THE EVOLUTION OF RETIREMENT IN BRAZIL*

BERNARDO LANZA QUEIROZ¹

Palavras-chave: previdência social; aposentadoria; seguridade social; participação no mercado de trabalho

RESUMO

Este artigo investiga as tendências históricas da participação no mercado de trabalho e de aposentadorias no Brasil. O artigo usa dados dos Censos Demográficos (1960-2000) para descrever as tendências históricas da participação no mercado de trabalho e comparar essas tendências com as de outros países desenvolvidos e em desenvolvimento. Em seguida, o artigo tenta responder uma questão correlata, como as taxas de aposentadoria variam no tempo e entre grupos sócio-econômicos. Os resultados mostram que a expansão do sistema de previdência no Brasil favorece a decisão de aposentar e criou incentivos para a saída dos trabalhadores do mercado de trabalho. A análise das taxas de aposentadoria revelam que as idades 60 e 65 são preferidas pelos trabalhadores para a saída do mercado de trabalho. A partir dessas observações, o artigo investiga como as mudanças na participação na força de trabalho e nos níveis de mortalidade afetam a duração esperada da aposentadoria. O artigo estima a duração esperada da aposentadoria como a média ponderada da esperança de vida em cada idade de aposentadoria. Os resultados mostram que a duração da aposentadoria mais do que dobrou entre 1960 e 2000, saltando de 7% da esperança de vida aos 20 anos em 1960 para 14% em 2000. A análise da contribuição relativa dos fatores (participação no mercado de trabalho e mortalidade) mostra que 2/3 do aumento é explicado por mudanças na participação no mercado de trabalho e 1/3 por melhorias nos níveis de mortalidade.

* Trabalho apresentado no XV Encontro Nacional de Estudos Populacionais, ABEP, realizado em Caxambu – MG, Brasil, de 18 a 22 de setembro de 2006.
¹ CEDEPLAR/UFMG
THE EVOLUTION OF RETIREMENT IN BRAZIL
BERNARDO LANZA QUEIROZ

1. INTRODUCTION AND OVERVIEW

There is widespread concern about how demographic changes, especially population aging, affect macroeconomic variables and public sector fiscal balance. A second related question is how the provision of social security benefits affects retirement decisions of older workers (Wise, 2004). The literature on this topic in developed countries is extensive (Costa, 1998; Burtless & Quinn, 2001; Gruber & Wise, 1999). People know a great deal about retirement behavior in different developed countries around the world. There are two main explanations for early retirement in developed countries. First, the existence of generous public pension systems (Gruber & Wise, 1999; 2004), and second, higher income and expansion of the leisure class (Costa, 1998). Population aging combined with early retirement has put social security systems across the industrialized world under pressure. Legislation changes have taken center stage in public policy debates in recent years (Diamond, 2004; Wise, 2004).

Despite unabated interest among researchers in issues pertaining to the impacts of social security provision to retirement behavior, little is known about these issues in emerging economies. Brazil is one example of an important context for elaborating linkages between pension benefits provision and retirement behavior. The rapidly aging population presents one of the greatest public policy challenges in Brazil. Compared to other emerging economies, Brazil is distinct for combining a relatively large public sector with rapidly aging population and declining labor force participation at older ages. The percentage of individuals age 65 and over is estimated to be 18% in 2050, compared to 3% in 1970 (UN, 2003). These changes in population age structure may impose severe pressures on the public sector (Bongaarts, 2004). At the same time, the length of working life has fallen over time, which results from both increases in educational attainment (younger workers) and changes in retirement behavior (older workers). The fall in economic participation for older workers (65 and older) is striking: 30% of them were in the labor force in 2000 compared to 60% in 1970. In 2002, social security benefits and other forms of elder support represented about 12% of the GDP (Brasil, 2003) and are expected to be the fastest growing component of public spending (Giambiagi & Além, 1997; Giambiagi & Castro, 2003).

Despite the growing interest in this area, I am not aware of many studies aiming to examine trends in labor force participation of older workers and the evolution of retirement in Brazil. LeGrand (1995) demonstrates that in 1980 the social security system influenced retirement in the expected ways. Self-employed workers and those in the informal sector had lower retirement probabilities than workers in the formal sector. Carvalho-Filho (1999) shows that the social security reform of 1991 reduced retirement age of rural workers affected by the reform. Leme & Malaga (2001) show that the Brazilian pension system creates incentives to early entry into the labor market as well as early retirement, a clear waste of productive resources in the country. In this paper I contribute to the debate by investigating labor force participation and retirement in Brazil. First, I use census data to describe historical trends in labor force participation rates of older workers. I also compare trends in labor force participation...
participation and retirement in Brazil with other developed and developing countries. Next, I put forth a second and related question, namely how retirement hazard rates vary over time and for different socioeconomic groups. I then look at how changes in labor force participation and mortality levels have affected the expected duration of retirement over time. My main goal is to elaborate stylized facts that will guide the discussion of retirement behavior in future research.

