a greater number of children have a negative effect on the permanence of aged women at work, but no effect at all on the elderly men. The explanation for this situation is that women depend more on family relations to support themselves than men do.

Saad (1999) points out in a study about intergenerational transferences inside the families that, in Brazil, differently from in Indonesia or Mexico, these transferences do not happen only from children to parents. Due to the continuing economic crises Brazil has been suffering from – which increase poverty – adult children are becoming more dependents on their parents. Therefore, the co-residence of the elderly with their adult children may be more probable if the elderly are still working and earning a salary, and/or receiving retirement benefits.

Health as a determinant in labor supply of the elderly

The existent endogeneity between health and work is due to the fact that health interferes in the labor supply capacity. At the same time, the fact whether the individual works or not also interferes in the individual's health status. One of the sources of endogeneity is the effect that labor market activity has on health status. The type of job one has may affect one's health through stress, risky activities, or through the probability of physical injury provoked by the job post (Rhum, 1996). Another source of endogeneity is the interference of the kind of work in the level and way an individual will invest in her own health. Health status depends on one's earnings, given that the earnings will reflect the amount of investments one will make in benefit of her own health. Therefore, health status will also depend on work income.

The effects of the existing endogeneity between health and work indicate that the measures of health will be correlated with the error term in the work models. It leads to a

[1] Co-residence is defined in this paper as older people who live with their adult children. Non-co-residents are those who do not live with children regardless of the kind of family arrangement.

situation where the simple estimate of the model with the variable of health taken as exogenous will generate biased estimates to the coefficients. Therefore, health should be treated as an endogenous variable and adequate actions should be carried out in order to control this endogeneity.

Measuring health status

Another important question when dealing with the variable of health concerns which measure to use or how to measure health status in relation to work. The ideal measure should refer to "working capacity". In practice, the usually available information about health status that permits relating health to working capacity offers eight types of measure: measures of self-reported health (SRH); measures that bring information about health limitations in the act of working; measures that relate the capacity of performing daily living activities (DLA); the presence of chronic diseases; the use of medical care (especially in reference to hospitalizations); questions related to mental health or alcoholism; nutritional state (height, weight, or body mass index); and expected or future mortality (Currie & Madrian, 1999). Studies have shown that the estimates of the effect of health status upon labor supply and salaries are extremely dependable on the kind of measure used. Thus, the kind of measure used in each study needs to be explicit.

Some studies suggest that subjective measures, such as self-reported health, are good health indicators because they are highly correlated with the medically diagnosed health. (Nagi, 1969; Maddox & Douglas, 1973; Ferraro, 1980; Mossey & Saphiro, 1982). Besides, Mossey & Saphiro (1982) have discovered that self-reported health was a better mortality predictor than more objective measures of health.

Nevertheless, such subjective measures present a strong bias against individuals' health reports, and the problem is that these reporting errors are not equally distributed between working and non-working population. Non-working individuals or individuals who have reduced their work hours are inclined to attribute their bad situation to poor health. By this means, the bias derives from individuals who justify their situation of labor market inactivity on the grounds of health problems, either because this is a socially better accepted reason, or because individuals

are encouraged by the social systems to state that they are sick, so that they can continue receiving disability insurance[2].

Besides, the subjective measures of health are influenced both by the access and use of health services, and by one's capacity of noticing one's symptoms. Moreover, the latter is influenced by education, income, job post, and health insurance. Some studies have demonstrated that the utilization of health services increases with individuals' income, even among those who see themselves as healthy (Currie, 1995; Strauss & Thomas, 1998). The consequence of this situation is that individuals with higher income may seem to be the ones who report a greater number of diseases.

How to deal with endogeneity

Among the solutions to the problems of endogeneity and to the reporting errors mentioned above is the method of the Instrumental Variables. In this method the measures of health are estimated using variables that do not affect labor supply, in a way that they eliminate the correlation of the variables of health with the error term in the work model. The problem with this model is the difficulty of choosing a vector of instruments that can withdraw this endogeneity. One of the studies that use this method is Dwyer & Mitchell's (1998), which uses several measures of health – both objective and subjective. They compare the models considering the variables exogenous and instrumentalized.

Other works, such as Lindeboom & Kerkhofs's (2002) use data from the Netherlands to create an estimate based on the health status reported by workers. They count on the possibility that this information does not present any justification bias and, in addition to that, they introduce a filter with objective measures of health status. By this means, these studies create an estimator for health status not affected by endogeneity problems. These are the problems that produce the effects of both labor force status upon health and of non-observable factors upon work and health simultaneously. The authors show that there is a strong bias against the subjective measures of

[2] Using data from American households, Ettner (1997) has observed that the measures of self-reported health among women are not influenced by their labor force status, indicating that women are not as socially pressured as men when it comes to justifying their absence at work through health problems.

health, especially when there is financial encouragement for those who report health problems, given that the retirees with disability insurance are the ones who present the strongest bias against the effect of health status upon labor force status.

In studies about the health and work of elderly in developing countries, the process to control endogeneity is based, almost exclusively, on the method of the instrumental variables. However, the instruments and the measures of health may vary for the reason that they are different realities, where the variables assume entirely distinct levels of importance and meaning. Among these studies is Mete & Schultz's (2002), with data from Taiwan. These authors use the level of difficulty in performing daily living activities, and self-reported health as measures of health. The results indicate for both measures of health – either instrumentalized or not – that men and women in poor health have a lower probability of being on labor market activity and of working full-time. Nevertheless, instrumentalized measures of health provoke a greater and more negative effect on the probability of labor supply than when they were considered exogenous.

