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A Dynamic Analysis of Household Decision-Making: The Brazilian Case

BY

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1. Introduction

1.1. Motivation

The relationship between family and welfare distribution is strong and direct, and it has an endless scope. First, a family is the basic distribution unit, responsible for coordinating the pooling process of income of all its members. The family is also responsible for the distribution process of the benefits arising from the pooled income among its members. The outcome of these two processes—pooling and distribution—is the fact that welfare is distributed on a much more equal basis than the distribution of income per capita, which is a fact common to all societies.

Secondly, families interfere in welfare distribution to the extent that they are the basic decision-making units of a society. Families have to take decisions about time allocation of each of their members, how the family income must be earned and how it will be divided between consumption and savings. Moreover, families play an important role in deciding how many children they will have and on the future distribution of welfare, since they are responsible for investing in the human capital of their children and thereby determining the level of human capital of the next generation. In short, family structure and behavior are of the utmost importance in forming the distribution of a society's welfare.

1.2. Objectives

This study has two central objectives. We first describe in detail the structure and behavior of Brazilian families during their life cycle.[1] Secondly, we investigate the main socioeconomic determining factors of alterations in families' structure and behavior over the past few decades. We therefore have two interrelating objectives. We describe how the patterns have changed in the past few decades, on the one hand, while on the other, we investigate how these changes in the structure and behavior of the families can be explained by concomitant variations in the Brazilian socioeconomic environment.

[1] The analytical unit with which we will be working is the household and not the family. Neverthless, we are using the word family throughout this study.

1.3. Structure

The study is organized in four sections, in addition to the introduction. Section 2 describes the methodology and source of information used in the empirical studies performed. Section 3 is structured in five subsections. The first investigates the way in which the family's structure develops during its life cycle. The second analyzes the evolution of the educational capital stock for each cohort. The third subsection analyzes the ratio between wages and schooling during the life cycle and its variations for each cohort and over time. The fourth is devoted to the study of time allocation by the members of the family, particularly of its share in the labor market during the life cycle and how this allocation has changed among cohorts. Lastly, the fifth subsection looks at the investment made in educational capital of its children and how this investment varies during the school life cycle and for each cohort. Section 4 of this study is organized in six subsections. The first studies the connection between schooling and fertility. The second investigates the determining factors of the growing prevalence of women as heads of families. The third investigates how socioeconomic factors determine retirement. The fourth and fifth subsections investigate the determining factors of female and child labor, respectivel, and the sixth subsection looks at the determining factors of the children's educational performance. Section 5 summarizes the principal conclusions of the study.

2. Methodology and Source of Information

2.1. Methodology: The Question of Identification

We can generally say that the central objective of this study is to look at how certain family characteristics (its nature or behavior): (i) evolve during its life cycle, *v*, (ii) have varied among cohorts, *c*, and (iii) have varied over time, *t*. So if *I* is any indicator of interest, then the objective is to find function *h* so that

$$I = h(v,c,t)$$

In this case, function *h* reveals how this indicator varies during the life cycle, among cohorts and over time.

For us to estimate function *h* it would be necessary for us to obtain data on how indicator *I* varies during the life cycle, *v*, for each cohort, *c*, and point in time, *t*. However, as it always true that

$$t = c + v$$

it is clearly impossible to vary one of these variables, say *v*, and keep the other two, *t* and *c*, constant. In other words, it is impossible to see how indicator *I* varies during the life cycle, *v*, for each cohort, *c*, and point in time, *t*, and, therefore, it is impossible, without further hypotheses on the form of *h*, to estimate this function.

A particular case where function *h* can be estimated is when the indicator does not vary over time, varying only for each cohort and during the life cycle. Family characteristics, such as size and composition, that vary significantly during the life cycle and from cohort to cohort, but are influenced very little by the socioeconomic conditions at a certain time, are included in this case. Also included here are the indicators for children's educational performance. These indicators vary widely with the child's position in its life cycle and from cohort to cohort, but the influence of socioeconomic conditions at a certain moment is relatively slight. In the above examples, we can approximate function *h* by

$$I = h(v,c).$$

It can be estimated provided that it is possible to follow each cohort during the life cycle. Based on an annual poll series, it is always possible to accompany cohorts during their life cycle. In this study we can refer to 16 annual studies covering a 19-year period (1979-97) and can therefore follow each cohort for 19 years during its life cycle.

A second case is that of indicators that do not vary over time nor during the life cycle. The schooling of the adult population, for example, that in the absence of adult education programs is a function only of the birth cohort, is included in this case. Function *h* can, then, be approximated by calculating

$$I = h(c)$$

and be estimated on the basis of a single household poll. The only advantage of a series of polls, in this case, is to permit an increase in the number of cohorts that can be investigated.

In both the aforementioned cases, the absence of time-effect permits us to estimate function *h* and, therefore, isolate the effects of the life cycle from the cohort-effect. However, when all three effects are present it is impossible to identify function *h*, unless certain further characteristics of this function are known.

In this study, the three effects are relevant in three situations and, therefore, there is a problem of identification. This is the case of the rate of return on education, which certainly depends on the economic conjuncture, as well as the worker's experience in the labor market, except to the extent that general and specific human capital are complementary to production. Furthermore, to the extent that different cohorts are imperfect substitutes in production, the rate of return shall depend on the size of the cohorts and distribution of education in each of them. A similar situation occurs with the rate of participation in the labor market, which is influenced both by the economic conjuncture and structural factors (cohort) and by position in the life cycle. Lastly, there is family income per capita, which also depends on both conjuncture and structural factors, in addition to varying during the life cycle.

In such cases, further hypotheses on function *h* are required for us to be able to estimate it. In this study we used two alternative strategies, one proposed by MaCurdy and Mroz (1995) and another by Deaton and Parkson (1994).

2.2. Source of Information

Basic information for all empirical analyses in this study comes from a series of 16 Pesquisas Nacionais por Amostra de Domicílios-PNAD (National Household Sample Polls) from 1979 to 1997. The PNAD is an annual household research conducted by the Instituto Brasileiro de Geografia e Estatística-IBGE (Brazilian Institute of Geography and Statistics) at a national level and carried out in the third quarter of each year. Each poll involves interviewing around 100,000 households.

This research began on a national scale in 1971 and underwent a major revision between 1990 and 1992.[2] The research contains extensive information on individual characteristics, including information about all sources of income, participation in the work force and school attendance, among other data. As the research is on a household basis there is also detailed information about the family structure. The fact that there are many PNADs and each poll includes a very large sample makes them very useful in describing life cycle patterns and their variations over time and through cohorts.

2.3. Start-up

Between 1979-97, 16 PNADs were collected covering all 19 years in the period, except for 1980, 1991 and 1994.[3] Thus, based on this research, it is possible to follow almost continuously the life cycle of each cohort over the 19-year period, except for the three years mentioned herein. In order to eliminate the three gaps, the information was completed by using the information from the adjacent years relating to the same cohort. For example, as no PNAD was carried out in 1980, there is no information for the 30-year-old cohort born in 1950, although there is information for this cohort at 29 years old in the 1979 PNAD and for the same cohort at 31 years old in the 1981 PNAD. Thus, we chose to complete the information for this cohort relating to 30 years old as the average between the values for this cohort obtained in the two 1979 and 1981 PNADs.[4]

In this study we address two kinds of life cycle: the life cycle of individuals and the life cycle of families. To characterize the family life cycle we use the age of the family head. Despite the magnitude of the PNAD sample, it is quite limited in some cells. This is why we endeavor to pool the cohorts in five-year birth groups (1900-04, ..., 1985-1989) and thus obtain a more suitable cell size (see Tables A4 and A5 in the Appendix).

During the study, we accompanied the performance or behavior of cohorts over time or of their life cycle without, in fact, having access to truly longitudinal information. The principle that permits us to accompany it is that, in the absence of mortality or selective migration, an average relating to a cohort in a poll collected five years after the other is an unbiased estimate of the average situation of that cohort five years later, even when the people or families effectively interviewed five years later are not the same. However, as we have already mentioned, the validity of this approach depends on the absence of mortality or differentiated migration. If these conditions are not ascertained, averages for the same cohort in consecutive polls will not

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[2] We are not using 1971-78 PNADs in the study due to difficult access to their databases.

[3] In 1980 and 1991 the PNAD was not performed as the Population Census was carried out instead. In 1994 the PNAD did not go to the field.

[4] Table A1 in the Appendix shows how the data of the evolution during the life cycle of the different indicators used in this study was organized in five-year birth groups. In this table each line corresponds to an interval of five years in the life cycle and each column to a birth cohort. Note that since PNAD had not been carried out for three years in the 1979-97 period, there are no primary data on four diagonals in this table. Tables A.2 and A.3 in the Appendix give the number of people and families interviewed in each cell obtained by comparing age and birth cohort. The Appendix accompanies the electronic version of this paper, available at: www.iadb.org/res/32.htm.

properly represent the evolution of the behavior or performance of the cohort during the life cycle or over time.

3. Family Life Cycle, Structure and Behavior

3.1. Family Structure

This subsection describes the typical development of the Brazilian family structure throughout its life cycle and has four objectives. First, we look at the behavior of family size, its composition by age and gender, and kin relationship between its members[5] and the head. Secondly, we look at how the patterns described in the first objective have changed over time. Thirdly, we look at how family characteristics vary during its life cycle. Finally, we investigate how the characteristics of the family to which a person belongs vary during his/her own life cycle.

As mentioned in Subsection 2.3, we will use the age of the head of the family to identify the family's position in the life cycle.

Figures 3.1 to 3.14 provide estimates of the life cycle pattern for a variety of family characteristics for each birth cohort. Once these estimates are obtained from a series of 16 household polls covering the 1979-97 period, the available information covers only a small fraction (19 years) of the life cycle of each cohort. To simplify the presentation, these figures show the results only for cohorts born every five years. A series of regularities can be identified from these figures.

Family Size

Figure 3.1 reveals that the family size reaches its peak when the head of the family is approximately 40 years old. There is evidence that, as time goes by, this peak occurs increasingly early in the life cycle. The position of this peak is determined principally by the age at which people marry, the number of children and the intervals between children. As time goes by, the age at which people marry has been delayed, pushing the peak to a later point in the family's life cycle. On the other hand, the number of children has diminished, pushing the peak to an earlier point in the family's life cycle. Generally speaking, the second effect prevails, leading the peak of the family size to occur earlier in its life cycle. Moreover, this figure reveals

[5] Family members are the head, spouse, children, other family members and kin. Boarders, domestic staff and their relatives are not considered members of the family.

one more regularity: there is a drop in the family size when we move from the older to the younger cohorts. While those born in 1950 have families with a maximum size of 4.6, the family size was 5.4 for those born ten years earlier. Hence, the maximum family size is diminishing at a rate of 0.8 members per decade. However, there is evidence that this downward rate is decreasing.

Number of Children

Figure 3.2 reveals that the number of children under six years old per family reaches the peak earlier in the family life cycle. This peak is reached when the head is between 25 and 30 years old. There is also evidence that the peak occurs increasingly early among the young cohorts. We can also see from this figure that the maximum number of children has dropped considerably when comparing young and old cohorts. While the maximum number of children for the cohort born in 1950 was approximately 1.5, the average number of children was 1.2 for the cohort born in 1960. In other words, we may say that the maximum number of children under six years old has dropped at a rate of 0.3 per decade.

Lastly, it is worth mentioning that the number of children under six years old has dropped substantially, after reaching the maximum, when these children move up to the next age group. This rate of decline is faster than the family size rate, since the change in the children's age group does not necessarily mean a change of family.

Number of Juveniles

The number of juveniles between 7 and 14 years old per family reaches the peak when the heads are over 30 years old, as can be seen in Figure 3.3. This figure reveals a gentle move towards an earlier peak in the life cycle of the younger cohorts.

As in the case of the children, there is clear evidence of the sharp drop in the number of juveniles per family. The maximum is around 1.5 for the cohorts born in 1945, while the number is less than 1.3 for cohorts born ten years later.

Figure 3.4, however, permits us to conclude that, taking children and juveniles as a whole, the number of children has dropped from a maximum of 2.6 for the cohort born in 1945 to a maximum of 2.1 for the cohort born in 1955.

Number of Young Adults

We can conclude from the analysis in Figure 3.5 that the number of young adults with work potential (people between 15 and 21 years old) reaches a peak when the head of the family is approximately 45 years old. The figure also shows that the maximum number of people in this group has steadied at about one person per family among the younger cohorts.

Number of Adults

The number of adults (people between 22 and 64 years of age) is approximately two at the start of the family life cycle, rising to 2.5 when the children become adult. We can see this from Figure 3.6, which does not show changes in the pattern of the life cycle of the number of adults among the cohorts. Thus, the changes among cohorts in the number of people per family are fully caused by changes in the number of children and juveniles.

Number of Elderly

We can see from Figure 3.7 that the number of 65-year olds or over per family is very small, at less than 0.1 per family. This figure indicates a slight increase in the number of the elderly during the family life cycle but no difference in the pattern of the life cycle among the cohorts.

The Age of the Youngest and Oldest Member

Figure 3.8 shows how the average age of the youngest member varies in the family life cycle. This figure reveals that in the first half of the family life cycle (before the head is 50 years old), the youngest person is around ten years old. In this interval of the family life cycle the age of the youngest person is constant.

Once the head of the family is 50 years old, the age of the youngest member starts to increase in the same proportion as the head's age, indicating that the fertility cycle has ended. We can see from Figure 3.9 that the oldest member of the family is very close to the age of the head, indicating that, in general, the head is the oldest family member.

Lastly, it should be mentioned that these figures show very slight variations among cohorts with regard to both the age of the youngest and the age of the oldest family member.

Gender of Family Head

With regards to the gender of the head of the family, Figure 3.10 shows that the proportion of heads that are women increases during the family life cycle. This rise is the result of the cumulative effects of both separations and the woman's tendency to live longer than the man. Moreover, the figure also shows that the number of female heads of family is higher among the younger than among the older cohorts, and that the growth rate is approximately 4% every decade. Hence, the percentage of female heads in the cohort born in 1940 is close to 12%, while this percentage is 16% in the cohort born in 1950.

Relationship with Head

Figure 3.11 shows the number of the head's children per family during the life cycle per birth cohort. This figure reveals that the number of children reaches its peak when the head is approximately 40 years old. We can also see that the maximum number of children has dropped sharply over time. More precisely, this number has dropped from 3.3 in the cohort born in 1940 to 2.6 in the cohort born in 1950, showing a drop of approximately 0.7 every ten years. As the drop in the family size is 0.8 per decade, we can conclude that the responsibility for the total drop in family size is essentially the decrease in its number of children.