2. THE SOCIAL SECURITY SYSTEM IN BRAZIL

The pension system in Brazil consists of three main segments: the general system (private workers), the civil servants system, and the other general private funded systems. Most pension system is based on the PAYGO scheme (Bonturi, 2002). The country has also a large non-contributory system with means-tested eligibility that provides benefits for low-income elderly. Public expenditures on social security benefits and other forms of elderly support amount to 12% of GDP (Brasil, 2003).

The Social Security system for private workers (general system) is an unfunded defined-benefit program. There is still debate regarding when it began. In 1888 some measures were taken to provide pension benefits for postal workers and employees of the national press. In the following years, retirement benefits were extended to railroad workers, employees of the Ministry of Finance, the Mint and the armed forces. In 1923, the Lei Eloi Chaves (legislation) was approved to regulate social security for both civil servants and private sector workers. This law decentralized the pension system, as each company became responsible for its own employees. The first reform happened in 1933 when the pension funds became structured by professional categories (Leite, 1983). The general pension system was centralized only in 1966, when the House of Representatives approved the Social Security Ordinary Law. The National Social Security Administration, INPS, incorporated all the revenues and expenditures from sector-specific programs as well as its assets and liabilities. Another major change during this time was in the scheme of the program, which changed from a capitalization system to PAYGO (Leite, 1983).

The last major reform occurred with the 1988 Constitution, which extended mandatory social security coverage to most of the previously excluded groups, including rural workers, without requiring equivalent increases in revenues from contributions. Other measures also made the system more generous than before: establishing the minimum wage as the lowest benefit paid by the system, indexing all pensions to the minimum wage, and reducing minimum retirement age (Stephanes, 1998).

Until 1998, full pension benefits were granted to all workers who had contributed for a minimum of 10 years to the system, have reached normal retirement age through the Old-Age Pension Benefit (65 for men and 60 for women), or could prove that they have been working for a certain number of years with the Length of Service Pension Benefit (35 for men and 30 for women, but without requirement of contribution for the same period of time). In addition, special retirement schemes existed that granted proportional retirement benefits for individuals who had worked for 30 and 25 years, for men and women respectively. The benefits were computed based on the last 36 months of activity (Brasil, 2002). The level of benefits is relatively high, old-age benefits recipients receive, on average, 3 times the minimum wage, and the length of service benefits is 2.5 times higher than the old-age benefits. In recent years, the system has been facing budget shortfalls, which have gradually increased after the new
regulations were implemented in the early 1990s. In 1996, the deficit was equal to 0.1% but increased to 1.7% in 2004. The implicit debt, a long term measure of the system’s financial adequacy, is also large and amounts to about 350% of the GDP (Holzman, et al., 2004).

Alongside the general pension system, civil servants have their own pension program, which is also an unfunded PAYGO defined benefit program. Although smaller in absolute numbers when compared to the general program, expenditures with the civil servants are large, reaching 4.7 percent of the GDP in 2002. The program is a complex chain of federal, state and local systems, including special programs to different civil servants categories. Benefits are more generous in the civil servant program: replacement rates are higher and time of contribution to receive full benefits is shorter (Medici, 2001).

3. DATA AND METHODS

I use Brazilian census data to study historical trends in labor force participation rates. The data - 1960, 1970, 1980, 1991, 2000 - are public available at the Integrated Public Use Microdata Sample (IPUMS). In those years a short and a long enumeration forms were used. The short form contains general information about the household and about each person who resides in that household. The long form contains more detailed information about the characteristics of the household, families and persons in the household. In 1960, 1970 and 1980 twenty-five percent of the households were selected to the long form enumeration. In 1991 and 2000, the long form was applied to a ten percent sample of the population in cities with more than 15,000 inhabitants and twenty percent on smaller cities. The IPUMS dataset is based on the long form enumeration files collected by the Brazilian national statistics office and contains over thirty-two million observations at the individual level. The available data allows aggregation at the household, state and region levels. IPUMS uses United Nations (UN) and ILO labor force definitions to maintain consistent across time and countries, however they caution that small differences exist which can affect analysis of the results. For 1960, 1970 and 1980 a 5% sample is available, for 1991 a 5.8% sample and for 2000 a 6% sample.