A similar conclusion can be found in a study that analyses the effects of health upon the wage of the elderly, with data from Mexico (Parker, 1999). However, this effect is verified only upon men, not upon women. In the mentioned work, the measures of health were the individuals' self-reported health, the number of difficulties in daily living activities, and the amount of non-working days which were consequence of health problems[3].

Labor supply of the elderly in Brazil

In 1997, the labor force participation rates among men over 60 years old were of 41% and of 13% for women – 25% of the total elderly population. These rates are slowly declining, but the participation of the elderly in the total working population is compensated by the relative raise of their number in the total population. As a result, the proportion of older men and women in the work force is constantly increasing and is expected to raise from 9% in 1998 to 13% in 2020 (Wajnman et al., 1999).

[3] The sample for this study is restricted to individuals of 60 years or more who are not working, and only the effect of health status upon salaries is observed, not upon labor force status.

In Brazil, there are few studies that take in consideration the variable of health as a determinant for the labor market activity of the elderly. This might be caused by the lack of adequate database for the study of the relation between the health of the elderly and their participation in the job market. The few studies on this area (Giatti & Barreto, 2002&2003; Campino et al., 2003) have come to the conclusion that workers are the healthiest individuals, and that poor health is negatively correlated with the probability of being on labor market activity. Nevertheless, not any of them considers the possible endogeneity problems of the relation between work and health; therefore, their results are dubious, since they do not control this endogeneity at all.

Studies concerning the relation between health and work in Brazil that try to control endogeneity are only those which included the entire working population, not only the elderly (Strauss & Thomas, 1997; Kassouf, 1997).

We suppose that, in the case of the elderly in Brazil, the same endogeneity problems between health and work that were observed in studies about other countries can be found. The North-American and European literatures are usually more concerned about intentional errors in the health reports of those who do not work anymore than the Brazilian one. This happens because, in those countries, the elderly in general are receiving early retirement benefits and disability insurance. In the case of Brazil, where formal jobs are scarce and retirement benefits tend to be insufficient, the amount of intentionally wrong reports of those who are out of the job market would probably be smaller, since it would imply income benefits. But, in the same way, we expect those who continue working to relate a better health, even though it might not be true, because when they see they are capable of working, they assume their health to be good. So far, endogeneity would exist in the same way as it was presented in international literature. However, we can suppose another type of endogeneity that acts in the opposite way. Supposing that there might be a positive correlation between work and access to health services – due to a higher level of education of the older workers, income from work, or health insurance – a possible result would be the workers to report poorer health than people with the same health status who do not work. This would happen because those who do not work would have less access to services, and

would not be able to notice properly their own health status. Because of that, in countries such as Brazil endogeneity has been converted into a key element in the study of the relation between health status and labor supply.

Data and methodology

SABE is a survey about health and living conditions of the elderly who live in seven cities of different countries of Latin America and Caribbean: Buenos Aires (Argentina), Bridgetown (Barbados), São Paulo (Brazil)[4], Santiago (Chile), La Havana (Cuba), Mexico D.F. (Mexico), and Montevideu (Uruguay). This paper has explored only the data from the city of São Paulo.The database contains information as to family basic characteristics, self-reported health and chronic diseases, anthropometric methods, disability, depression and cognitive state, use and access to health services, family and institutional transferences, and labor force and retirement (Palloni & Peláez, 2003).

SABE's sample survey is of 2142 people over 60 years old who lived in the city of Sao Paulo in the year 2000. In order to avoid untrustworthy answers, in this paper we eliminated individuals who did not answer to any of the questions used as variables in the models, and also those who presented any kind of cognitive disability in the test and did not have a replacement to respond for them at the moment of the interview. The total number of individuals ended up in 2113, among which 871 are men, and 1242 are women.

Choosing the variables

In order to measure labor supply the sample of men and women was divided into those who were on labor market activity at the moment of the survey and those who were not.

The variables used in the labor supply models were classified in three kinds of determinants to men and women:

[4] In São Paulo, the Department of Epidemiology of the Public Health School of the University of São Paulo was responsible for this survey, which was financed by the Research Support Foundation of São Paulo – *FAFESP*.

- ✓ Socio-demographic: age, level of education, marital status, and number of children.
- ✓ Economic: non-work income, and the number of consumer goods per household.
- ✓ Health status: given the previously mentioned problems in relation to the choice of the measures of health, we have decided to test models with three measures of health:
  1. *Self-reported Health (SRH)*: refers to the interviewee's self evaluation in respect to her own health status. We adopted the dichotomous form, dividing the population into healthy – those who answered "Excellent", "Very good", or "Good" health), and unhealthy (those who answered "Bad" or "Poor" health).
  2. *Daily Living Activities (DLA):* one of the ways to evaluate the health status of the elderly is to determine their level of independency. For this case, we considered the difficulty the individual presents in doing six daily living activities: to walk through a room, to get dressed, to take a shower, to eat, to lay down and to get up, and to use the bathroom. They were divided into two categories: those who presented at least one difficulty, and those who did not present any.
  3. *Combined health index:* In this index, a series of health problems were categorized from 0 and 1 in a way that 1 means presence of problem, and 0 means absence of problem. The list of problems includes the difficulties in daily living activities, chronic diseases, mobility capacity[5], and the presence of depression[6] problems. Moreover, we attached a classification derived from the questionnaire about presence of difficulties in cognitive capacity[7]. This indicator does not have any theoretical basis, and was built in an effort of summarizing, in a concise indicator, both physical and mental or psychological problems.