Another relevant aspect is that the percentage of families with spouse present decreases almost throughout the life cycle (see Figure 3.12) as a consequence of separations and mortality. More specifically, the percentage of families with a spouse present increased substantially in the earlier stages of the life cycle, reaching 85% of the families with 30-year-old heads. From this point in the life cycle, this percentage dropped to around 57% among the 70-year-old heads.

Figure 3.13, however, shows the evolution of the average number of kin who are not children and spouses during the life cycle. This figure shows that the number of other kin tends to drop to the minimum (0.2 person per family) when the heads are in the 30-year-old age group. When the head's age group moves from 40 to 60 years old, the average number of other kin triples, reaching the maximum of 0.6 person per family. With regard to the life cycle pattern of the number of family members that are not children and spouses, the results show that there is very little difference among the cohorts.

Lastly, Figure 3.14 reveals that the number of non-kin is very small (close to 0.02 person per family). Moreover, this figure does not vary much during the life cycle of the cohorts.

3.2. Stock of Human Capital

In this subsection our objective is to provide a good view of the evolution of educational performance in Brazil since the start of the century. Estimates, thereby, are given of the education distribution per birth cohort. Besides these distribution estimates per cohort, we looked at the average level of education, inequality in education distribution, education density and retention rates for each cohort. These estimates are given in Figures 3.15 to 3.25, from which we can identify a series of regularities:

Illiteracy Rate

By studying Figure 3.15 we can conclude that illiteracy is still high even among those born in 1970. In fact, almost 10% of the cohort born in 1970 is illiterate. The illiteracy rate has, however, dropped somewhat since the start of the century, at a rate close to 7.5% every ten years. At the beginning of the century the illiteracy rate was over 50%, which confirms the decrease in this rate. At this downward rate (7.5% per decade), illiteracy should be eradicated in Brazil by the next decade. However, there is also evidence of a recent lagging in the declining illiteracy rate. In fact, when we compare the illiteracy rate between the cohort born in 1950 with that born in 1970, we find that the illiteracy rate is now dropping at a rate of 5% per decade.

Average Education

Despite the continuing rise since the beginning of the century, average education is relatively low, even among those born in 1970. In fact, the cohort born in 1970 has completed an average of only 6.5 years of study, as we can see in Figure 3.16. This figure shows that in the 1920s and 1930s average education increased 0.75 years per decade and in the 1940s and 1950s this rate rose to 1.25. For the overall period, the rate of increase in education was one year per decade. Finally, we should mention that there was a sharp drop in the growth rate of average education since the cohort born in 1960. In fact, if we compare the average education of the cohort born in 1960 with that of the cohort born in 1970, we can see an improvement in the average education of only one quarter of a year's education. This improvement is modest from a historic viewpoint and in terms of the experience of other Latin American countries.

Inequality in Education Distribution

Figure 3.17 shows the evolution of the standard deviation of the education distribution for each birth cohort. It shows a sharp rise in inequality from the beginning of the century until the cohort born in 1950. During this period, the standard deviation almost doubled, rising from 2.5 to 4.5 years of education, and average education at least tripled. Consequently, the variation coefficient, a weighted average of inequality, decreases due to a smaller rise in the standard deviation than in relation to the increase in the average. However, for cohorts born after 1950, inequality dropped even when measured by the standard deviation.

Education Density

With regard to education density, Figures 3.18 to 3.21 show the evolution of the percentage of adults in the population with a given level of education.

Figure 3.18 reveals that even among the younger cohorts, the percentage of the population with zero years of education is still very high, 10%, although it has been steadily dropping since the beginning of the century. As in the case of the illiteracy rate, we can clearly identify the existence of a recent deceleration in the downward rate. Figure 3.19 shows that the percentage of the population with exactly four years of education was 25% in 1950. This percentage has dropped significantly since the 1955 cohort, even reaching 15% for the younger cohorts. In relation to the percentage of the population with 8 and 11 years of education, Figures 3.20 and 3.21 show that this percentage has increased throughout the period of analysis.

Accumulated Distribution of Education

The evolution of the percentage of the adult population with a level of education higher than a given level is shown in Figures 3.22 to 3.25. Figure 3.22 shows that even among the younger cohorts, the percentage of people with some formal education is still far from 100%. Although it continues to rise since the start of the century, we can see a recent drop in its growth rate.

Figure 3.23 gives the percentage of the population that has at least four complete years of education, that is, the first stage of junior school (first to fourth grades). Although this percentage is rising over time, only 60% of the adult population, even among the younger cohorts, completed the fourth grade. A similar analysis can be made for the fraction of the population that has at least completed junior school. Figure 3.24 shows that, although the percentage of the

population with at least eight years of education is rising over time, even among the younger cohorts, only 30% of the adult population has completed the eighth grade. With regards to the percentage of the population that completed at least 11 years of education (i.e., has completed high school) Figure 3.25 shows that, although this percentage is also rising over time, even among the younger cohorts, only 10% of the adult population has completed high school.

Retention Rates

We define herein the retention rate at a given level of education as being the percentage of the adult population that has this level of education is a proportion of the population that has reached at least this level of education. Thus, the retention rate in the first grade of junior school is the ratio between the percentage of people who have this grade (at most) and the percentage of people who have at least completed this grade. The results obtained are given in Figures 3.26 to 3.36.

When we study Figures 3.26 to 3.29 we can perceive that the retention rate of the first stage of junior school (former primary) has dropped over time. Figure 3.29 shows, however, that despite this improvement, the retention rate in the fourth grade is still 20%, even among the younger cohorts, which means that 20% of all children who completed the fourth grade did not move on to the next one.

Figures 3.30 to 3.33, however, show that the retention rate of the whole second stage of junior school (from fifth to eighth grades) did not drop over time, except in the case of the eighth grade. However, the retention rate of the eighth grade is still 25% despite the decrease, even among the younger cohorts. In other words, 25% of the children who complete junior school do not go on to high school.

In relation to high school, the results in Figures 3.34 to 3.36 show that the retention rate has increased over time; in other words, dropping out of school at the secondary level has become an increasing problem in recent decades. Moreover, Figure 3.36 shows that the retention rate at the end of high school education has continued at a very high level (55%) and remained constant over time, at least until 1950. There is, nonetheless, some evidence of an increase in the retention rate after 1955. In other words, the probability that a juvenile who has completed high school goes on to university is not high (45%) and has dropped over the last few decades.

3.3. Returns on Human Capital

In this subsection we estimate the relationships between wages and education for each cohort and time period. Drawing on these estimates, we looked at the form in which the returns on education have developed among cohorts and during the life cycle. We used non-parametric specifications to be able to obtain estimates separately for marginal returns at all levels of education. In particular, we give estimates of the evolution of the returns on the levels of junior, high school and university education over time and for each cohort. These estimates are found in Figures 3.37 to 3.43. A series of regularities were identified based on these figures:

Average Returns

The evolution of the average impact of one extra year of education on the wages (return on education) during the life cycle, per cohort, is given in Figure 3.37. This figure shows that the returns on education in Brazil are between 10% and 17% for each extra year of education, which can be considered extremely high if compared to international standards. Moreover, these returns on education are rising at the start of the life cycle, at least until 35 years old. We noted a clear downward trend of the returns as time went by, but it was not clear if this drop is due to cohort or time effects.

Regional Differences

The evolution of the impact of one extra year of schooling on wages during the life cycle, per cohort, in the Southeast and Northeast regions is given in Figures 3.38 and 3.39. Although the patterns are the same, the returns are higher in the Northeast.

Returns per Education Level

Figures 3.40 to 3.43 show the evolution of the impact of an extra year of education on the wage during the life cycle for each cohort, separately for each level of education. First, Figure 3.40 shows that the returns on education in the first stage of junior school seem to increase during the life cycle. We can also perceive that the return has dropped over time, being higher for the older cohorts. By comparing Figures 3.40 to 3.43, we can see that, among all education groups, the returns on university education are the highest and the returns at first to fourth grades come close behind.

In relation to the returns at the second stage of junior school, Figure 3.41 shows that they seem to be much less sensitive to the life cycle than the returns in the first stage. Moreover, there is strong evidence that the returns at the second stage of junior school have dropped over time, being much higher for the older cohorts. When we compare Figures 3.40 to 3.43 we find that the return in the second stage of junior school is the lowest of all the other education groups.

Figure 3.42, in its turn, shows that the returns for high school education has a pattern in the shape of an inverted U, where the return rises until 35 years old and falls for the following ages. There is also clear evidence that these returns have dropped over time and are much higher for the older cohorts. When we look at Figures 3.40 to 3.43 we can find that the returns on high school education are high but are still lower than university education. The comparison with the returns on education in the first stage of junior school depends on the cohort. The returns are higher in the first to fourth grades among the older cohorts, while among the younger cohorts the returns on high school education are higher.

Finally, Figure 3.43 shows that there is no defined pattern for the life cycle of the returns associated with university education. Unlike the other education levels, there is evidence that returns have increased over time. As we have already mentioned, by comparing Figures 3.40 to 3.43 we can see that the returns on university education are always higher than the returns at other education levels.

3.4. Time Allocation

In this subsection we discuss how families allocate their members' time between activities in the labor market and domestic production or leisure during their life cycle. The development of this pattern in the life cycle is analyzed for each birth cohort each year. More specifically, in this subsection we investigate differences in the share in the labor market, over time, for each cohort and gender, as well as the differences in these patterns between regions and through different education levels. We also investigated two alternative ways of breaking down the participation rate. First, the participation rate is broken down into half-day and full-day activities. Secondly, participation is broken down according to the nature of the employment relationship: self-employed, formal employee and informal employee.

The estimates for life cycle patterns for all these definitions of a participation rate are given in Figures 3.44 to 3.67, based on which some regularities were found.

Male Patterns

For a series of birth cohorts, Figure 3.44 presents the life cycle pattern for the participation rate of men in the work force. There is little variation in this pattern over time and among cohorts, where the sole exception is the participation of juveniles in the work force, which displays a slight decrease in time and among cohorts. In general terms, Figure 3.44 shows a sharp rise in participation in the work force until 25 years old, when the participation rate reaches 90%, and continues above 90% until 50 years old. After this age, participation in the work force drops at a 20% rate per decade.

Female Patterns

The pattern of the life cycle for the rate of female participation in the work force for a series of birth cohorts is given in Figure 3.45 which, unlike the preceding figure, shows substantial variations among the cohorts. In particular, participation in the work force tends to be much higher in the younger than in the older cohorts. When we compare women at the same age in different cohorts, we can see that female participation in the work force has increased 15% each decade. However, most of this change was concentrated among adult women, with very little variation in the participation of juveniles in the work force.

We can also conclude that currently female participation in the work force is 60% and that the age at which a woman reaches the peak depends heavily on the cohort: the younger the cohort, the earlier the peak. Moreover, the fact that participation of older women in the work force is still growing, while the participation of younger women is apparently steady, may be considered evidence that, in addition to the cohort effect, a time tendency also influences female participation in the work force. This participation starts to decrease five years earlier than male participation. In fact, while male participation in the work force starts to drop at 50 years old, participation in the work force among women begins to drop at 45 years old.

Regional Disparities

Figures 3.46 to 3.49 give the rate of participation of men and women in the work force during the life cycle for each cohort and region. These figures show that the regional disparities are not very important either for men or women. Nevertheless, there is a trend that there is a bigger drop in participation in the Southeast than in the Northeast among people over 50 years old. In other

words, retirement seems to be more important in the Southeast than in the Northeast of Brazil. Surprisingly, with regards to the juvenile work force, the differences between both regions are not significant.

Differences per Education Level

Figures 3.50 to 3.57 show the life cycle pattern of the rate of participation of men and women in the work force for each cohort and education level.

The evidence for women given in Figures 3.50 to 3.53 shows that the rate of participation in the work force is considerably higher among women with a high level of education than among women with a lower level of education. In fact, if we consider women born in the 1960s, the participation of the 30 to 40 age groups in the work force varies from 50% for women with the first stage of incomplete primary schooling to 75% among women who have completed high school. These figures show that the difference between young and old cohorts regarding participation in the work force is much less for women who have completed high school than for women with a lower level of education. Furthermore, these figures show a bimodal pattern for women with a lower level of education, while for women with a higher level the pattern is single mode.

The evidence for men is given in Figures 3.54 to 3.57, which show slight differences at each level of education. The most obvious difference is in the period when they enter the work force. Since the group with a higher education level needs to stay longer at school, they are forced to postpone their admission to the work force. Besides, although the differences in age when the education groups enter the work force, their retirement age is quite similar. As a result, on average, the groups with less education tend to work more years of their life than the groups with a higher level of education.

Full-Time versus Part-Time Work

Figures 3.58 to 3.61 show the pattern of the life cycle of the composition of employment of men and women according to the hours worked. The results show that among adult workers (from 30 to 50 years old), 10% of the men and 35% of the women work part-time (less than 30 hours a week). In this way, women are more likely to occupy part-time jobs than men. Among juveniles,

however, part-time jobs are traditionally more common among both men and women. Moreover, part-time jobs among juveniles are increasing fast over the last 20 years.

Among the young 15-year-old adults the percentage of part-time jobs increased from 25% to 70% for men, similar to the variation for women. The same can be found for older people, where the percentage of part-time jobs is also higher. Among 65-year-olds, 50% of women and 15% of men perform part-time work.

Formal versus Informal Employment

Figures 3.62 to 3.67 show the composition of male and female employment according to the nature of its relationship: formal, informal employee and self-employed. These figures show that the composition of employment for men and women changed very little over time and among cohorts. Nevertheless, we can see a tendency for women to increase the degree of formalization.

In relation to the life cycle patterns of the employment composition, they are extremely similar when comparing men and women. In both cases, the percentage of the work force that works in self-employment has steadily risen during the life cycle at a rate of 7.5% per decade. However, this percentage is around 5% higher for men than for women, considering workers of all ages.

Informal jobs are quite common among both young men and women. For instance, 45% to 50% are informal jobs among the young 15-year-old adults. However, when we consider people between 30 and 60 years old, the percentage of informal jobs is much lower and essentially constant: 15% among men and 20% among women.

With respect to the life cycle pattern, the figures show the percentage of formal workers in an inverted U form for both men and women. In both cases, the peak occurs at around 25 years old, when 40% of men and only 35% women have a formal job. After 25 years old, the percentage of formal employment drops, while the importance of self-employment increases.

3.5. Investments in Human Capital

In this subsection we look at how the family invests in its future. More specifically, we analyze school attendance of children over time and for each cohort. We look at how investment in human capital in children in Brazil has developed over the last few decades and how this investment occurred during the child's education cycle.