The study of retirement behavior and trends uses labor force participation rates as its basic measure (Costa, 1998). I follow the same approach in this paper. Labor force participation rate is defined by the International Labor Organization (ILO) as the proportion of the population of some specific age; normally population aged 16 to 65 years, who is either working or actively seeking work to the total population in the same age group.

I estimate labor force participation rates using Brazilian Census. The Brazilian census enumerates the population aged 10 years and above who are in the labor force. Until 1950 the unemployed were not enumerated as being in the labor force. From 1960 on the enumeration form was adjusted to incorporate this group in the labor force, consistent with the International Labour Organization definition. The enumeration of labor force is stable and consistent over time, however there are some limitations. The labor force is made up by the employed population plus the unemployed. Employment status is fairly consistent over time. Paiva (1984) argues that from 1960 to 1980 the definitions are very similar with small differences on the order and the phrasing of the questions, which might affect the enumeration of the economic active population. The problem arises because of changes in the unemployment concept. There are two main differences: first unemployment became more strictly defined, and second the period of reference changed in 1991. The first three censuses used the reference
week to determine unemployment status. The last two also use a reference week but only consider unemployed those who were not looking for a job within the last two months in 1991, and the last month in 2000. Paiva (1984) discusses in detail the changes in the enumeration of the labor force population in Brazil and compares how those changes affect estimates. The author finds that labor force enumeration in the 1970 and 1980 censuses are consistent although less reliable than the PNAD.

I use labor force participation rates to estimate retirement hazard rates (Costa, 1998; Hurd, 1996; 1990b). This rate is an estimate of the chances of leaving the labor force at a given age, conditional on being in the labor force in the previous year. The retirement rate shows whether there is a preferable retirement age, and it helps to understand the effects of the social security system in the patterns of retirement. When these rates are being estimated from cross-sectional data, they do not represent the actual labor market transitions of individuals (Hurd, 1996). Thus, I call it pseudo-hazard rates. In most of my analysis, the retirement rate is simply the percentage decline in the proportion of individuals in the labor force between ages n and n+1 in a particular year.

4. RESULTS

4.1. AGE PROFILES OF LABOR FORCE PARTICIPATION

The trend in labor force participation for Brazilian male workers shows significant changes in the last decades (Figure 1). It is clear that the length of working life shrunk over time. Labor force participation rates of young individuals have declined because of the increase in educational attainment. Based on census data I calculated that 95% of the population aged 10-14 years was in school in 2000 compared to 54% in 1960. The rates have also declined for older workers. In 1950 almost 90% of the population aged sixty to sixty-four years was in the labor force, and this number has declined to 65% in 2000. The same rate of decline is observed for younger old workers. The fall in economic participation is even greater for older workers, those above sixty-five years of age: 30% of them were in the labor force in 2000 compared to over 60% in 1950.

Figure 1
Labor Force Participation Rates, Brazil, Males, 1950-2000

Source: ILO Database (2005) and IPUMS (2005)
The female labor force participation rate shows a completely different trend in the same period (Figure 2). The main change in female labor force participation is the rapid increase in the economic activity of females in their prime-age; those aged 20 to 60 years. Durand (1975) suggested a U-shaped pattern between female labor force participation and economic development, and the Brazilian case seems to fit this pattern. Durand (1975) and Mammem & Paxson (2000) studied this pattern in several countries, finding a similar relation between economic development and female labor force participation. At youngest and oldest ages, female labor force stays stable over the fifty years of analysis. For women aged fifty to sixty year labor force participation is much higher in 1990 and 2000 than it was in any preceding years.

![Figure 2](image)

**Figure 2**  
**Labor Force Participation Rates, Brazil, Females, 1950-2000**

Labor force participation rates fell for workers of different socioeconomic backgrounds. I use years of schooling as a proxy for socioeconomic status (SES) and estimate participation rates using census data from 1960 to 2000 by four different levels of education: 0 to 4, 5 to 8, 9 to 11 and 12 and more years of schooling. This measure is highly correlated with the general socioeconomic status of the individual and is preferred to other measures of SES (e.g. wealth or income) in this study since it offers better comparability among age groups.