The method of the Instrumental Variables (IV)

There are different ways of identifying endogeneity problems between two variables; in this case, between health and labor supply. The method used in this paper in order to verify the

[5] It means the ability of doing a series of physical activities: walking, sitting, standing up from a chair, going up stairs, bowing, raising the arms, pushing and lifting weights, and moving a coin.
[6] Those who presented more than 6 points in the test for the symptoms of depression were considered to have a depression problem.
[7] For those who were not able to answer the questionnaire, we applied the average points of those who presented cognitive disability in the test.

real existence of endogeneity between the chosen measures of health and the measures of work was the Hausman Specification Test[8].

The endogeneity that exists between health status and labor force status leads the coefficients of the models of labor supply determination to be estimated with bias. In order to control this bias we used the method of Instrumental Variables, which is inspired in the method of Two-Stage Least Squares (2SLS). Through this method, measures of health are estimated by means of a series of variables called instruments. These instruments affect health, but not the labor force status, allowing the estimated variable of health to be free from the correlation that derives from endogeneity, finally avoiding bias in the work model.

The method follows this logic: we consider the following models:

$$T = \beta_{10} + \beta_1 * X_1 + \beta_{12} * X_2 + \beta_{13} * S + \varepsilon_1 \qquad \text{(work model) (1)}$$

$$S = \beta_{20} + \beta_{21} * T + \beta_{22} * X_1 + \alpha_1 * Z_1 + \alpha_2 * Z_2 + \varepsilon_2 \qquad \text{(health model) (2)}$$

where X's are exogenous variables which were predetermined out of the model, and S is correlated with the error term ε_1, given that it is simultaneously determined by T, what defines it as an endogenous variable. In order to correct the bias that would estimate equation (1) through Ordinary Least Squares, we need an estimate of S which is not correlated with the residue ε_1. This estimate is obtained through equation (2) and through the presence of Z_1 and Z_2 – called instruments – which correlate with S, but not with ε_1. The Z variables permit the S variable to be free from its correlation with the residue ε_1 and to study the free effect of S without the bias that provokes endogeneity. This "new" estimate – S^{IV} – which may be highly correlated with S, but not with ε_1, is called **Instrumental Variable**, and variables Z_1 and Z_2 are the **instruments.** (Gujarati, 2000; Wooldridge, 2003)

[8] This method consists in modeling the health measure through the exogenous variables of the work model, and from that point on to estimate the error term. After that, the work model is estimated, including the measure of health and the error term previously estimated. If the T-Student test for the error term is significant, null hypothesis of non-correlation cannot be accepted. In other words, if the coefficient of the estimated error term in the work model with

Choosing the instrumental variables

In order to find an adequate instrument, we need to find an instrument which is correlated with the measures of health, but not with the error term of the model that estimates labor supply.

Among the instruments used in the literature, those suggested by Mette & Schultz (2002) are the father's level of education, the individual's place of residence by 12 years old, whether the father or mother died before 60 years old, and the average consumption of pork and vegetables in the birth region. Parker (1999), in his work, uses as instruments: access to running water, number of hospitals per capita in the city, and the percentage of homes with earth floor. Finally, in Dwyer & Mitchell's (2003) work the variables chosen as instruments are the mortality rates of the interviewees' parents, the ratio of weight to height, and the number of nights ever spent at the hospital.

The variables selected for this paper were restricted to those offered by the database. Among them we decided for those we expected to be less related to the probability of the elderly being on labor market activity. Also, we prioritized those variables which were trustily filled in. This is the final choice: the number of diseases before 15 years old – in order to control the individual's propensity to be sick; whether the person has lived in the field for more than five years before 15 years old – what may indicate the individual's access to health services during childhood; whether the person was or still is a smoker; and the level of alcohol consumption – the last two variables try to control adverse behavior to health.

Specification of models

In order to estimate the individual's probability of being on labor market activity, we used a binomial logistic regression, given that the answer would be "yes" (on labor market activity), or "no" (not on labor market activity):

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the variable of health is significant, there is a correlation of endogeneity between the measure of health and labor supply.

$$Logito\ \ (labor\ \ participat\ ion) = \log\left(\frac{prob\ \ (actually\ \ working\ )}{prob\ \ (not\ \ being\ \ working\ )}\right) = x_i\beta \qquad (3)$$

In order to estimate the variables of health through the instruments, we used several models, which vary according to the nature of the variable to be studied. For the variable of dichotomous Self-Reported Health (SRH) and for the variable of dichotomous Daily Living Activities (DLA) we used the model of the binomial logistic regression, given that the answer is binary:

$$Logito\ \ (bad\ \ health\ ) = \log\left(\frac{prob\ \ (bad\ \ health\ )}{prob\ \ (good\ \ health\ )}\right) = x_i\beta \qquad (4)$$

$$Logito\,(at\ least\ one\ dificulty\ on\ DLA) = \log\left(\frac{prob\,(at\ least\ one\ dificulty\ on\ DLA)}{prob\,(none\ \ dificulty\ \ on\ DLA)}\right) = x_i\beta \qquad (5)$$

In order to estimate the SRH with the five categories the best option is the ordinal logistic regression, first because the categories follow an order, and second because one needs to go over all four categories before going to the last one:

$$Log\left\{\frac{\Pr(y_i \le j|x_i)}{\Pr(y_i > j|x_i)}\right\} = \alpha + x_i\beta \qquad (6)$$

$$Log\left\{\frac{\exp(x_1\beta)}{\exp(x_2\beta)}\right\} = (x_1 - x_2)\beta \qquad (7)$$

Finally, the variable of the combined health index, which assumes from 0 up to 30 points, may be considered an almost continuous variable; therefore, we chose the linear regression:

$$Healthindex = \alpha_o + \beta_i \cdot X_i + \varepsilon_i \qquad (8)$$

The measures of health refer to the probability of the person to be in poor health. When they are incorporated into the labor supply model, we always consider the effect produced by poor health on labor supply.