Based on the 16 household polls used in this study, we can accompany the cohort born between 1969 and 1971 for most of its education life cycle. The 10 to 25 year old cohorts will be accompanied, and their education history is described in Figures 3.68 to 3.77, on which basis the following regularities can be identified:

First Stage of Junior School (First–Fourth Grades)

Figure 3.68 shows that 25% of all 11-year-old children have not yet completed the first grade. Moreover, 14% of children at this age are still enrolled in the first grade, 8% of this cohort will not finish this grade and 10% will not pass to the next grade. With regard to the second grade, we can see from Figure 3.69 that more than 40% of all 11-year-old children have not yet completed the second grade. Also, 16% of children at this age are still enrolled in that grade; 10% of this cohort, though, will not finish second grade and 15% will not pass to the next grade. Figure 3.70, however, shows that more than 60% of all 11-year old children have not yet completed the third grade. Also, 19% of the children at this age are still enrolled in this grade, 15% of this cohort will not finish it and 21% will not pass to the next grade. Lastly, with respect to the fourth grade, Figure 3.71 shows that more than 80% of all 11-year old children have not yet completed this grade. Moreover, 19% of the children at this age are still enrolled in the grade, 22% of this cohort will not finish it, and 35% will not pass to the second stage of junior school.

Second Stage in Junior School (Fifth –Eighth Grades)

Figure 3.72 shows that at 11 years old, at least 20% of children in this cohort have already reached the fifth grade. Only 15% of the children at this age are enrolled in this grade, 36% of this cohort will not finish it, and 45% will not pass to the sixth grade. Considering 12-year-olds, we can see in Figure 3.73 that less than 15% of the children in this cohort have already reached the sixth grade. Only 12% of children at this age are enrolled in this grade, 45% of this cohort will not finish it and 51% will never pass to the next grade. In relation to the seventh grade, we can see from Figure 3.74 that 13% of 13-year-old children have already reached the seventh grade. Only 11% of the children at this age are enrolled in the seventh grade, 52% of this cohort will not finish it and 57% will not pass to the next grade. Finally, with regard to 14-year-old children, Figure 3.75 shows that 12% have already reached the eighth grade. Only 10% of the

children at this age are enrolled in the eighth grade, 58% of the children of this cohort will not finish it, and 68% will not go on to high school.

Secondary Education (First-Third Year)

Figure 3.76 shows that 10% and 27% of 15 and 18-year-olds, respectively, have been admitted to high school. Moreover, 71% of this cohort will not complete high school and around 91% will not go on to university.

University

The results in Figure 3.77 show that only 5% and 9% of 18 and 21-year-olds, respectively, have already gone to university, and only 5% of this cohort completed the university course before reaching their twenty-sixth birthday.

4. Determining Factors of Family Structure and Behavior

The objective of this section is to investigate the main determining factors of the family structure and behavior. To do so, we organize our analysis in five subsections. The first studies the relation between fertility and education, taking into consideration the existing disparities both in regional terms and among cohorts. In the second subsection we look at the socioeconomic determining factors for female participation in the labor market. The third subsection contains an analysis of the determining factors for leaving (early) the labor market, and in the fourth we discuss the socioeconomic determining factors of child labor. Finally, in the fifth subsection, we submit an analysis of the determining factors for the young portion of the population's lag at school.

4.1. Investment in Human Capital and Drop in Fertility

In Section 3 herein we show that the main transformation that affected Brazilian families over the past few decades was the sharp drop in the number of children. We also show that the average level of education of the adult population tripled during this period. In this subsection, we look at the connection between these two phenomena. More specifically, three issues are examined. The first refers to the relationship between fertility and women's education. To

analyze this relationship, we estimated the impact of an extra year of education for women on the number of children. We also investigated how this impact varies with women's original level of education. More specifically, we examined whether an extra year of junior school has the same impact on fertility as an extra year in high school, and how the impact of education varied over time and between regions. Second, we will analyze the extent to which the fertility occurring in the past ten years can be explained by the increase in education. Finally, we look at the importance of the noticeable differences in school attendance to explain the regional differences in fertility.

The Impact of Education on Fertility

We use the number of births as a measurement of fertility. In order to find approximate overall fertility, the analytical universe was restricted to women between 45 and 69 years old. To calculate the impact of education on fertility, we went back to our measurement of fertility in education, using women's age, race and home region as control variables. The regression also includes an indicator for dwelling in urban areas.

In the regression we do not assume that the relationship between education and fertility is linear. On the contrary, we left this relationship completely free, including an education indicator for each level. Table 4.1 gives the estimated figures.

This table shows that, on average, an extra year of education reduces fertility by 0.32; that is, a woman needs around three more years of education to reduce the number of children in a unit. The impact of education, however, is not linear. As Table 4.1 shows, fertility is more sensitive to the first years of education (junior school) than for variations in education above this level. In fact, while an extra year of education in junior school reduces fertility by around 0.33, an extra year in high school reduces fertility by around 0.15, and an extra year at university reduces fertility by around 0.10. In other words, we find that basic education has, on average, an effect on fertility twice (three times) greater than an extra year at high school (university).

Disparities among Cohorts

Fertility has been dropping significantly in Brazil as time goes by. Table 4.2 shows the average number of children born to various cohorts, showing a 0.9 drop every ten years. At the same

time, we find that education is increasing at a rate of 1.2 for every extra year of education per decade.

We then look at the extent to which the drop in fertility is due to the increase in education. So we re-estimated our regression for each cohort. The results are given in Table 4.3. This table shows that the average impact of education on fertility has been decreasing as time goes by, that is, the impact is greater among the older rather than the younger cohorts. Based on our regressions and the distribution of education per cohort, we find that the increase in education would reduce fertility by around 35% in relation to the level found (see Table 4.4a). In other words, we find that more than one third of the drop in fertility was due to increases in women's level of education.

Disparities among Geographic Regions

Based on information in Table 4.2, we can see that there is less fertility and more education in the Southeast region than in the Northeast. In fact, average education in the Southeast is 1.7 years more than in the Northeast.

We now move on to investigate the extent to which differences in fertility can be explained by differences in the level of education. So we re-estimated our regression per geographic region. The results are given in Table 4.4. This table shows that the average impact of education on fertility is stronger in the less developed regions, such as the Northeast. Based on these regressions and distribution of education between the regions, we estimated how much the regional differences in fertility can be reduced if regional differences in education are eliminated. The results given in Table 4.4a show that the regional differences in education explain 25% of the differences in fertility. In other words, we find that one quarter of the higher fertility in the Northeast can be explained by women's lower level of education in this region.

4.2. Socioeconomic Determining Factors of Female Participation in the Labor Market

The woman's participation rate is another characteristic identified in the second part of the study as having sharp variations both in time and among cohorts. In this subsection we examine to what extent these variations can be explained by concomitant changes in the socioeconomic environment during the life cycle, among cohorts and as time goes by.

Bearing this goal in mind, we relate the evolution of the female participation rate during the life cycle for a group of cohorts to those that would be its most immediate socioeconomic determining factors: (a) average woman's wage, (b) net family income per capita from the earnings from women's work, and (c) proportion of families headed by women. From a theoretical viewpoint, we should expect that the rise in the participation rate is partly explained by the rise in their wages and increase in the prevalence of families headed by women. On the other hand, the increase in net family income per capita from the earnings from the women's work appears as a factor that would induce decreases in the female participation rate. In order to find factors not included in the analysis, and which vary either during the life cycle or among cohorts, we also included in the analysis the age and birth cohort (time). The less important this variable is the greater the capacity of the included variables for explaining the variations per cohort and during the life cycle.

The results obtained are in Table 4.5. This table shows that both the effect of women's wages and that of family income are statistically insignificant. The only statistically explanatory significant factor obtained in these regressions was the prevalence of families headed by women. Estimates obtained show that the increase in the proportion of families headed by women has been an important factor in raising women's participation rate over the past few decades.

4.3. Socioeconomic Determining Factors for Retirement

One of the main conclusions from studying the participation rate in the labor market conducted in the second part of this study was that the participation rate in Brazil starts to drop very early in the life cycle. In fact, as we can see in Figure 3.44, the participation rate starts to plummet long before 50 years old.

Two kinds of socioeconomic factors influence the behavior of the participation rate. On one hand, there are supply factors that influence the reserve wages, such as family income per capita and the availability and generosity of the pension. On the other hand, there are demand factors, represented fundamentally by the market wage. The higher the market wage in relation to the reserve wage, the more likely the person is to remain in the labor market.

In order to check the importance of these socioeconomic factors to explain the exit of people 50 years old or over from the labor market, we estimate the relationship between the participation rate in the labor market and these factors based on the probit model shown in Table

4.6. In this model, the wage-hour was calculated for those outside the work force as being equal to the average wages of workers with identical personal characteristics (education, age, gender, race and geographic location) who are still in the labor market.

The results obtained are in Table 4.6 and show that, despite the importance of all the socioeconomic factors under study, age is still a major factor in determining the participation rate, indicating the existence of important bound factors (such as health, for example) that were not included in the analysis.

The sign of the impact of the socioeconomic factors estimated in Table 4.6 is fully in agreement with what would be expected in theory. All factors that raise the reserve wage, such as pension availability and generosity, reduce the participation rate in the labor market. The wage-hour, however, has a positive statistically significant impact on the participation rate, as expected. In short, we find that the sharp drop in the participation rate for 50-year-olds in Brazil is, to a great extent, explained by demand factors (lower wage-hour) and supply (more access to retirement). It is worth mentioning, however, that the impact of age is still relevant, indicating that other factors bound to the life cycle, such as deterioration in health conditions, are also very important.

4.4. Socioeconomic Determining Factors of Child Labor

One of the major conclusions from the analysis on the participation rate in the labor market conducted in the second part of this study was that, in addition to the sharp rise in female participation and the early departure from the labor market of people close to 50 years old, Brazil continues to show a high rate of child participation in the labor market.

As in the case of adults, two kinds of socioeconomic factors influence the behavior of children's participation rate in the labor market. On one hand, there are supply factors that influence the reserve wages, such as family income per capita, size of family, education of parents, and school availability. On the other hand, there are demand factors represented, basically, by the market wage and available work in the family business. The higher the market wage and possibilities of employment in relation to the reserve wage and education possibilities, the more likely the child or teenager is to enter the labor market.

In order to check the importance of these socioeconomic factors to explain the inclusion of children in the labor market, we estimate the relationship between its rate of participation in

the labor market and these factors based on the probit model in Table 4.7. In this model, the wage-hour was calculated for those without a job as equal to the average wage of those with identical personal characteristics (education, age, gender, race and geographic location) with a job.

The results obtained show that at least the sign of the impact of the estimated socioeconomic factors is fully in accordance with what would be expected in theory. Every factor that raises the reserve wage, such as income per capita and education of parents, reduces the rate of participation in the labor market. Similarly, the factors that reduce the reserve wage, such as family size, raise the labor market participation rate. As expected in theory, however, the wage-hour has a positive, statistically significant impact on the rate of participation.

In short, we find that the high prevalence of children's labor in Brazil is, to a great extent, explained by demand (lower wage-hour) and supply (poor quality of family environment and inadequate school access) factors. The parents' level of education seems to be the most important of the factors in the study.

4.5. Determining Factors of Lag in Education Among Juveniles

The analysis of the educational performance among juveniles has shown that a significant portion are either out of school or enrolled in grades far below what would be expected for their age group. This poor learning performance is partly the result of the high degree of poverty and low level of education of their parents. Moreover, no access to school and its poor quality and the high prevalence of child labor are also important factors in explaining this poor educational performance.

In this subsection we look at the relative importance of these factors in explaining the poor Brazilian educational performance. Bearing this objective in mind, we use a linear regression to relate the grade-age lag with these determining factors.

The results in Table 4.8 show that both personal and family environment characteristics are of major importance in explaining the lag in school education. Particularly important is the education of the parents, mainly of the mother. Family income per capita has the expected impact, but its scope is much more limited than that of the parents' level of education.

With regards to the availability and quality of the school, we find that, despite the importance of the family environment, important regional differences prevail, indicating that

differences in school availability and quality are very important. The results obtained also show that the occurrence of child labor increases the lag at school significantly.

5. Conclusion

In this study we endeavored to present a detailed description of the structure and behavior of Brazilian families during their life cycle and also look at the main socioeconomic determining factors in changes in its structure and behavior occurring over the past few decades, based on the National Household Sample Research (PNAD). Hence, on one hand, we describe how the patterns shift over the past few decades and, on the other, look at how these changes in structure and behavior of the families can be explained by concomitant variations in the Brazilian socioeconomic environment. There are nine main conclusions in this study.

First, in relation to *family structure*, we find that the family size reaches its peak when the head of the family is around 40 years old, although this maximum has been occurring increasingly early in the family life cycle. Moreover, evidence has shown that the family size of the younger cohorts tends to be smaller than that of older cohorts. The main explanation for this drop in family size was a decreasing number of children among younger as compared to older cohorts. Another important finding was that the proportion of families headed by women in Brazil has increased during the family life cycle, with the younger cohorts presenting a larger proportion of female heads of family than the older cohorts.

In relation to the *education capital stock*, evidence has shown that the illiteracy rate has been decreasing since the beginning of this century, although the downward rate has slowed down for the cohorts born after 1960. Although it has continued to grow through the birth cohorts, average education is still relatively low, reaching only 6.5 complete years of study for the cohort born in 1970. Moreover, we identify the existence of a clear slowdown in the growth rate of average education for the cohorts born after 1960. Educational inequality–measured by the standard deviation–rises fast until the cohort born in 1950, after which it drops. Although it is still low for the younger cohorts (75%), the proportion of the adult population that has studied to at least full fourth grade has increased significantly since the beginning of the century. The same proportion for those with more than eight full years of education has also grown considerably, although it remains low (30%), even for the younger cohorts. Although it has also increased, the proportion with at least complete high school education has not yet reached 10%.

These conclusions are explained to a large extent by the decrease in the retention rate of the grades in the first primary cycle (up to fourth grade), a phenomenon which is not encountered in the second cycle. The retention rate for high school education has been increasing over time; the probability that a young adult who has completed this cycle will enter university has been lower in recent decades.

Thirdly, we find that the *returns on human capital* are quite high (10% to 17% on average per extra year of study), principally when compared to international standards. Moreover, these returns are rising at the start of the life cycle and then dropping after around 35 years old. We cannot identify whether this profile is due to the cohort-effect or time-effect. We also found that the returns on education tend to be less for the younger than for the older cohorts. Returns on education provide heterogeneity between the different stages of the education cycle and are relatively higher for university education and the first stage in primary schooling.