Figure 3 plots participation rates of men aged 55-59, 60-64 and 65-69 by SES group from 1960 to 2000. In 2000, participation of workers aged 60-64 and 65-69 years old, for all SES groups, intercept at the same levels around 50% and 40%, respectively. For older workers, those above 70 years of age, the rates converge at lower levels around 20% participation rates (results not shown). The figure shows a decline in the participation rates for all SES groups, but steeper for the oldest age group (65-69). The decline is also steeper for the low SES, which might be explained by the universalization of the access to social security benefits. High SES workers have lower participation rates at all times but their decline over time is slower than that of low SES. From 1960 to 2000, the participation rates of workers aged 65-69 years declined 33 percentage points for low SES workers and 20 percentage points for the high SES ones. The lifetime earnings of low SES workers are much lower than those of high SES workers and cannot be the only explanation for the decline and convergence in participation rates. The trend reflects the increase in the coverage of the social security system in the country, a move away
from agriculture work and increase levels of income of the older population in the past half-century.

**Figure 3**

**Labor Force Participation by educational level, Males, Brazil, 1960-2000**

The results presented before show how labor force participation of older men has declined rapidly in Brazil. A more useful way to focus on timing of retirement and its changes is to

Source: IPUMS (2005)

Figure 4 plots retirement hazard rates for the census years 1960, 1970, 1980, 1991 and 2000 for all male workers in Brazil age fifty to seventy-five. In general, the hazard increases smoothly with age and shows peaks at ages of sixty and sixty-five corresponding to early and normal retirement ages in Brazil. However, the hazards vary substantially over time. Between 1960 and 1970 the retirement hazard rates rose steadily with age, but hazard rates were never greater than 10%. In 1980, 1991 and 2000, a more pronounced peak is observed at age 65 (about 15%), and hazard rates are higher at younger ages when compared to 1960 and 1970.

The hazard rates can be compared to the rates estimated in OECD countries by Costa (1998) and Gruber & Wise (1999). In most of the OECD countries retirement hazards are very high at ages when pension benefits are available. For example, in the United States Costa (1998) estimates rates of 15% and 25% at age 65, in 1940-60 and 1970-90 respectively. The Brazilian rates at age 65 are much lower than the ones observed in Europe. Gruber & Wise (1999) show hazard rates of over 60% in France and Spain. However, whereas for most countries hazard rates before age 60 are virtually zero, in Brazil I estimate rates ranging from 5 to 10%.

The rise in retirement hazard rates, especially the observed age peaks, matches the changes in the pension system since its establishment. In the 1960s, most urban employees were covered by the system, and coverage was being expanded to all urban employers and self-employed workers. In the 1970s, the system expanded to cover the entire elderly population, including rural workers. From 1970 on the system kept growing rapidly. Data from the Brazil Social Security Administration show that the number of elderly receiving pension benefits increased five-fold from 1970 to 1990, from 19% to 70%.

Figure 5 and Figure 6 show retirement hazard rates for urban and rural males workers separately, from 1960 to 2000. For rural workers the effect of the 1988 reform that reduced normal retirement age is clear. There is a single peak of retirement at age 60 whereas for 1980 and 1991 the peak is at age 65. Retirement hazard rates for urban workers increase
continuously with age with peaks at ages 60 and 65 probably because of the availability of old-age retirement pension benefits. Another striking fact is that hazard rates at younger ages are much higher for urban workers than rural workers in all years, which is a clear effect of the existence of length of service pension benefit for urban workers. The differences in retirement hazard rates for urban and rural workers appear due to differences in pension regimes. For urban workers social security provides two types retirement: by age and by length of service. Rural workers do not have access to the length of service retirement benefit. The normal retirement age for rural workers was reduced from 65 to 60, for urban workers, the normal retirement age remained 65 after the 1988 reform.

Figure 5
Retirement Hazard Rates at Single Ages, Urban Males, Brazil, 1960-2000

Source: IPUMS (2005)

Figure 6
Retirement Hazard Rates at single ages, Rural Males, Brazil, 1960-2000

Source: IPUMS (2005)

The retirement rates in Brazil spike at age 65 and 60. Also, rates at younger ages are higher than most OECD countries, indicating that the incentive to retire associated with the pension program is substantial. The increasing probabilities of retirement over time and age suggest that elderly adjust their labor force behavior in response to the existence and expansion of the pension program. Thus, the existence of spikes in hazard rates indicates that retirement is not
only affected by productivity and health status but also, and perhaps mainly, by economic incentives associated with the public pension program (Costa, 1998).