Analysis of the results

Distribution of the elderly from São Paulo per socio-demographic and epidemiologic characteristics

By expanding the database, we have in total 825,374 individuals aged 60 years old or more. Data from the Brazilian estimated population Census of 2000 point out that 972,199 people aged 60 years old or more live in the city of Sao Paulo, representing 9.3% of the total population. Among these, 40.5% were men, and 59.5% were women. As one can notice, data from *SABE* are slightly different from data from Census, but we point out that the former survey was carried out around 8 months before Census.

In Table 1 (Appendix) it could be seen the distribution of characteristics from *SABE's* data. This indicates that 58.52% of the people aged 60 years old or more who lived in Sao Paulo in 2000 were women, and that 41.47% were men. More than 70% of men and 80% of women had only up to four years of education. About marital status, 79% of men aged 60 or more were married, against only 41.4% of women. Men, as expected, had access to more valuable income than women. On the other hand, almost 30% of women did not have any non-work income, while only 18% of men were in this situation.

About health status, in general women are in poorer health than men. In both genders the evaluation was concentrated in the intermediate levels: Good and Bad. About the number of difficulties to perform the Daily Living Activities (DLA), while 77.7% of women did not present any difficulty, 85% of men were in the same situation. Besides, only 17% of women were not diagnosed any chronic disease, against 27% of men.

Simple labor force participation rates of the elderly per socio-demographic characteristics

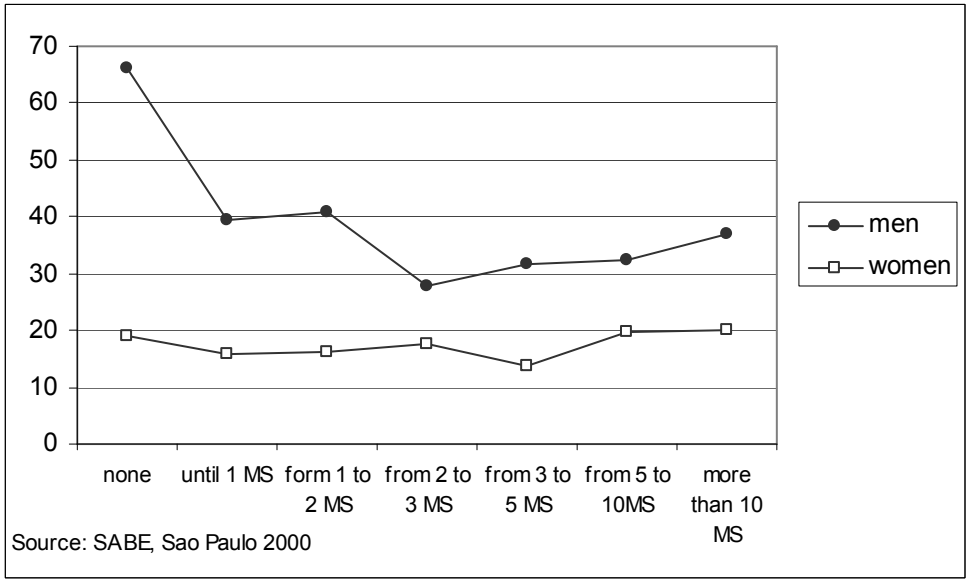
We can observe in Table 2 (Appendix) how labor force participation rates are distributed according to the explicative variables of the models. Data indicate that 40.62% of men and 17.11% of women aged 60 years or more declare that they were working in the week previous to

the survey. A significant proportion of men – 8.84% - was still inserted in the labor market by the age of 80. Women's participation rates were significantly smaller than men's in all ages.

About the years of education, the highest labor force participation rates were from the most educated people, what confirms other studies on the same theme. Participation rates for women with more than 12 years of education – 38% - are especially surprising given the feminine average rates. About marital status, single women and married men are the ones who present highest participation rates. In reference to the number of children, the more the number of living children, the highest men's participation rates. For women this relation is not so clear.

Men's distribution of labor force participation rates per non-work income follows the inverted J shape (Graph 1), where those with no earnings have the highest participation rates – 66.3%. About the number of consumer goods, the group with the highest number also presents the highest participation rates – 48.78%.