In relation to *time allocation*, we confirm the inverted U format for the male participation pattern in the work force, with negligible differences between the birth cohorts. The life cycle pattern for the rate of female participation is also in the inverted U format, but with a significantly lower peak than that of the men (60% against almost 100%). Unlike male participation, female participation displays wide variations among cohorts, chiefly in the adult stage. Women tend to leave the work force at 45 years old, while men tend to leave later when they are 50 years old. There is no difference in the male and female participation patterns between the Southeast and Northeast regions, although the downward trend in the participation rate for both genders occurs earlier in the former region. There is very little difference in the male participation pattern according to level of education. In the woman's case, however, we found that the participation rate tends to be significantly higher for those with a higher educational level. In terms of duration of a day's work, the evidence shows that women over 25 years old are more likely to occupy part-time jobs than men in the same age group. We also found a substantial increase in part-time jobs in the past 20 years for young adults of both genders. With regards to employment relationship, evidence has shown a steady upward trend in self-employment over time, for both men and women. Informal employment is higher at the start of both men's and women's life cycle until they are 15 years old, when it decreases until reaching stability at around 20%. Formal employment shows an inverted U profile during the male and female life cycle.

In relation to the *impacts of education on fertility*, we found that an extra year of education reduces the fertility of the women by an average of 0.32 child. However, this impact is quite distinct according to the women's education group, being three (four) times higher for those who have an extra year of basic education than for those who had an extra year of higher education (university). When this same analysis was performed for different female cohorts it showed that the impact of education is stronger for the older than for the younger cohorts. We could estimate from this that more than one third of the drop in fertility was due to the rise in women's level of education. In regional terms, we found that the average impact of education on fertility is greater in the less developed regions, such as the Northeast.

In relation to the *economic determining factors of female participation*, our study shows that the only factor that was statistically significant in explaining the increase in the female participation rate was the increase in the proportion of families headed by women. The effects associated with women's wages and family income were shown to be statistically insignificant.

Considering the *economic determining factors of retirement*, we could see that the decrease in the participation rate after 50 years old is to a large extent explained by the drop in wages and further access to retirement, as well as age. These results are fully in agreement with what would be expected in theory. It is worth noting that the impact of the age factor indicates the importance of other factors relating to the life cycle, such as health.

With respect to the *socioeconomic determining factors of child labor*, we could see that the high prevalence of child labor in Brazil could be explained by what are called demand (market wage) and supply (family size, education of parents and available schools) factors. The parents' education plays the most important role of all factors involved in the study.

The results of the *socioeconomic determining factors of young adults' learning gap* show that both personal characteristics and those of the family environment are of major importance in explaining the lag in education at school. In particular, the education of the parents–namely that of the mother–plays a crucial role. We also found that regional differences are important, indicating the relevance that the availability and quality of the school can have. Child labor was also found to be considerably significant in explaining young adults' lag in their education.

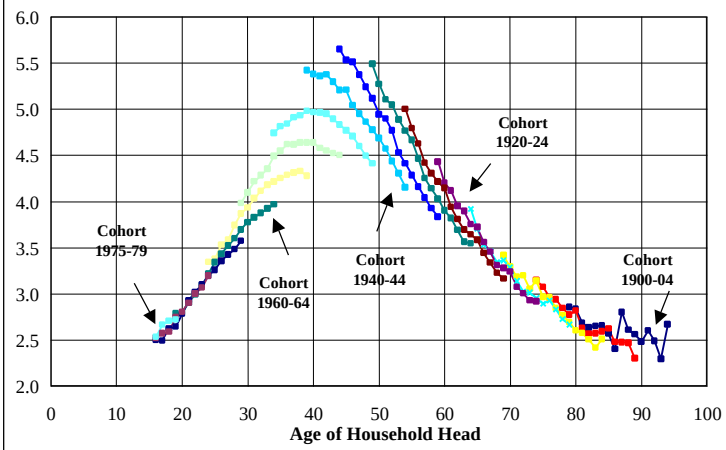
Bibliographic References

Deaton, A. and Paxson, C. 1994. "Intertemporal Choice." *Journal of Political Economy*. 102 (3): 437-467.

IBGE. 1997. *Pesquisa Nacional por Amostra de Famílias, 1977 a 1997*. Rio de Janeiro: IBGE.

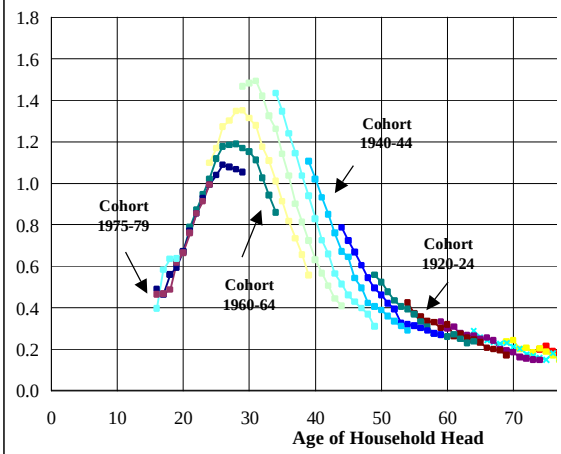
MaCurdy, T. and Mroz, T. 1995. "Measuring Macroeconomic Shifts in Wages from Cohort Specifications." Stanford, United States: Stanford University. Mimeographed document.

Figure 3.1. Number of Persons per Household by Ageof Household Head



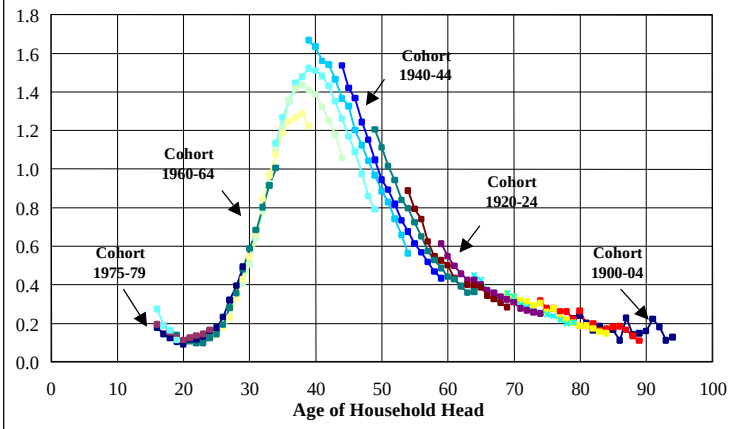
Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.2. Number of Children between 0 and 6 Years by Age of Household Head



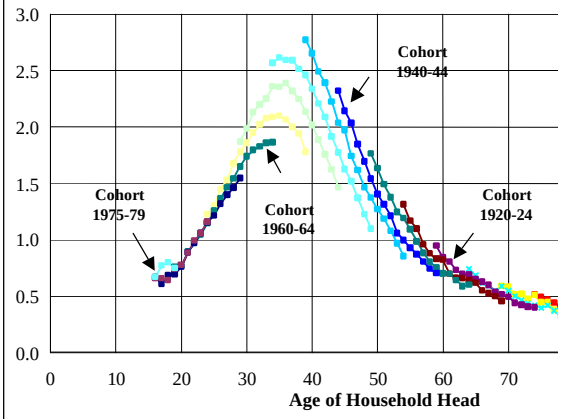
Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.3. Number of Persons 7-14 Years of Age per Household by Age of Household Head



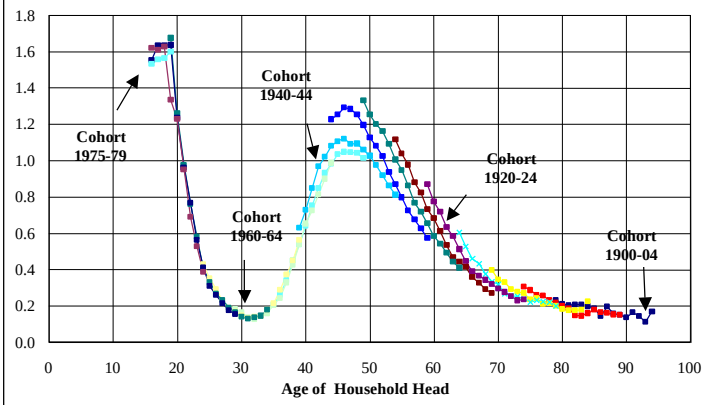
Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.4. Number of Persons Over 14 Years of Age per H by Age of Household Head



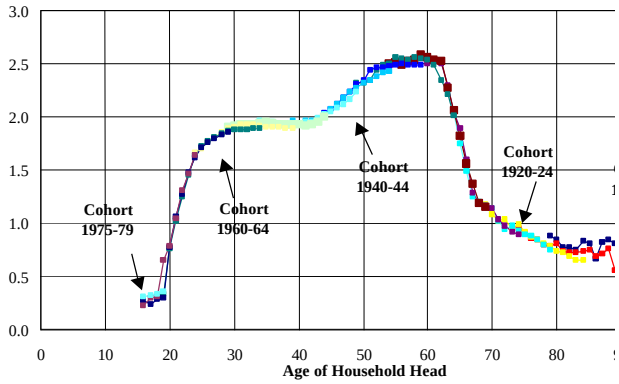
Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.5. Number of Persons 15-21 Years of Age per Household by Age of Household Head



Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.6. Number of Persons 22-64 Years of Age per Household Age of Household Head



Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.7. Number of Persons 65 Years and Older per Household by Age of Household Head

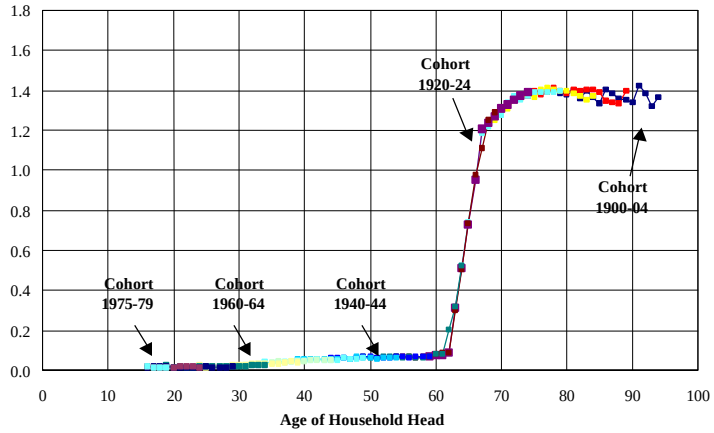
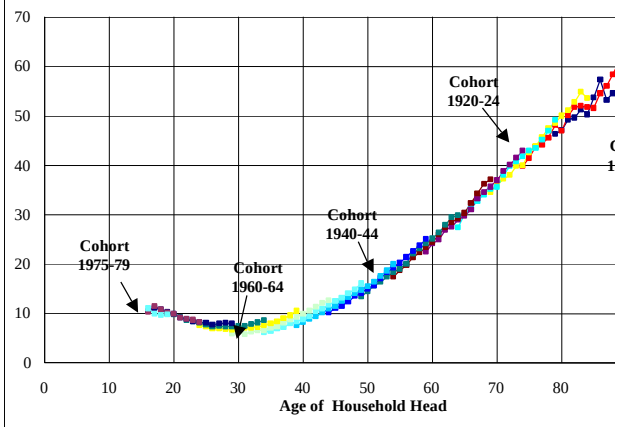
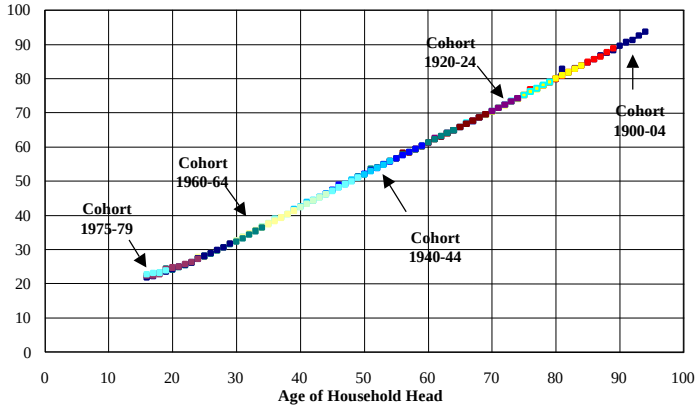


Figure 3.8. Average Ageof Youngest Household Numl by Age of Household Head



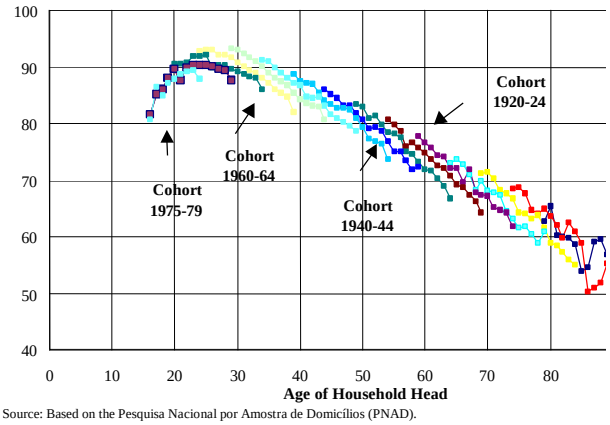
Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.9. Average Age of Oldest Household Member by Age of Household Head



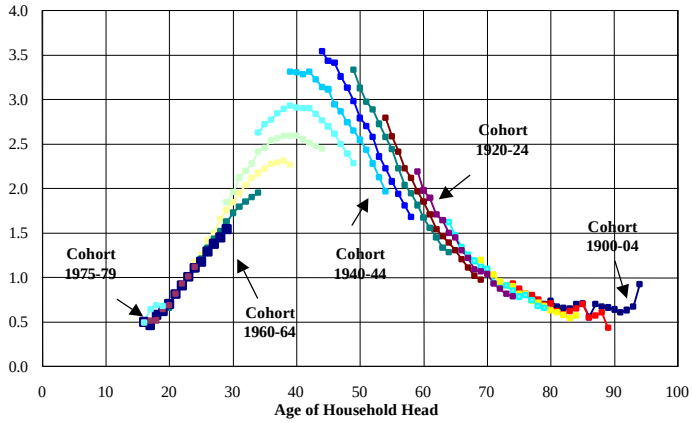
Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.10. Probability of Male-Headed Household by Age of Household Head



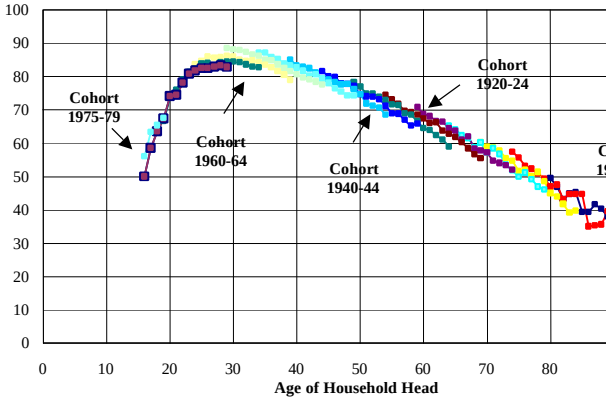
Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.11. Number of Children per Household by Age of Household Head