This is a major problem to be addressed by policy makers. As observed in several studies for developed countries, social security rules and regulations seems to create positive incentives for early retirement in Brazil as well, and workers adjust their labor market behavior in response to these incentives. The most striking feature, however, is that retirement hazard rates peak at much younger ages than observed in the United States and Europe. For instance, a worker who enters the labor market when 20 years old can retire when 50 years old and then live a longer time receiving a pension benefit than the number of years he contributed to the system. If on the one hand, the decline of labor force participation rates seems to have slowed down or stopped in recent years, on the other hand early retirement hazard rates seem to be stable and very high for workers under the age of sixty. I do not show results for women. The behavior of the hazard rates is erratic and there is no clear peak. My reading of the results suggests that most of the fluctuation is reflect of sample noise, rapid changes in labor force participation of younger cohorts, and low levels of labor force participation at older ages.

4.2. INTERNATIONAL COMPARISON

It is important to compare the Brazilian experience of declining labor force participation of older workers with those of other developing and developed countries. I use data from International Labour Organization for twelve countries to compare trends in overall labor force participation rates and older age groups. I selected Argentina, Brazil, Chile, Mexico, and Colombia from the developing countries. These countries are in an earlier stage of the demographic transition, have relatively young populations and are at earlier levels of economic development. From the industrialized world, I use data from the United States, Japan, Germany, Italy and the Netherlands. These countries have older population age-structures and more mature social security systems.

Figure 7 shows the declining trend in labor force participation for workers aged 65 and over for the selected countries. The figure shows that developed countries, with the exception of Japan, start and finish with lower levels of participation rates compared to less developed economies. The average participation rate, for older workers, in developed nations was 41% in 1950 compared to 72% of the developing economies, a thirty percentage-points difference. In 2000, developed nations still had lower participation rates, 12% compared to 30%, but the difference across countries was much smaller. The reduction in the difference is explained by the much faster decline in participation rates in developing countries where, from 1950 to 2000, rates fell 41 percentage-points compared to 30 percentage-points observed in more developed economies. The decline observed in Latin American countries was 1.5 times faster than the decline observed in those industrialized economies.
Figure 7
Labor Force Participation Rates, Males 65 and over, selected countries, 1950-2000

Figure 8 shows labor force participation rates for workers aged 60-64 years. Although developed countries have lower participation rates, as for the oldest age group, the differences in the beginning of the period are much smaller than the ones observed in the previous graph. In 2000, however, the gap between the two groups of countries is much wider, the difference, on average, rises from nine to twenty-five percentage points. Gruber & Wise (1999) and others discussed in detailed the reasons for these trends in developed nations. Brazil shows an impressive decline in participation rates for these age groups of twenty-four percentage points. The country fell from the second highest participation rate in 1950 to the forth in 2000. A similar trend is observed for younger elderly, those aged 55-59 years. The main difference for these age group is that participation rates are closer both in the beginning and at the end of the period of analysis. Figure 4.9 shows participation rates for workers aged 55-59 years. The rates decline at the similar speed for all countries, except for Japan, Italy and the Netherlands. For this age group, the participation rate for Brazilians is comparable to that observed in Germany, which has a much more generous pension system and alternative ways to earlier retirement, and the United States. The labor force participation rates for Brazil, Germany and the US are 75%, 75% and 77%, respectively. This result is impressive, indicating that one quarter of the population 55-59 years old is already out of the labor force.
Figure 8
Labor Force Participation Rates, Males 60-64, selected countries, 1950-2000

Source: ILO Database (2005)
4.3. MEDIAN RETIREMENT AGES

The long term information on labor force participation can be used to study trends in retirement. I estimate median retirement age for males from 1960 to 2000. The median retirement age is the youngest age at which fewer than 50% of the population is in the labor force (Burtless & Quinn, 2001). Following this definition, the retirement age for Brazilian males declined from 69 years in 1960 to 63 years in 2000, an average decline of 1.5 year per decade.

<table>
<thead>
<tr>
<th>Year</th>
<th>Brazil</th>
<th>USA</th>
<th>Italy</th>
<th>Germany</th>
<th>Japan</th>
<th>Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>69</td>
<td>66</td>
<td>65</td>
<td>65</td>
<td>67</td>
<td>66</td>
</tr>
<tr>
<td>1970</td>
<td>65</td>
<td>65</td>
<td>63</td>
<td>65</td>
<td>68</td>
<td>64</td>
</tr>
<tr>
<td>1980</td>
<td>65</td>
<td>64</td>
<td>62</td>
<td>62</td>
<td>67</td>
<td>61</td>
</tr>
<tr>
<td>1990</td>
<td>65</td>
<td>63</td>
<td>61</td>
<td>60</td>
<td>67</td>
<td>59</td>
</tr>
<tr>
<td>2000</td>
<td>63</td>
<td>63</td>
<td>61</td>
<td>61</td>
<td>67</td>
<td>59</td>
</tr>
</tbody>
</table>