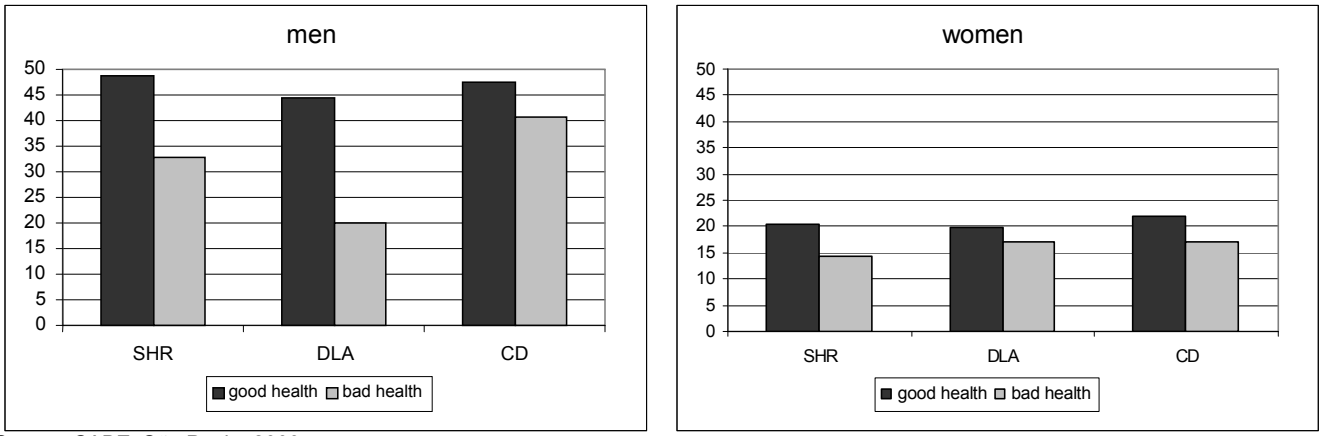
Graph 1: The labor force participation rates of the elderly per non-work income, Sao Paulo, 2000



In the variables of health, the highest rates are among the categories of better health status. However, if we expect health to be a strong determinant of labor supply, it is surprising that the participation rates of those who report their health as poor are also high: 17%. Among

women, there is no clear differentiation between participation rates for healthy and unhealthy women, differently from what happens to men, as we can see in Graph 2.

Graph 2: Labor force participation rates of the elderly per SRH (Good and Poor health), per difficulties in the DLA (none or at least one), and per chronic diseases (none or at least one).



Source: SABE, São Paulo, 2000

Labor supply: the probability of being on labor market activity

The first step was to check if the hypothesis of endogeneity between labor force status and health status should be accepted. In order to do it, we used Hausman's Specification Test. The results have shown that, for men, all measures are endogenous. Among women, endogeneity was not found in any measures of health. Therefore, in principle we would need to use instruments only for men, not for women. Even so, we chose to estimate the measures of health through the instruments for both sexes, in order to facilitate the comparison between them.

Once endogeneity was verified, the second step was to estimate the variables about health status through the following variables: age, education, marital status, and the instruments previously mentioned. In the models, these determinants estimate the probability of poor health among the individuals. In that way, when the coefficient of these estimates is introduced in the work model it indicates how poor health affects the probability of work.

The last step consisted in estimating the probability of labor market activity. These results may be seen on Tables 3 and 4, where the reasons of chance reveal the ratio of the chance of being working to the chance of not being working.

Seven models for labor force status were used for men, and seven for women. The first one does not include any variable of health; three of them use variables of health as exogenous[9]; and the other three models use the same variables, but now instrumentalized[10]. The variables of health are: dichotomous SRH (SRH (2)), difficulties in the dichotomous DLA's (DLA (2)), and the combined health index (hindex).

In the case of men, in the model without measures of health, the results indicate that older men present less chance of being working, and that this chance considerably decreases with age. Men with higher levels of education present greater chance of being working and this chance may be 162% bigger for those with 9 or more years of education in relation to illiterates. Marital status does not seem to have any effect upon aged men's labor force status, nor does the number of children. This result is a constant in all the other models for both variables.

Non-work income has a negative effect, even though odds ratio is small. This variable was included in the model as continuous and, therefore, for each extra income unit the chance of being working decreases in 0.026% in comparison to those who declared not to receive any non-work income. Those with a greater number of goods have a bigger chance of being working.

When health variables are incorporated as exogenous, age slightly looses its explicative capacity in the model, and education even more, to the extent that some categories completely loose their significance. With the measures of health being estimated through the instruments, age looses even more effect, and education looses all its significance in the SRH and in Combined Indicator models. One way to explain this result would be that part of the effect of health and education on the probability of work would derive from its relation to health status. The elderly would be in poorer health than younger people, and the most educated would enjoy better health than the illiterates. The variables of non-work income and consumer goods seem not to change much, or at least to present very small variations which are difficult to be interpreted in the

[9] The non-instrumentalized measures of health were considered exogenous, and the variables of health estimated through the instruments were considered endogenous. Non-instrumentalization presupposes the variable to be exogenous to the model, although we know this cannot be true.
[10] These instrumentalized measures of health are codified in models by the termination EST.

models considering health as exogenous. Having health as exogenous, the coefficient of non-work income becomes more negative, and the coefficient of the number of goods becomes more positive.

The most important result of such models which include instrumentalized measures of health is that, in most of them, the negative effect of poor health on the probability of work increases enormously in comparison to the effect of health when treated as exogenous. In the case of the dichotomous SRH, this measure, when treated as exogenous – poor health implies a 40% smaller chance of being working in comparison to good health – presents a negative coefficient that can even double when it starts being treated as endogenous (80% less chance). This fact was also observed in other studies about developing countries, such as Mexico (Parker, 1999) or Taiwan (Mete & Schultz, 2002).

For women, the behavior of some of those variables is completely different from men's. In the model without health as a reference, the effect of age and education occurs is in the same sense, but it is smaller than the men's. Besides, a constant in all models is that the coefficients that refer to the group of 2 to 4 years of education are not significant, indicating that there is no difference in labor force status between women without education and women with 4 years of education at most.