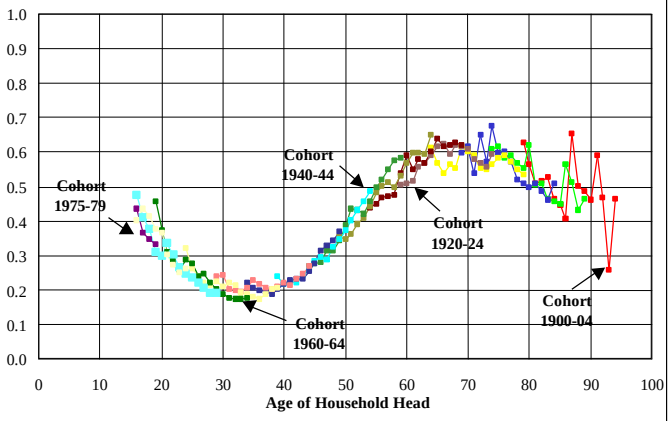
Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.12. Probability of Household with Present Sp by Age of Household Head



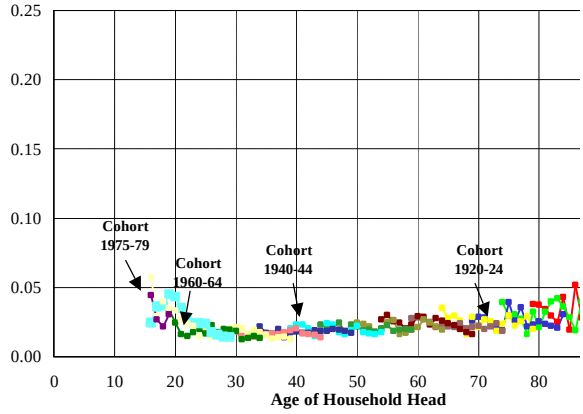
Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.13. Number of Relatives Other than Children and Spouse per Household by Age of Household Head



Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.14. Number of Non-Relatives per Household by Age of Household Head



Source: Based on the Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.15. Illiteracy Rate

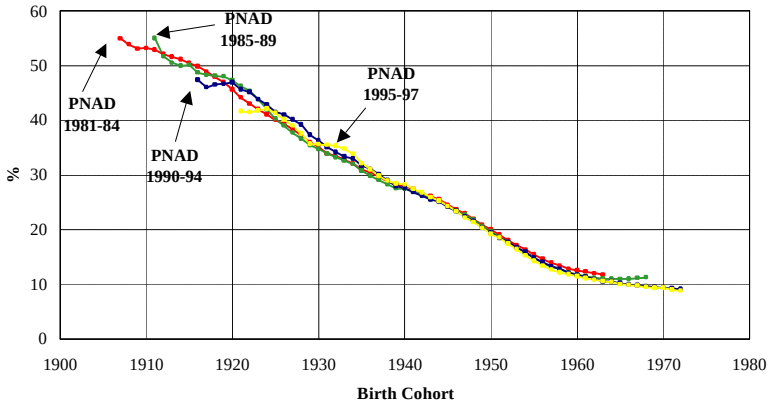


Figure 3.16. Average Education

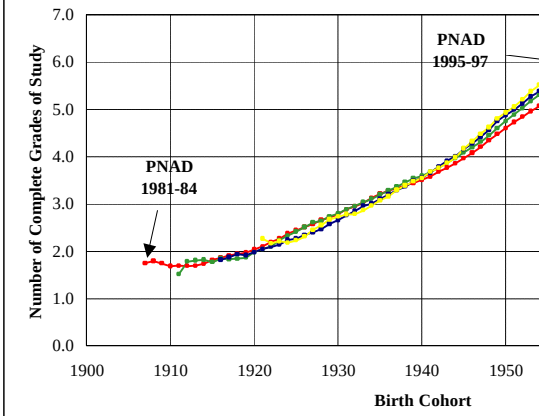


Figure 3.17. Standard Deviation of Schooling

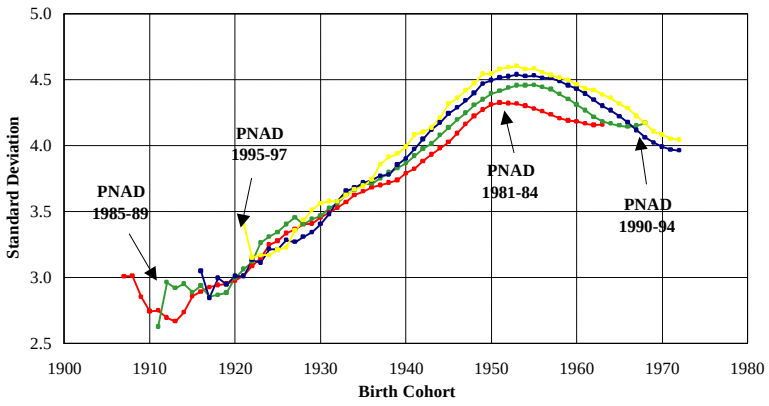


Figure 3.18. Proportion of Population with 0 Years of Schooling

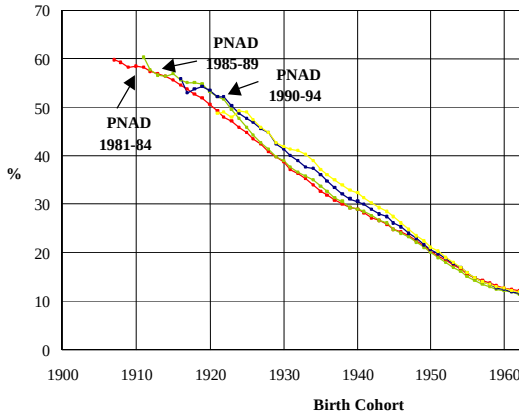


Figure 3.19. Proportion of Population with 4 Years of Schooling

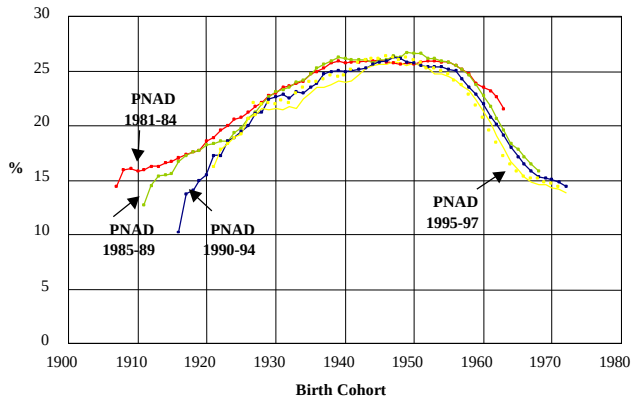


Figure 3.20. Proportion of Population with 8 Years of Schooling

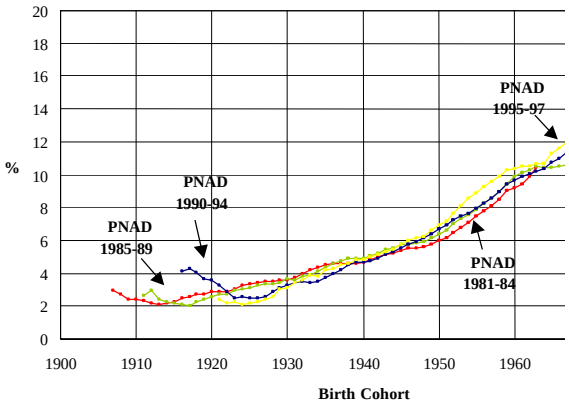


Figure 3.21. Proportion of Population with 11 Years of Schooling

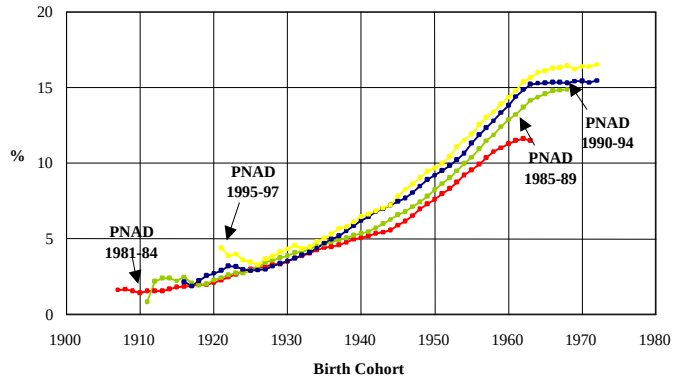


Figure 3.22. Proportion of Population with More Than 0 Years of Schooling

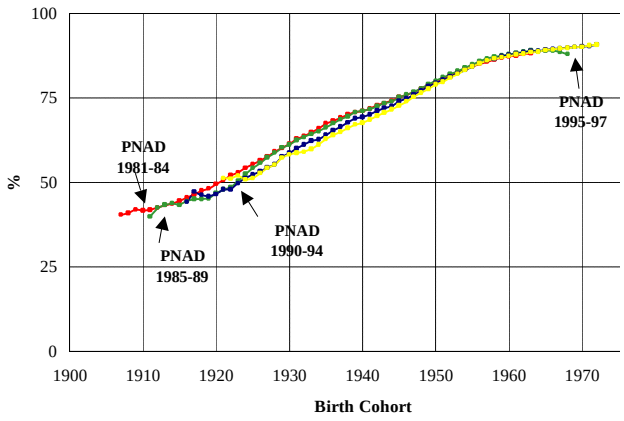


Figure 3.23. Proportion of Population with More Than 4 Years of Schooling

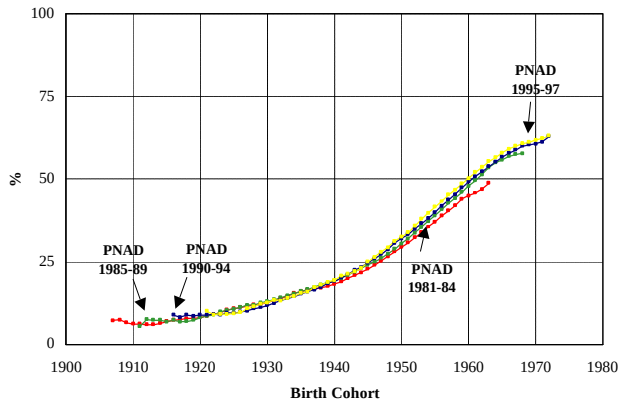


Figure 3.24. Proportion of Population with MoreT 8 Years of Schooling

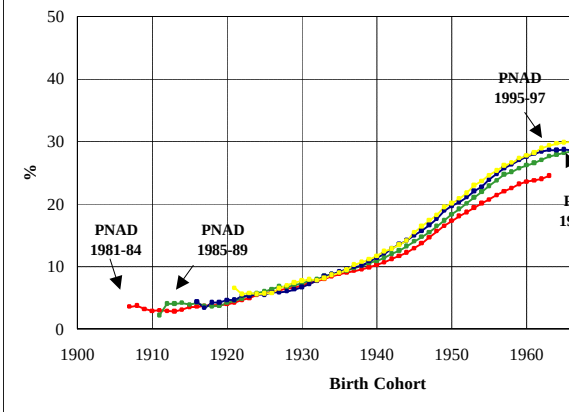


Figure 3.25. Proportion of Population with More Than 11 Years of Schooling

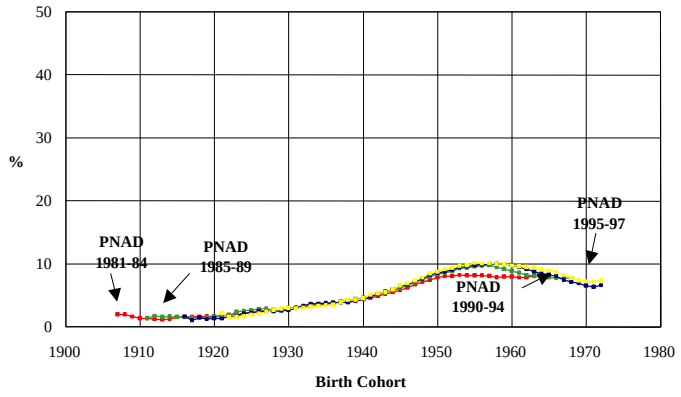
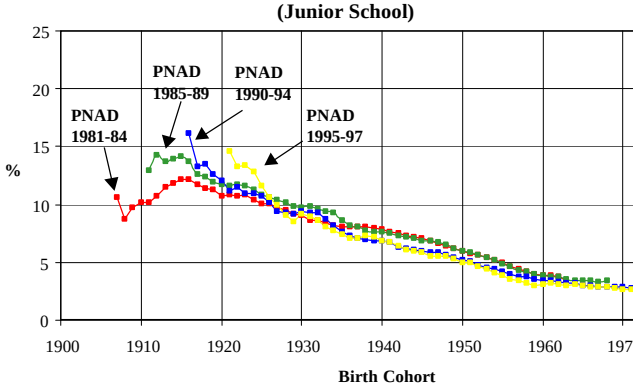
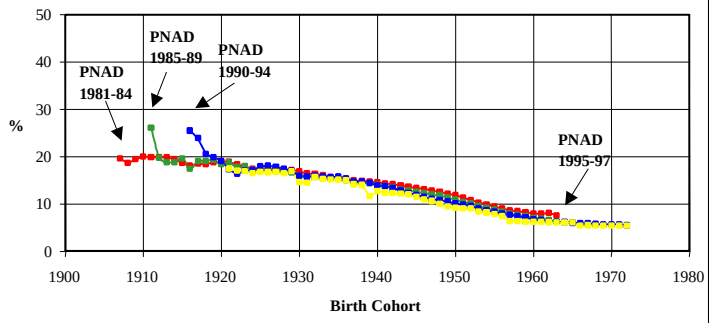


Figure 3.26. Retention Rate in First Grade (Junior School)



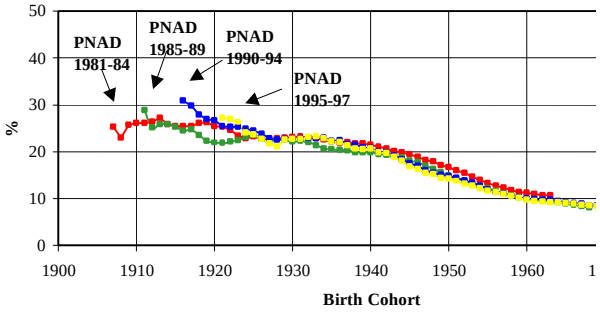
Source: Based on Pesquisa Nacional por Amostra de Domicílios
Universe: People between 25 and 74 years of age.