Table 1 shows median retirement ages for a series of countries. The retirement age in the United States fell from 74 years in 1910 to 63 years in 2000, a drop of 1.2 years per decade (Burtless & Quinn, 2001). In the same period covered by the Brazilian data, the decline in the average retirement age in the U.S.A has slowed down or even reversed. During this period the average age declined 0.75 years per decade, from 66 years in 1960 to 63 years in 2000 (Burtless & Quinn, 2001). The trend toward early retirement is a common feature of the labor market in developed nations. Sveinbjorn & Scarpetta (1998) estimate average retirement ages for a series of OECD countries based on survey data on determinants of retirement. They estimate retirement ages from 1950 to 1995 and observed a steady decline in retirement ages over time. The average retirement age for men dropped from about 65 years in 1950 to around 60 years in 1995. I estimate average retirement ages for Brazil using Sveinbjorn & Scarpetta (1998) methods. The average retirement age in 1950 was 60.17 and fell to 57.83 in 2000.

4.4. COMPARISON OF UNUSED PRODUCTIVE CAPACITY

Gruber & Wise (1999) propose the Unused Productive Capacity as a summary measure of the labor force participation of older workers. The measure is calculated by summing up the proportions of individuals out of the labor force between ages 50 and 69 and dividing it by 19 (Similar calculation is made for those between ages 55 and 65, but diving by 11). The measure is interpreted as follows. Suppose the unused capacity measure between ages 50 and 69 in a particular year is 50%. It means that a cohort experiencing the labor force participation rates in that year for their whole life would work only 50% of their potential life time person-working-years (Gruber & Wise, 1999).

Table 2 shows this measure for Brazil from 1960 to 2000 using census data. The unused labor capacity for the age group 55-65 increases from 28% in 1960 to 40% in 2000. This means that, in 2000, workers living under those labor force participation rates would work only 60% (57%) of the potential working years between ages 55 and 65 (50 and 69). The increase in unused labor capacity occurs as the pension system reaches more population sub-groups and as it becomes more generous. Table 2 also shows the percentage of males out of the labor force at age 59, which is another simple measure of early retirement proposed by Gruber & Wise (1999). This measure gives a similar picture to that of the unused labor capacity. These are relative measures, they do not imply that all men out of the labor force should be working or could work.

<table>
<thead>
<tr>
<th>Year</th>
<th>Ages 55-65</th>
<th>Ages 50-69</th>
<th>% out L.F. age 59</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>28</td>
<td>30</td>
<td>24</td>
</tr>
<tr>
<td>1970</td>
<td>36</td>
<td>38</td>
<td>33</td>
</tr>
<tr>
<td>1980</td>
<td>38</td>
<td>40</td>
<td>34</td>
</tr>
<tr>
<td>1991</td>
<td>38</td>
<td>41</td>
<td>35</td>
</tr>
<tr>
<td>2000</td>
<td>40</td>
<td>43</td>
<td>36</td>
</tr>
</tbody>
</table>

Source: Brazilian Censuses (IPUMS), 1960-2000

I use these measures to compare Brazil to the countries in the international study edited by Gruber and Wise. As Gruber & Wise (1999) point out, these two measures vary substantially
across the eleven countries. Unused labor capacity for ages 55-65 ranges from 67% to 22% and the percentage of men out of the labor force at age 59 ranges from 58% to 13%, for Belgium and Japan respectively. Brazil compares to the countries on the lower end of the distribution. The unused labor capacity in Brazil is similar to those observed in the United States and Sweden, 37% and 35% respectively (Figure 10). The percentage of males out of the labor force at age 59 in Brazil is higher than that of the US (26%) and very similar to the levels in the United Kingdom (38%), Germany (34%), Spain (36%), and Canada (37%). Despite the limitations of these two measures, I present this comparison to illustrate the patterns of retirement in Brazil and how they fare with those of more developed economies. These results provide more evidence that the pension system in Brazil has direct incentives to retirement.