In relation to marital status, on the contrary of men, the coefficient for being single is significant and very positive, showing that single women have almost three times more chances of being working than married ones. On the other hand, the coefficient for women with more than 5 children is significant and positive, indicating that women with 5 children or more have even double chances of being working than women who do not have any living children. Finally, and in opposition to what happens to men, the variables of non-work income and the number of consumer goods seem not to have any effect on the probability of work for elderly women in neither of the models, with or without health.

In the analysis of the models which include measures of health, the results also revealed differences of women in relation to men. In the model of difficulties in performing the DLA's,

the results for the models with the instrumentalized variables should be analyzed with much restriction, given that the instruments were not the most adequate ones, and this may imply the presence of some bias. The effect of age almost does not change when the measures of health are incorporated. Education, in the models with exogenous health, has its effect decreased until loosing its significance with the combined health index. When health is instrumentalized, the results vary: for SRH measures, the effect of education raises, and, for the variable of DLA's and for the combined indicator it remains significant. We expected the effect of education to be smaller when we included the variable of health than when we excluded it from the model. However, it is important to remember that this result may be biased because the presence of endogeneity between health status and labor force status was not observed in the case of women; therefore it was not necessary to instrumentalize health.

The exogenous measures of health show that the poorer health is, the smaller the probability of work is for women, even though the effect for them is smaller than in the case of men. On the other hand, the instrumentalized measures of health behave in an entirely different way from the way we observed among men, since not any of them is significant. These results may be due to the fact that Hausman's Test had not indicated the need for instrumentalization. All this leads to the conclusion that the effect of health upon the probability of work for elderly women is much smaller than in the case of men. The fact that the instrumentalized measures are not significant may precisely indicate that these variables are not improving the specification of the work model among aged women.

TABELA 3: Logistic regression´s odds ratios of the probability of being working. Elderly men, São Paulo, 2000.

	without health	SRH(2)	SRH(2) _EST	DLA(2)	DLA(2) _EST	Hindex	Hindex _EST
60-64 years	1,000	1,000	1,000	1,000	1,000	1,000	1,000
65-69 years	0,600**	0,639*	0,782	0,598**	0,623*	0,6435*	0,818
70-74 years	0,366***	0,382***	0,464**	0,377***	0,416***	0,432***	0,697
75-79 years	0,233***	0,237***	0,280***	0,249***	0,3066***	0,268***	0,441*
80+	0,086***	0,088***	0,109***	0,098***	0,1375***	0,124***	0,389
no education	1,000	1,000	1,000	1,000	1,000	1,000	1,000
2-4 years of education	1,561*	1,479	1,308	1,510**	1,399	1,394	0,899
5-8 years of education	1,698*	1,519	1,162	1,583	1,335	1,433	0,799
9 or+ yeras of education	2,621***	2,182**	1,369	2,457**	1,986*	2,299**	1,198
married	1,000	1,000	1,000	1,000	1,000	1,000	1,000
never married	0,497	0,497	0,562	0,487	0,445	0,534	0,573
divorced	0,881	0,821	0,690	0,846	0,837	0,813	0,753
none children	1,000	1,000	1,000	1,000	1,000	1,000	1,000
1-2 children alive	0,743	0,707	0,707	0,740	0,731	0,750	0,712
3-4 children alive	0,862	0,789	0,845	0,921	0,854	0,955	0,851
5 or+ children alive	1,198	1,178	1,236	1,281	1,251	1,276	1,221
non-labor income	0,99973**	0,99974**	0,99973**	0,99973**	0,99973**	0,99973**	0,99971**
consumption	1,1021*	1,1039*	1,107*	1,090*	1,103*	1,074	1,106*
SRH good		1,000					
SRH bad		0,587**					
SRH good_EST			1,000				
SRH bad_EST			0,139*				
DLA (none)				1,000			
DLA (1 or +)				0,392***			
DLA (none)_EST					1,000		
DLA (1 or +)_EST					0,084*		
Health index						0,894***	
Health index_EST							0,714*
constant	0,671	0,988	2,272	0,789	1,006	1,229	3,933

Source: author´s elaboration with SABE data, Sao Paulo, 2000

* P<0.10; ** P<0.01; ***P<0.001

TABELA 4: Logistic regression´s odds ratios of the probability of being working. Elderly women, São Paulo, 2000.

	without health	SRH(2)	SRH(2) _EST	DLA(2)	DLA(2) _EST	Hindex	Hindex _EST
60-64 years	1,000	1,000	1,000	1,000	1,000	1,000	1,000
65-69 years	0,629*	0,637*	0,608*	0,6061**	0,583**	0,638*	0,635*
70-74 years	0,493**	0,489**	0,496**	0,489**	0,510**	0,511**	0,511**
75-79 years	0,320***	0,322***	0,311***	0,331***	0,368**	0,358**	0,347**
80+	0,062***	0,060***	0,064***	0,070***	0,098**	0,085***	0,077**
no education	1,000	1,000	1,000	1,000	1,000	1,000	1,000
2-4 years of education	1,258	1,240	1,303	1,205	1,134	1,064	1,136
5-8 years of education	1,905*	1,835*	2,100*	1,815*	1,569	1,494	1,633
9 or+ yeras of educati	2,001*	1,921*	2,258*	1,921*	1,689	1,602	1,717
married	1,000	1,000	1,000	1,000	1,000	1,000	1,000
never married	2,932*	2,960*	2,943*	3,004*	2,914*	3,337**	2,958*
divorced	1,198	1,196	1,205	1,205	1,205	1,221	1,212
none children	1,000	1,000	1,000	1,000	1,000	1,000	1,000
1-2 children alive	1,521	1,549	1,513	1,597	1,516	1,761	1,516
3-4 children alive	1,422	1,456	1,415	1,528	1,431	1,633	1,420
5 or+ children alive	2,172*	2,228*	2,151*	2,260*	2,176*	2,505*	2,167*
non-labor income	1,000	1,000	1,000	1,000	1,000	1,000	1,000
consumption	0,979	0,973	0,980	0,972	0,977	0,970	0,978
SRH good		1,000					
SRH bad		0,833					
SRH good_EST			1,000				
SRH bad_EST			1,543				
DLA (none)				1,000			
DLA (1 or +)				0,412***			
DLA (none)_EST					1,000		
DLA (1 or +)_EST					0,116		
Health index						0,901***	
Health index_EST							0,949
constant	0,169***	0,193**	0,125*	0,197	0,280*		0,248