Figure 3.27. Retention Rate in Second Grade (Junior School)



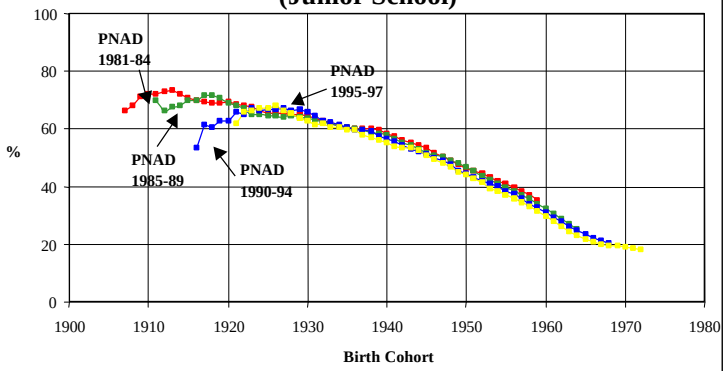
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).
Universe: People between 25 and 74 years of age.

Figure 3.28. Retention Rate in Third Grade (Junior School)



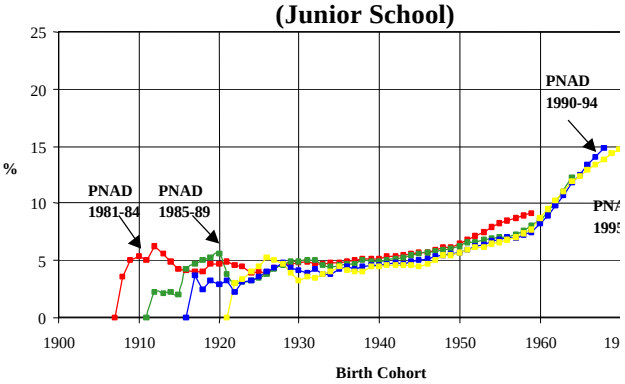
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).
Universe: People between 25 and 74 years of age.

Figure 3.29. Retention Rate in Fourth Grade (Junior School)



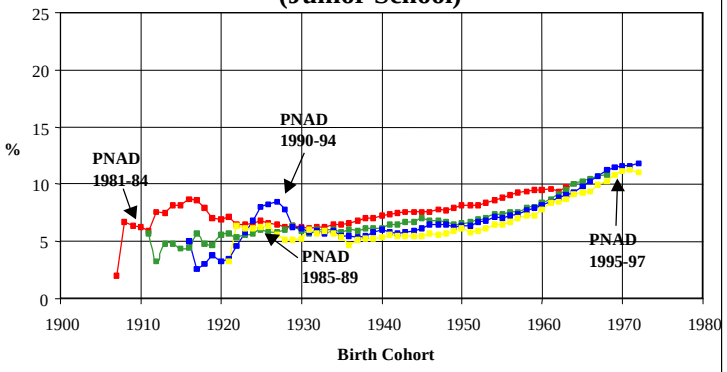
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).
Universe: People between 25 and 74 years of age.

Figure 3.30. Retention Rate in Fifth Grade (Junior School)



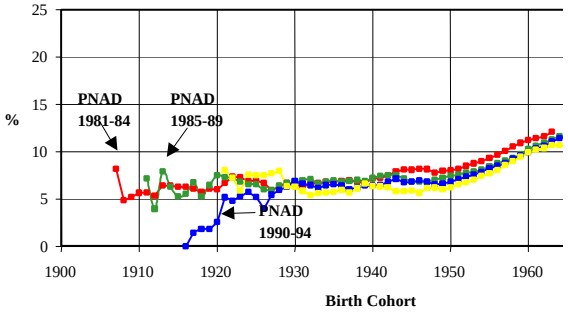
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).
Universe: People between 25 and 74 years of age.

Figure 3.31. Retention Rate in Sixth Grade (Junior School)



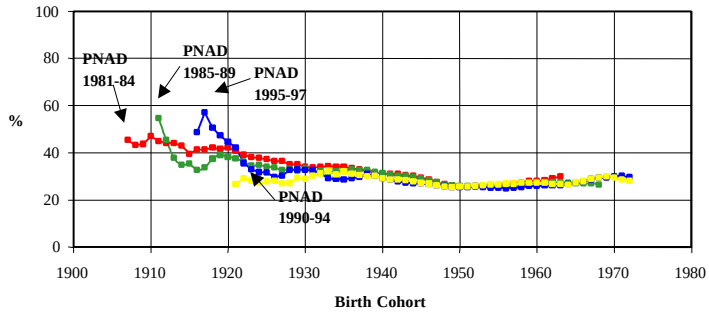
Source: Based on Pesquisa Nacional por Amostra de Domicílios
Universe: People between 25 and 74 years of age.

Figure 3.32. Retention Rate in Seven (Junior School)



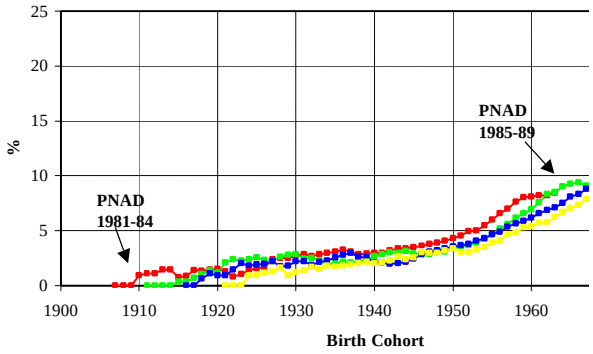
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).
Universe: People between 25 and 74 years of age.

Figure 3.33. Retention Rate in Eighth Grade (Junior School)



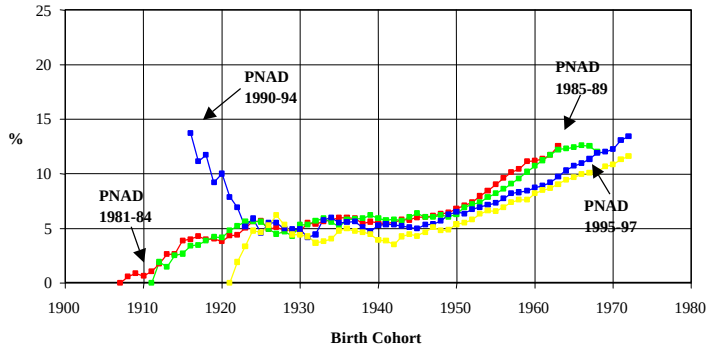
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).
Universe: People between 25 and 74 years of age.

Figure 3.34. Retention Rate in Ninth Grade (High School)



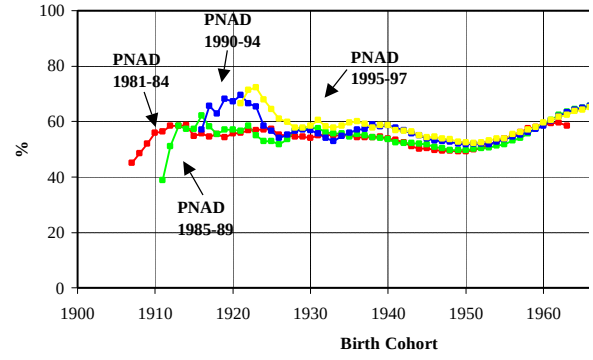
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).
Universe: People between 25 and 74 years of age.

Figure 3.35. Retention Rate in Tenth Grade (High School)



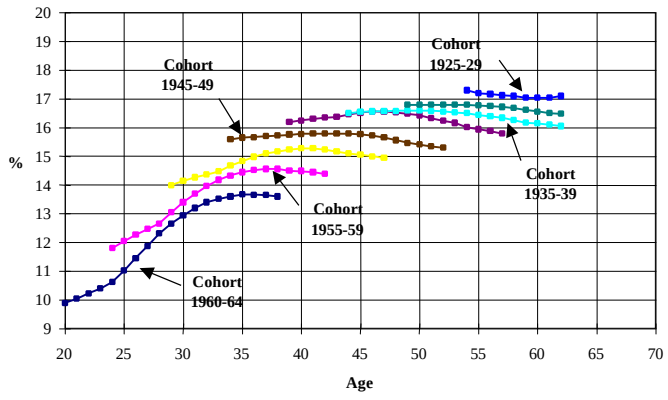
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).
Universe: People between 25 and 74 years of age.

Figure 3.36. Retention Rate in Eleventh Grade (High School)



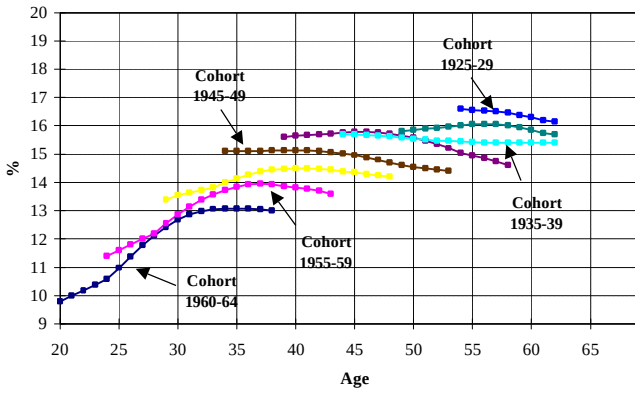
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).
Universe: People between 25 and 74 years of age.

Figure 3.37. Return to EducationOver the Life Cycle, Brazil



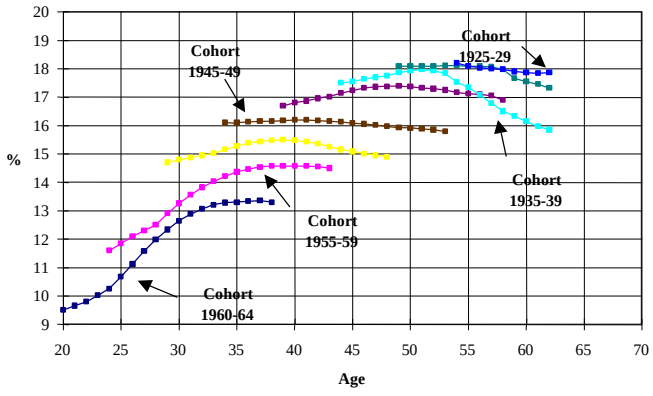
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.38. Return to Education Over the Life Cycle Southeast



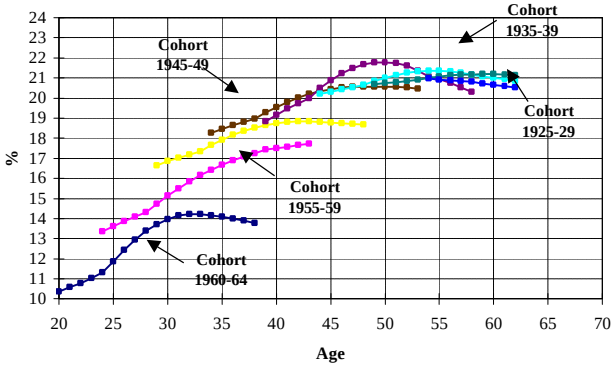
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.39. Return to EducationOver the Life Cycle, Northeast



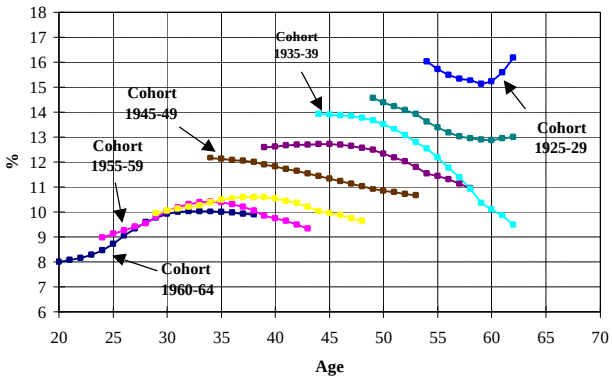
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.40. Return to Education, First School (1st to 4th série)



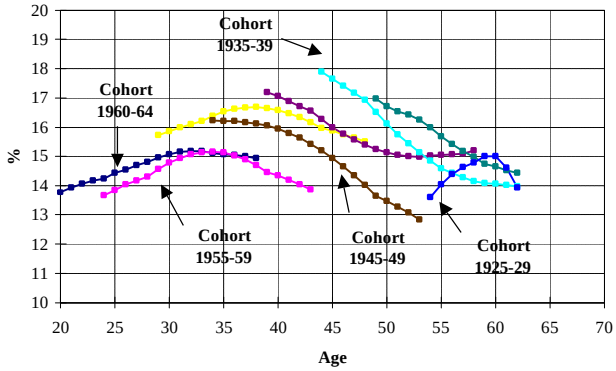
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.41. Return to Education, First Stage of Junior School (5th to 8th série)



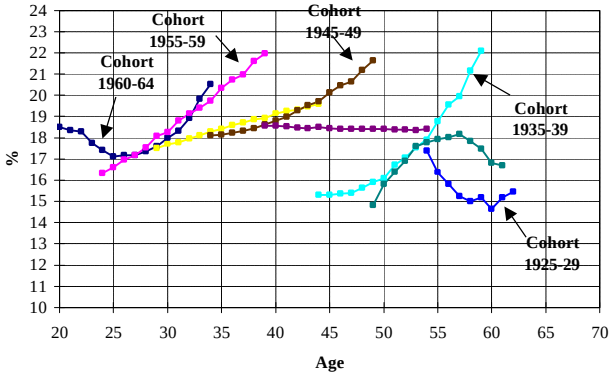
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.42. Return to Education, High School Education



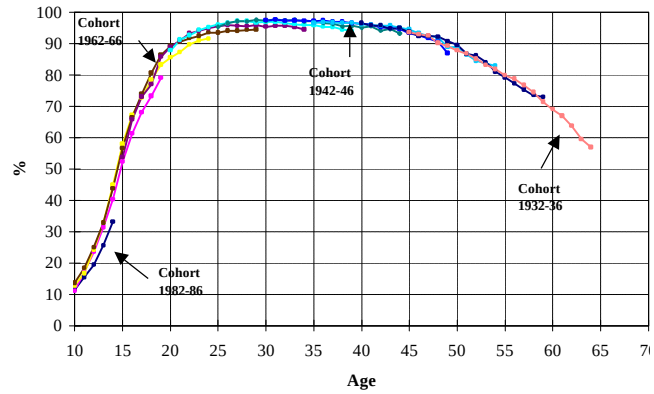
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.43. Return to Education, University Education



Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.44. Male Labor Force Participation Rate by Age



Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.45. Female Labor Force Participation Rate by Age