Figure 10
Unused Labor Capacity for Males 50-59 and Men Out of the Labor Force at age 59, OECD Countries and Brazil, circa 2000

Source: Gruber & Wise (1999) for OECD, IPUMS (2005) for Brazil

5. EXPECTED LENGTH OF RETIREMENT IN BRAZIL (1960-2000)

The previous sections showed that labor force participation of older men fell substantially in Brazil during the past half century. At the same time the country witnessed a rapid increase in life expectancy. In 1950, life expectancy at birth was less than 51 years, whereas in 2000 it was 70.3 years. In the middle of last century, over 60% of males aged 65 and above were in the
labor force, compared to less than 30% in 2000. The two simultaneous trends imply that the duration of retirement has increased.

Lee (2001) suggests that changes in length of retirement have important implications for economic issues (e.g. savings, and public pension finances). Despite its relevance, very few studies have tried to estimate such a measure (Lee, 2001). The author shows that in the United States, retirement years have increased six-fold since 1850 and now represent 30% of a worker's productive years. In Brazil, the rapid changes in life expectancy and labor force participation rates can have important implications for the economy. These two events combined to increase the percentage of one's life spent in retirement.

In this section, I estimate the expected length of retirement (ELR) in Brazil following the approach developed by Lee (2001). The advantage of his approach is that it considers the contribution of early retirement to the length of retirement.

5.1. ESTIMATION OF THE ELR

According to Lee (2001), the duration of retirement can be estimated as a weighted average of life expectancy at each retirement age, where the probability of retiring at age \( x \) is the weight of the life expectancy at that age.

Lee (2001) expresses the expected length of retirement in Equation 1:

\[
ELRP = \sum_{x=20}^{69} S_x T_x \delta_x [1 - (0.5 \times 1q_x)] \times [(e_x + e_{x+1})/2]
\]

where \( ELRP \) = expected length of retirement at age 20, \( S_x \) is the probability of remaining alive to age \( x \), \( T_x \) is the probability of remaining in the labor force until age \( x \) conditional on surviving until age \( x \), and \( \delta_x \) is the probability of retiring at age \( x \) conditional on remaining in the labor force at age \( x \) (Lee, 2001). The other terms account for men who die before they leave the labor force, and for those who retire between ages \( x \) and \( x+1 \) (Lee, 2001).

I estimate labor force participation rates using IPUMS data. Mortality estimates were obtained from CELADE and the United Nations. According to Lee (2001), length of retirement can be estimated under two assumptions. The first one it assumes that an individual assesses the length of his retirement based on current levels (period data) of labor force participation and mortality. In the second one, individuals adjust their expectations based on their cohort experience. The first, a synthetic cohort approach, gives us a lower bound of the estimates. For lack of cohort data in Brazil, and lack of good labor force participation projections, I can only calculate the period estimates.

5.2 RESULTS

Table 3 presents the period estimates for the Expected Length of Retirement (ELRP) and their ratios to life expectancy at age 20. Not surprisingly, improvements in life expectancy and decline in labor force participation results in the extension of retirement years. The ELRP at
age 20 went from 4.43 years in 1960 to 7.39 years in 2000. The results suggest that since 1960 the expected duration of retirement has doubled and now represents 14% of the life expectancy at age 20.

<table>
<thead>
<tr>
<th>Year</th>
<th>Period</th>
<th>Estimate</th>
<th>Life Expectancy</th>
<th>Age 20</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>28</td>
<td>30</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>36</td>
<td>38</td>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>38</td>
<td>40</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>38</td>
<td>41</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>40</td>
<td>43</td>
<td>36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Now, I show how changes in mortality and labor force participation rates impact the expected length of retirement. This estimate is made by calculating ELRP assuming that either mortality or labor force participation rates remain constant at the 1960 levels. For example, to examine the relative contribution of mortality decline, I calculate the ELRP in 2000 using retirement rates in 2000 and the 1960 mortality rates. This counterfactual estimate shows how large the increase in ELRP would be during the period had there been only change in labor force participation rates. To estimate the contribution of changes in retirement, I perform similar analysis holding retirement rates constant at the 1960 levels.

Surprisingly, the decline in LFPR is the more important factor in determining the changes in ELRP, as compared to changes in mortality. First, I hold labor force participation rates constant at 1960 levels. I find that the ELRP would be 37% shorter if there were no changes in labor force participation rates. On the other hand, improvements in mortality explain about 25% of the extension in ELRP. This result reflects the impressive decline in labor force participation discussed in previous sections. The lower contribution of mortality can be explained by the increase in adult mortality in the past two decades due to a rise in homicides and accidents.