Source: author´s elaboration with SABE data, Sao Paulo, 2000

* P<0.10; ** P<0.01; ***P<0.001

Final considerations

The results obtained in this paper are consonant with the international literature in relation to the effect of age and education upon the probability of being part of the labor force, both in relation to men and to women. In relation to marital status, the literature shows that married men have a high probability of staying in the labor force (Blau, 1994; Benítez-Silva, 2000; Perachi & Weltz, 1994). With women what happens is the opposite. Single women are the ones who present the same behavior as married men in labor supply. The results presented in this paper agree in respect to aged women, but not in respect to aged men, for whom marital status is not significant in mostly all models.

The variables that mostly relate to the individual's economic status explain a big part of men's labor supply. The individual's non-work income has a negative effect on the probability of work, indicating that the greater the income, the smaller the probability of being working. However, the proxy for family income or household income (number of consumer goods) positively affects it, indicating that the greater the number of goods in the household, the bigger the chance of the elderly of being on labor market activity. The contrary direction of these two economic variables in the case of men is very interesting. On the one hand, non-work income indicates the capacity of the individual to financially sustain himself, even without income from work. On the other hand, family income may indicate the level of consumption that the family is or was used to in the past, what would lead the individual to keep working in order to maintain that level. This variable as a proxy for socio-economic status may also indicate the kind of social networks the individual has access to. These networks would positively affect the employability of the elderly.

Among women, the economic variables are not significant. The socio-demographic variables, such as the number of living children, are the ones which mostly explain women's behavior in relation to the job market. Conversely to what we expected based on the literature we found (Parker, 1999; Cameron & Cobb-Clark, 2001), the number of children positively affects aged women's probability of being working. Among men, the descriptive analysis indicated that the greater number of children, the greater labor activity but this has not been confirmed in the

econometric models. This result may be related to the behavior of the intergenerational transferences in Brazil among the elderly and their adult children, as Saad (1999) points out. The author demonstrates that the elderly in Brazil provide their adult children with significant financial assistance. The fact that the variable of the number of children is only significant for women might mean that women tend to keep stronger family binds, as it was also stated by Saad (1999).

About health status, in general the results agree with the literature. To be in poor health means to have less probability of being on labor market activity, both for men and for women. Once health is introduced, age and education loose a big part of their explanatory power, as it was already expected. It indicates that part of the effect of these variables was a consequence of their inter-relation with health status.

The kind of measure of health status determines the kind of results obtained, confirming what was observed in several studies (Dwyer & Mitchell, 2002; Mete & Schultz, 2002; Larsen & Gupta, 2003). The only measure without any effects on work is the dichotomous SRH in the model for women. Besides, the variable of the difficulties in performing the DLA's show a bigger explanatory power than in the case of other measures, what could derive from the distinct nature of the measures. The comparison between objective and subjective measures of health indicates a behavior which is contrary to the argument of the justification bias, and, therefore, also contrary to great part of the results reported in the literature about developing countries. (Bound et al.,1999; Lindeboom & Kerkhofs, 2002; Kreider, 1996). If the justification bias existed, those measures with higher effect on labor supply would be the SRH and not the most objective ones, such as the DLA's or the combined indicator. This may indicate that being working may have a positive correlation with a better access to health services, what would lead workers to a better perception of their health status. This would be reflected in the fact that the more subjective measures indicate lesser differences between workers' and non-workers' health, given that older workers tend to notice more easily their health problems.

The results also seem to show the non-applicability of the theory of the justification bias, given that the instrumentalized measures of health present a more negative effect than the ones

treated as exogenous. According to Bound et al. (1999), if there is a justification bias, the effect of poor health upon labor supply – treated as exogenous – would be underestimated and would affect labor activity more negatively than it really does. Thus, the result of the instrumentalization would make the effect of the measure of health positive, i.e. it would remove part of the negative effect this measure would be provoking on the labor force status, what results in a less negative coefficient. As the results show the contrary, it means that either the justification bias does not exist or that it is not as important as it should be in order to be noticed. Studies about developing countries reinforce these results (Parker, 1999; Mete & Schultz, 2002).

This result leads to a very important conclusion once we can understand what happens in the estimate of the measures of health through instruments. When the measures of health are instrumentalized, we try to eliminate the effect of work upon health, i.e. we try to identify the effect of health upon work exclusively, without the endogeneity bias. The fact that the measure of health has a more negative effect than it had when it was not estimated indicates that the health difference between workers and non-workers is bigger when the variable is instrumentalized. It means that, if the effect of work upon health did not exist, workers would be in better health, and health of the elderly would be more distinguishable between those who work and those who do not work. In other words, if there is any effect of work upon health, it is a negative one, since workers are in better health when this effect is removed. This conclusion is entirely different from the one presented by Giatti & Barreto (2001, 2002) where the authors inferred that labor activity produces positive effects upon health. In the present work, as in other works cited in Ruhm's (1996) revision, the result indicates that the fact that one is on labor market activity and works a greater number of hours seems to negatively affect older workers' health, even though these are in principle healthier than the non-workers.