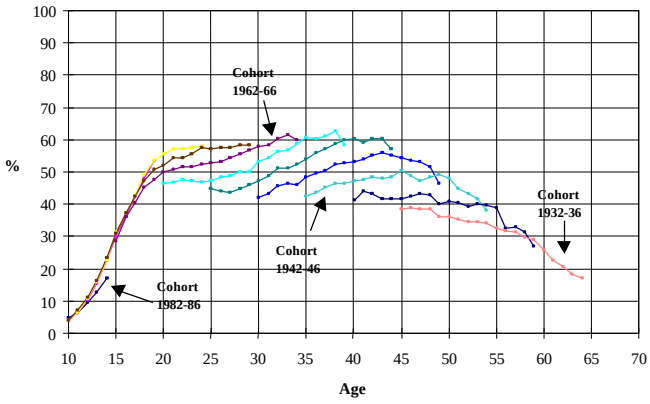


Figure 3.46: Female Labor Participation Rate by Age, Southeast Region

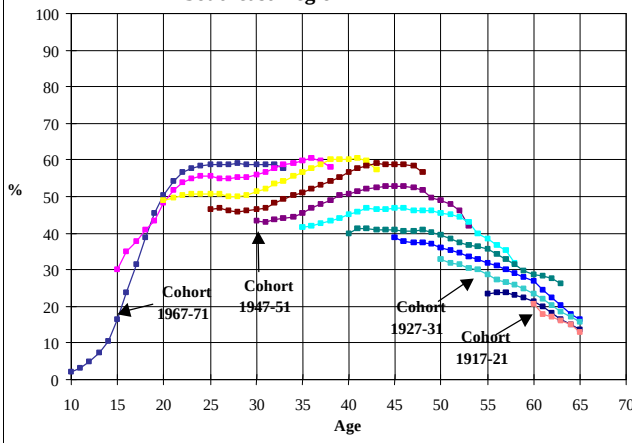
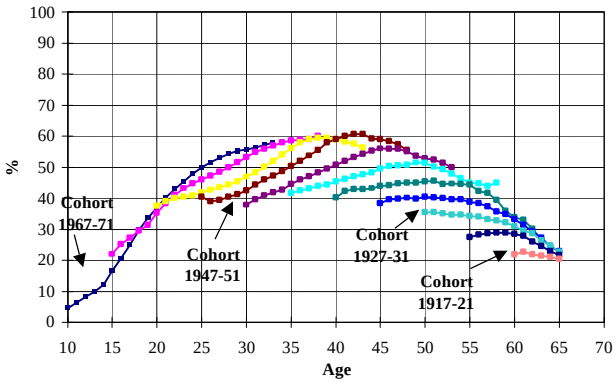


Figure 3.47. Female Labor Participation Rate by Age Northeast Region



Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.48. Male Labor Participation Rate by Age, Southeast Region

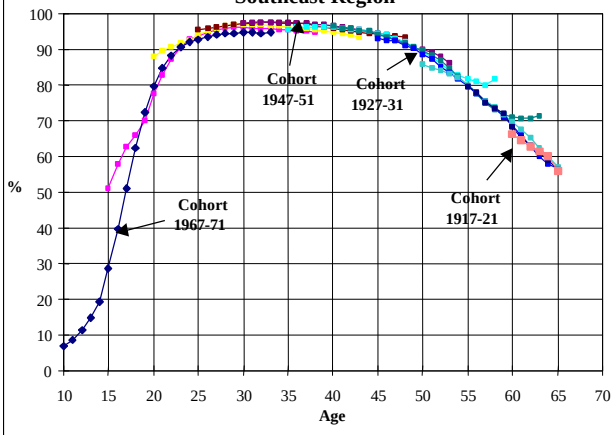


Figure 3.49. Male Labor Participation Rate byAge, Northeast Region

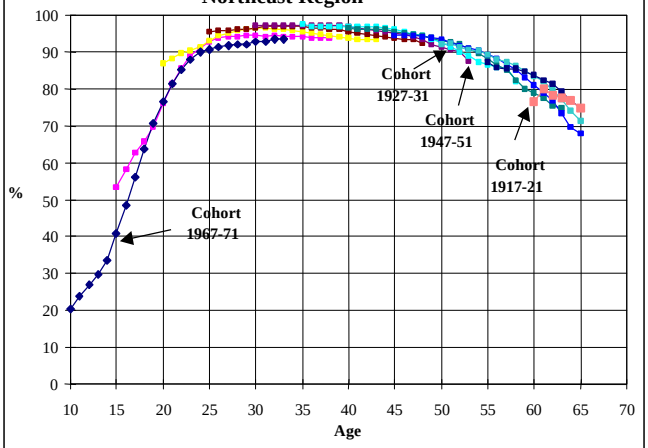
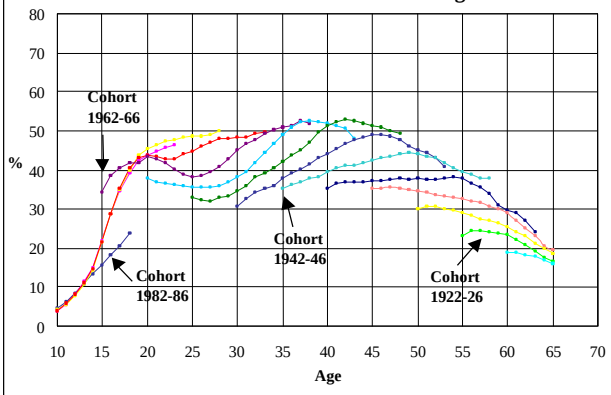
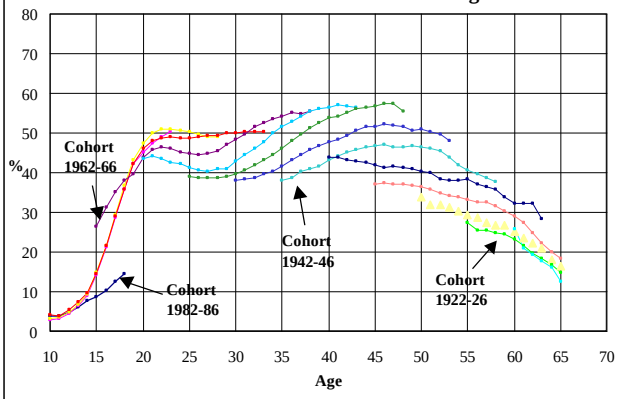


Figure 3.50. Female Labor Participation Rate by Age, 0 to 3 Years of Schooling



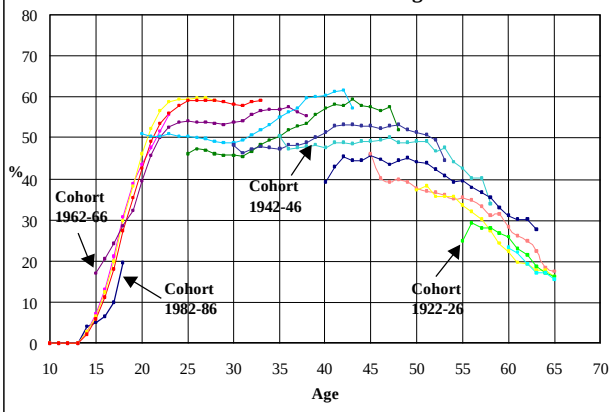
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.51. Female Labor ParticipationRate by Age, 4 to 7 Years of Schooling



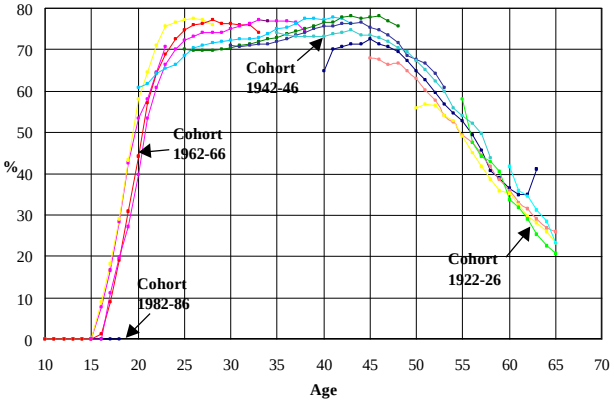
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.52. Female Labor Participation Rate by Age, 8 to 10 Years of Schooling



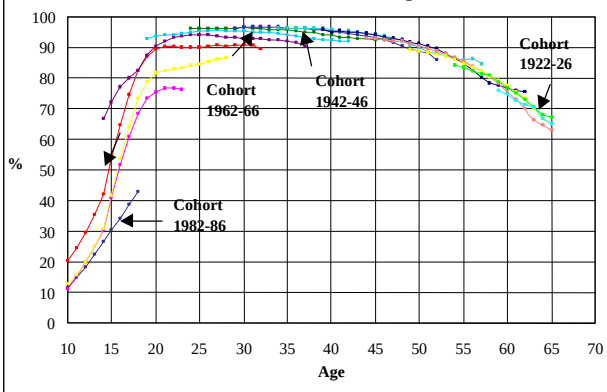
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.53. Female Labor Participation Rate by Age, 11 and More Years of Schooling



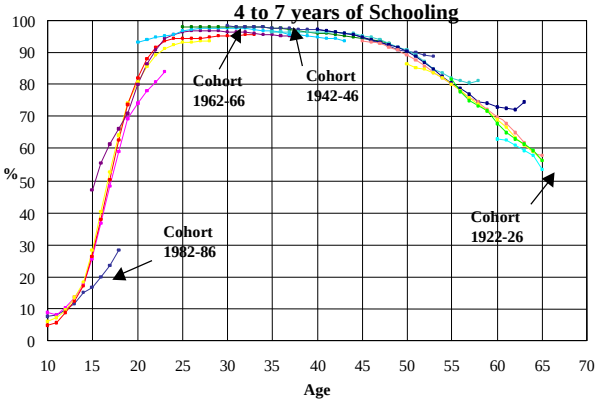
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.54. Male Labor Participation Rate by Age, 0 to 3 Years of Schooling



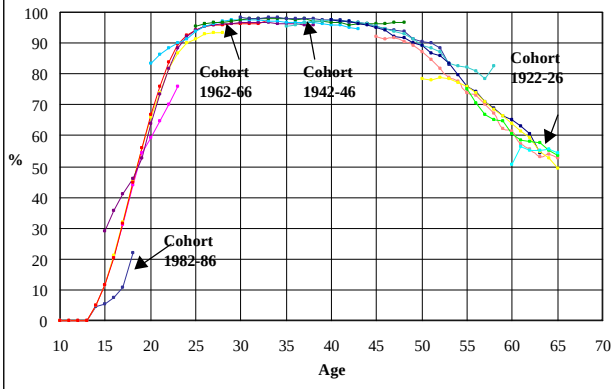
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.55. Male Labor Participation Rate by Age, 4 to 7 years of Schooling



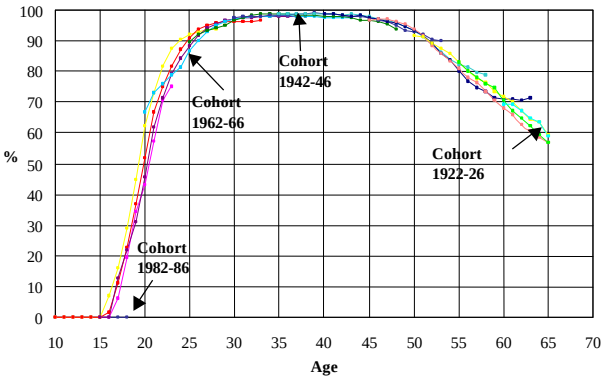
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.56. Male Labor Participation Rate by Age, 8 to 10 Years of Schooling



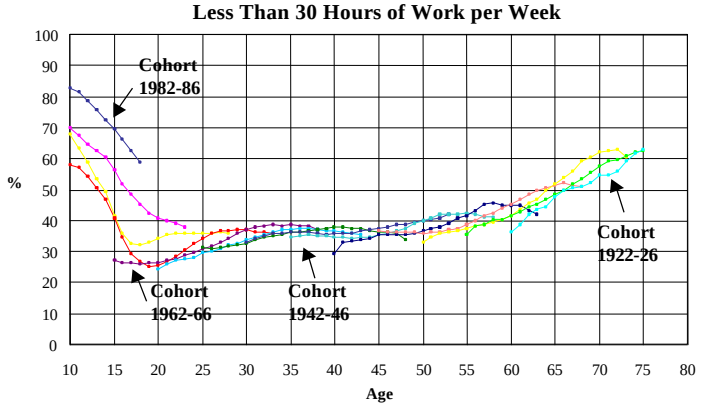
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.57. Male Labor Participation Rate by Age, 11 and More Years of Schooling



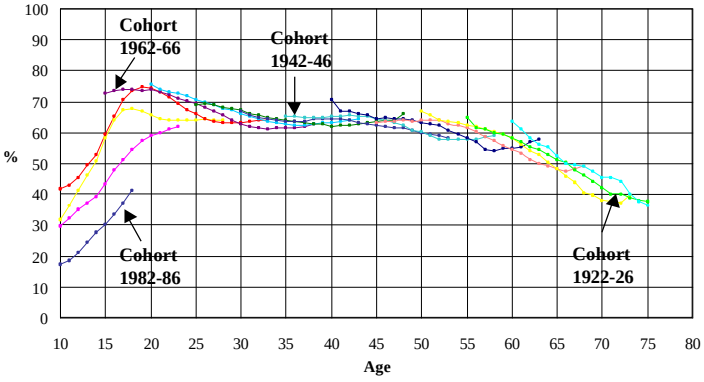
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.58. Female Labor Force Participation by Age, Less Than 30 Hours of Work per Week



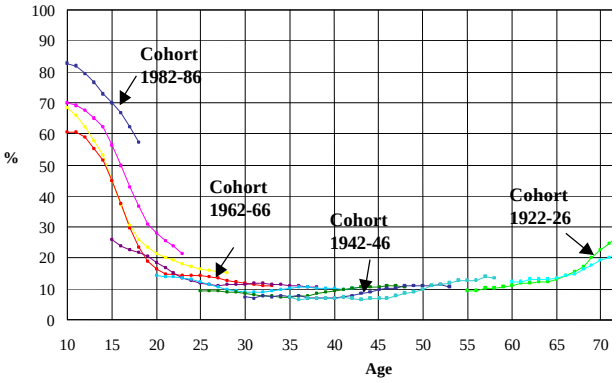
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.59. Female Labor Force Participation by Age, More Than 30 Hours of Work per Week