These results are the lower-bound of changes in ELRP. It is clear that age-specific labor force participation rates are declining and life expectancy is rising for younger cohorts, meaning that younger generations will have a longer length of retirement. The increase in ELRP indicates that workers should save more of their income to smooth their consumption over the life-cycle. It also suggests that pressures on the Brazilian pension system will be greater in the near future, as suggested elsewhere (Turra & Queiroz, 2005).

6. CONCLUSION

Retirement is an important stage on one’s life cycle. Contrary to the past, most workers today enjoy a long and healthy period of retirement. In Brazil, the expansion of the social security system, economic development and rising income have allowed more workers to leave the labor market. In addition, improvements in goods and services provided to the elderly have transformed retirement into a more pleasurable and desirable stage of life. What will happen in the future? Is Brazil ready to support a large population of retirees?
The rapid process of population aging will have huge impacts on the sustainability of the Brazilian pension system. The increase in the old age dependency ratio means a larger number of beneficiaries will depend on a smaller number of workers. The demographic problem is not the sole issue in this matter. There is also a strong downward trend in labor force participation at older ages. Early retirement has increased the dependency ratio more than would be predicted by demographic analysis (Turra & Queiroz, 2005). Labor force participation rates of older men fell significantly between 1950 and 2000. During this time, the Brazilian social security system expanded, absorbing a larger group of the population and helping to accelerate the trends toward early retirement. Social security regulations in Brazil, like in many other countries, provide incentives for the working population to postpone retirement until the age at which benefits are available. This occurs at age 65 in some cases but is sometimes at earlier ages, such as 55, due to the existence of benefits based on length of service.

I use census data to investigate time and age trends in retirement hazard rates for Brazilian workers since 1960. This paper has shown that expansion of the social security system favored the decision of early retirement and created incentives to withdraw from the labor force. Retirement hazard rates estimated in the paper have revealed that ages 60 and 65 are somewhat preferable to leave the labor force for most of the Brazilian workers since at this age they became eligible for social security benefits. One of the main findings is that changes in social security regulations have significant impacts on retirement ages. It is clear that the 1988 reform which created more incentives for rural workers to retire earlier changed the schedule of retirement for this group, as I show with the analysis of census data. I also find that declines in labor force participation rates and mortality levels were equally important in explaining the increase in expected length of retirement. In 2000 about 15% of a worker’s life expectancy at age 20 consisted of retirement years.

The fact that the rates are not as high as in Europe has two reasons. First, the urban workers have two options to obtain a pension benefit: by old age, when turning sixty-five years old for males and sixty for females; and by length of service, by proving thirty-five years of employment for men and thirty for women. In addition to that, complete withdrawal from the labor force is not mandatory to start receiving pension benefits in Brazil. Thus, measuring retirement hazard rates using labor force participation rates might be underestimating the real probabilities of retirement (e.g. receiving a pension benefit). Second, Carvalho-Filho (1999) and Afonso & Fernandes (2004) argue that the socioeconomic differences, inequalities and the labor market affect the access of some workers to the pension system which might influence the pattern of the labor force participation rates. They suggest that workers in higher socioeconomic strata might be better able to take advantage of social programs, because they are more able to understand the rules governing access to such programs.

The rapid population aging, size and fiscal problems of pension systems in the developed world led researchers to devote considerable attention to this problem in those countries. However, developing countries are aging more rapidly than developed countries, and social welfare programs will be asked to provide more support than they might be able to give. It is generally assumed that the Brazilian pension system is not generous and only pays small benefits. Another common idea is that low life expectancy at birth justifies early retirement ages, and by the fact that individuals have worked enough. This paper shows that this popular perception overlooks the role of the security system in shaping the evolution of retirement behavior in Brazil, how duration of retirement has increased in recent years, and the degree of generosity of the program, especially for some sub-groups of the population.
Brazil is facing a problem similar to that of developed nations. With population aging, these countries are looking for ways to increase the average retirement age and minimize the impact of population aging on the public sector. This paper shows that the evolution of the pension system in Brazil and its rules and regulations have important impacts on the labor supply of older workers. The empirical evidence presented before points to the importance of establishing a minimum retirement age, providing actuarially fair benefits for those who remain in the labor force beyond the normal retirement age, and creating incentives to bring in to the system workers in the informal sector who do not contribute but can still be eligible for benefits.

The importance of the public pension systems throughout the world is unquestionable, and the well-being of the elderly depends heavily on the provision of income from such programs. However, the necessity to reform the Brazilian pension system is clear. The main question is how the reform should take place and which generations will pay for the burden of the reform.

7. REFERENCES