Among women, the results about how health status affects the probability of being active is very different from men's. First, the measure of the dichotomous SRH does not have any effect on labor supply, and, second, not one of the instrumentalized measures of health has shown to be significant. These results ratify the studies of Parker (1999) and of Mete & Schultz (2002) that show that health has almost no effect upon labor supply for women, or that this is really small in comparison to men's. Nevertheless, the measures of health do not present any correlation with

the error term of the models of older women's probability of being on labor market activity, and the instruments used do not seem to be the most adequate for them. Hence, before we attempt to any definite conclusions, it would be very important to carry out a study with more proper instruments and then investigate better other possible determinants of labor supply for elderly women. Some allusions are made here through the evidence that the variables of family are especially significant for women.

To expand the investigation about the kind of present and past occupation of the elderly must help to respond several questions left without answers in this paper. To know the kinds of jobs done in the past by the elderly who do not work now might help elucidating the question whether the most demanding jobs would make the elderly leave the work force earlier. Unfortunately the available data did not permit such kind of analysis.

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Appendix

Table 1 : Distrivution of variables among individuals with more than 60 years-old, Sao Paulo, 2000

60 years-old, Sao Paulo, 2000		**men**	**women**
Age groups	60-64	34,61	30,83
	65-69	27,35	26,05
	70-74	18,80	19,00
	75-79	10,44	11,75
	80+	8,80	12,38
Years of education	until 1 year	25,96	34,37
	2 to 4 years	46,38	45,98
	5 to 8 years	9,29	8,93
	9 to 11 years	10,14	7,21
	12 or more	8,22	3,52
Estado conjugal	never married	4,13	5,20
	actually married	79,22	41,40
	broken marriage	16,65	53,40
number of children	none	8,02	10,16
	1 to 2 children	31,66	35,20
	3 to 4 children	34,08	29,68
	5 children or more	26,24	24,96
non-labour income	none	18,67	29,43
	until 1 minimum salary	14,73	32,01
	form 1 to 2 MS	14,17	13,53
	from 2 to 5 MS	10,79	7,86
	from 5 to 10 MS	19,43	7,95
	more than 10 MS	16,49	5,89
Bens no domicílio	until 1	2,51	4,79
	2-3	20,61	21,33
	4-5	30,69	34,14
	6-7	46,19	39,74
Self-reported health (SHR)	Excelent	4,55	4,78
	Very good	5,96	5,87
	Good	38,08	33,62
	TOTAL Good	48,59	44,26
	Regular	44,17	46,76
	Poor	7,24	8,98
	TOTAL Poor	51,41	55,74
Difficulties in Daily Living	none	84,98	77,76
Activities (DLA)	at least one	15,02	22,24
Cronic diseases	none	27,57	17,82
	at least 1 cd	72,43	82,18
Index of health problems	none	4,13	1,90
	1 problem	13,09	5,22
	2 problems	18,27	8,85
	3 problems	14,60	10,68
	4 problems	10,25	11,81
	5 problems or more	39,65	61,54

Source: SABE, São Paulo, 2000

Table 2: Labor force participation rates of individuals with more than 60 years-old, Sao Paulo, 2000

		Participation rates	
		men	**women**
Age groups	60-64	57,56	26,51
	65-69	43,96	18,09
	70-74	30,31	14,66
	75-79	21,10	10,13
	80+	8,84	2,04
Years of education	until 1 year	28,27	13,00
	2 to 4 years	43,15	17,12
	5 to 8 years	40,41	23,77
	9 to 11 years	46,88	18,31
	12 or more	57,90	37,99
Estado conjugal	never married	29,74	26,74
	actually married	42,91	17,77
	broken marriage	32,42	15,67
number of children	none	34,10	17,31
	1 to 2 children	38,79	16,64
	3 to 4 children	42,05	16,02
	5 children or more	42,97	19,00
Non-labour income	none	66,30	19,01
	until 1 MS	39,46	15,69
	form 1 to 2 MS	40,91	16,21
	from 2 to 3 MS	27,95	17,52
	from 3 to 5 MS	31,81	13,77
	from 5 to 10MS	32,29	19,73
	more than 10 MS	36,91	20,13
Bens no domicílio	until 1	37,00	16,02
	2-3	36,15	13,23
	4-5	31,87	18,91
	6-7	48,72	17,82
Self-reported health (SHR)	Excelent	45,59	32,54
	Very good	58,69	14,80
	Good	47,72	19,74
	TOTAL Good	48,86	20,47
	Regular	35,39	15,40
	Poor	17,28	9,53
	TOTAL Poor	32,83	14,45
Difficulties in Daily Living	none	44,26	19,80
Activities (DLA)	at least one	20,06	17,11
Cronic diseases	none	47,44	21,93
	at least 1 cd	40,62	17,11
Index of health problems	none	50,51	40,21
	1 problem	54,00	28,18
	2 problems	47,76	21,86
	3 problems	48,25	20,16
	4 problems	43,34	17,91
	5 problems or more	28,37	14,10
	TOTAL	40,62	17,11

Source: SABE, Sao Paulo 2000