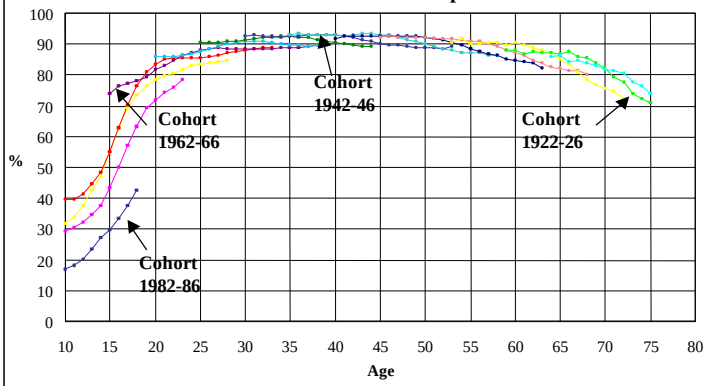
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.60. Male Labor Force Participation by Age, Less Than 30 Hours of Work per Week



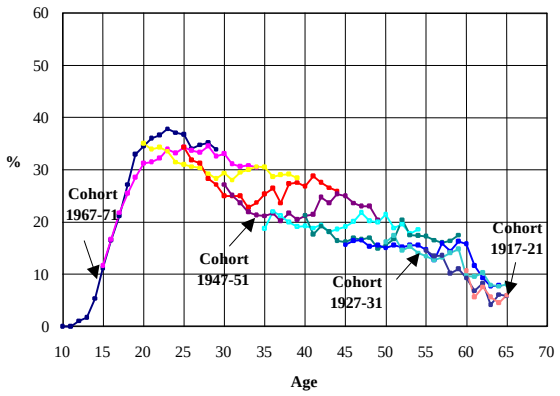
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.61. Male Labor Force Participation Rate by Age, More Than 30 Hours of Work per Week



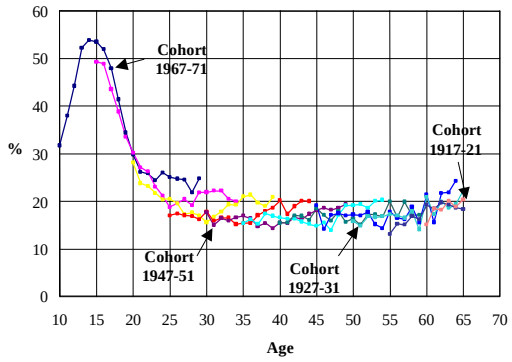
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.62. Female Labor Force Participation by Age, Protected Workers



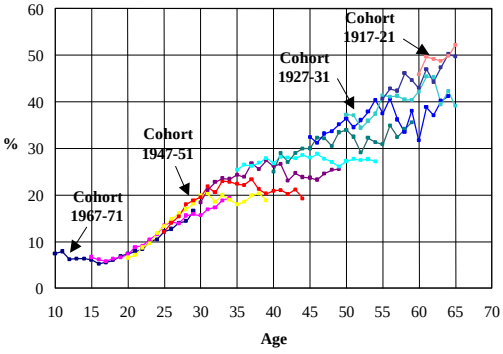
Source: Based on Pesquisa Nacional de Amostra de Domicílios (PNAD)

Figure 3.63. Female Labor Force Participation by Age, Unprotected Workers



Source: Based on Pesquisa Nacional de Amostra de Domicílios (PNAD)

Figure 3.64. Female Labor Force Participation by Age, Self-Employed Workers



Source: Based on Pesquisa Nacional de Amostra de Domicílios (PNAD)

Figure 3.65. Male Labor force Participation by Age, Protected Workers

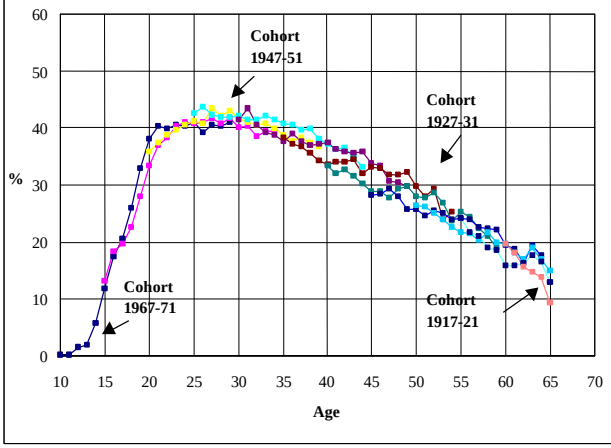


Figure 3.66. Male Labor Force Participation by Age, Unprotected Workers

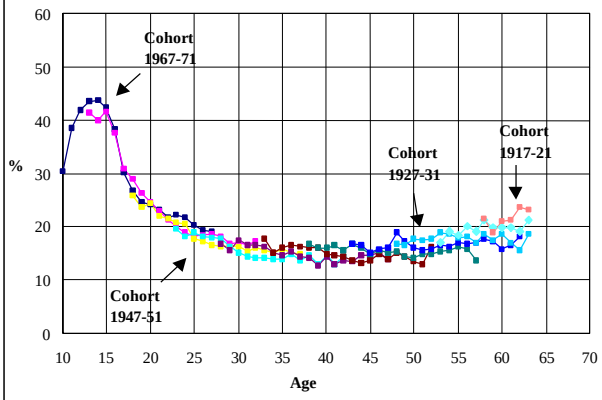
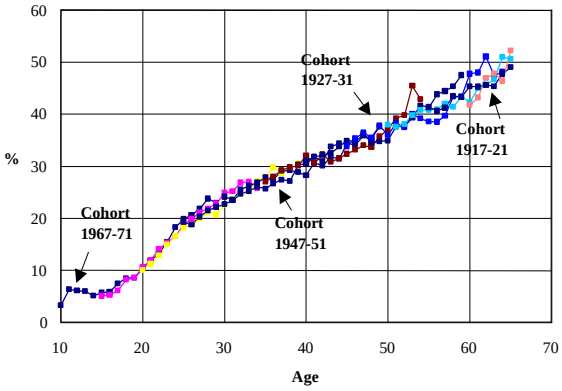
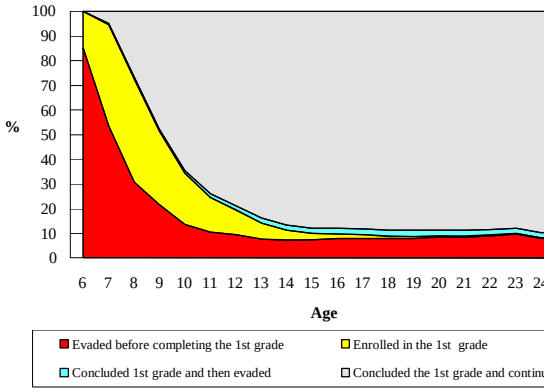


Figure 3.67. Male Labor Force Participation by Age, Self-Employed Workers



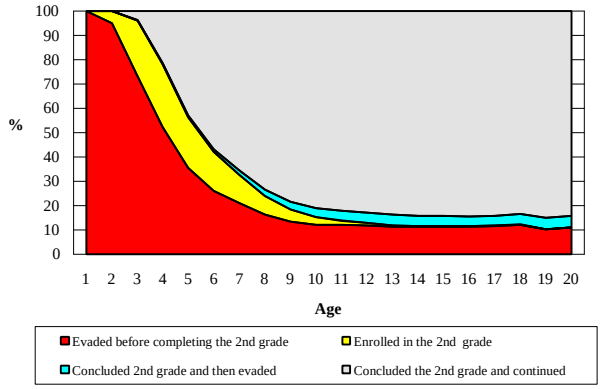
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD).

Figure 3.68. Access to and Progress in the First Grade of Junior School, by Age—Cohort 1969 to 19



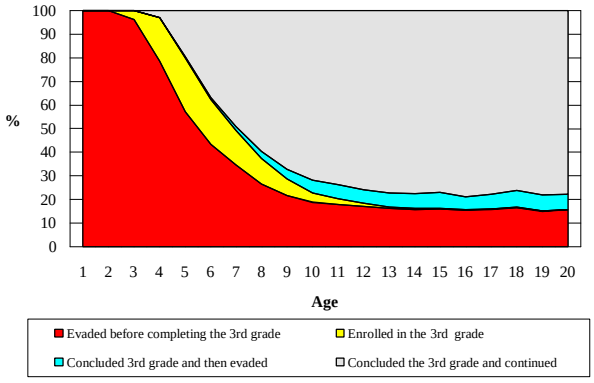
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD) of 1977 to 1979, 1981 to 199
1993, 1995 to 1997.

Figure 3.69. Access to and Progress in the Second Grade of Junior School, by Age—Cohort 1969 to 1971



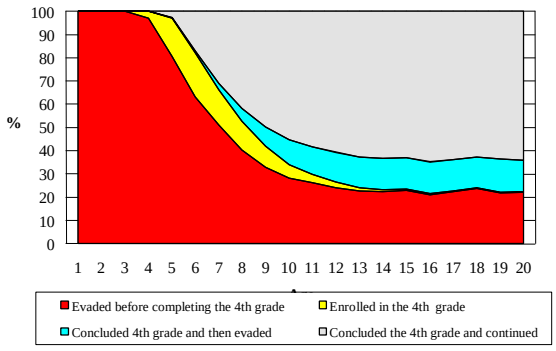
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD) of 1977 to 1979, 1981 to 1990, 1992, 1993, 1995 to 1997.

Figure 3.70. Access to and Progress in the Third Grade of Junior School, by Age—Cohort 1969 to 1971



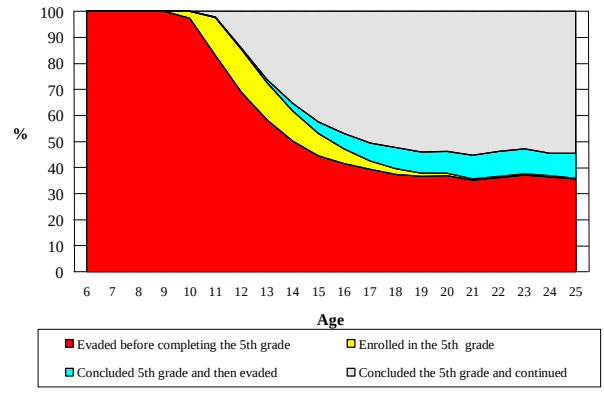
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD) of 1977 to 1979, 1981 to 1990, 1992, 1993, 1995 to 1997.

Figure 3.71. Access to and Progress in the Fourth Grade of Junior School, by Age—Cohort 1969 to 1971



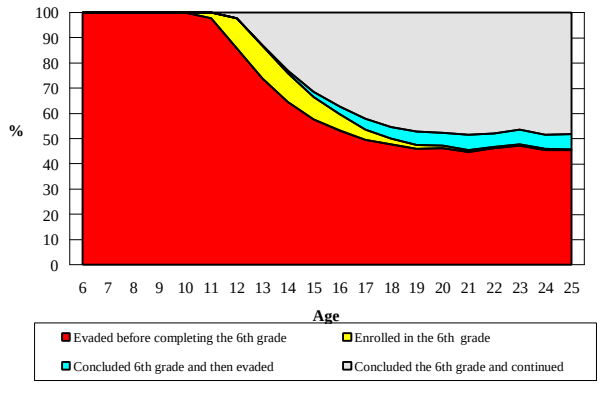
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD) of 1977 to 1979, 1981 to 1990, 1992 1993, 1995 to 1997.

Figure 3.72. Access to and Progress in the Fifth Grade of Junior School, by Age—Cohort 1969 to 1971



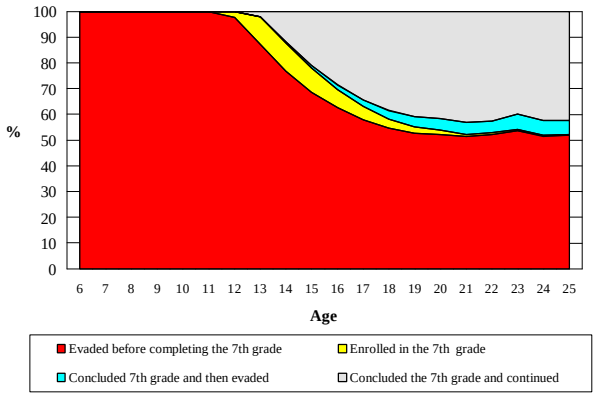
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD) of 1977 to 1979, 1981 to 1990, 1992, 1993, 1995 to 1997.

Figure 3.73. Access to and Progress in the Sixth Grade of Junior School, by Age—Cohort 1969 to 1971



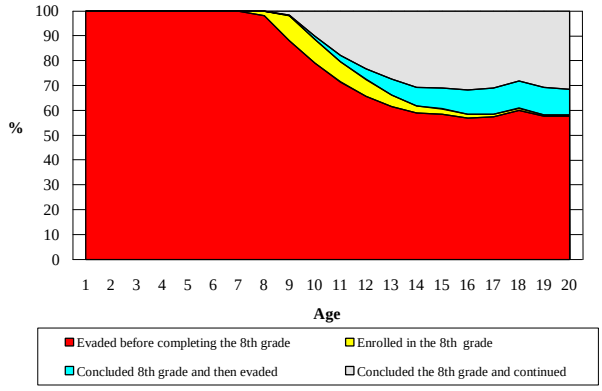
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD) of 1977 to 1979, 1981 to 1990, 1992, 1993, 1995 to 1997.

Figure 3.74. Access to and Progress in the Seventh Grade of Junior School, by Age—Cohort 1969 to 1971



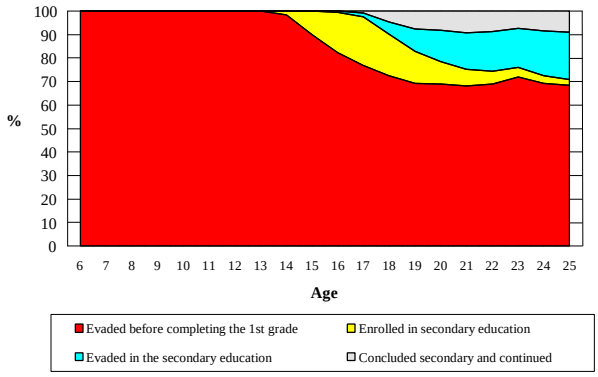
Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD) of 1977 to 1979, 1981 to 1990, 1992, 1993, 1995 to 1997.

Figure 3.75. Access to and Progress in the Eighth Grade of Junior School, by Age—Cohort 1969 to 1971



Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD) of 1977 to 1979, 1981 to 1990, 1992, 1993, 1995 to 1997.

Figure 3.76. Access to and Progress in Secondary Education, by Age—Cohort 1969 to 1971



Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD) of 1977 to 1979, 1981 to 1990, 1992, 1993, 1995 to 1997.

Figure 3.77. Access to and Progress in College Education, by Age—Cohort 1969 to 1971

Source: Based on Pesquisa Nacional por Amostra de Domicílios (PNAD) of 1977 to 1979, 1981 to 1990, 1992, 1993, 1995 to 1997.