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FEMALE LABOR FORCE PARTICIPATION IN BRAZIL ALTERNATIVES FOR PROJECTING LEVELS AND PATTERNS

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FEMALE LABOR FORCE PARTICIPATION IN BRAZIL: ALTERNATIVES FOR PROJECTING LEVELS AND PATERNS

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SUMÁRIO

1 INTRODUCTION

The macro level projection of female labor supply is useful for several planning purposes in the areas of economic development, social security projections, labor market projections, among others. Almost everyone dealing with these kind of projections notice that it is easier to project profiles of male labor force participation than that of female.

Micro level studies focused on the determinants of labor supply use cross-section or longitudinal data. This kind of study may give us some hints of the determinants of female labor force participation such as women's education, but the links with macro level projections of the age-specific rates for women are not clear.

It is a difficult task to perform long run projections of age-specific female labor force participation profiles (level and patterns of age-specific rates). This is not the kind of task that can be solved solely by the use of statistical packages to fit curves. One has to devise different scenarios, which are associated with knowledge of the field, intuition, and most importantly, the matching of alternative approaches.

In this paper we attempt to review different macro level approaches of female labor force participation with the purpose of informing sounded projections of female labor force participation profiles in Brazil.

First, we perform period analysis of levels and patterns of female labor force participation. This analysis is based on a comparative study of regional patterns with the purpose of framing the Brazilian experience in the period and its potential dynamics.

Second, we review the impact of marital status and fertility in the period analysis of labor force participation profiles. Marriage and fertility are two life cycle aspects that are almost universally accepted to be related with female labor force participation. We estimate a simple model with the purpose of describing this connection in Brazil.

Third, we try to connect age-cohort with age-period analysis in the context of women's life cycle. When the age-specific female labor force participation profile is stable among different birth cohorts then these cohorts are in a steady state type of equilibrium. Shifts in the profile of different birth cohorts affect the period profiles. Understanding some connections between cohort and period analysis, we may be able to perform accurate period projections.

We conclude that the profile of female labor force participation in Brazil has changed in the eighties and it will continue to change in the near future. Upward trends in the level of participation of young birth cohorts and the loose impact of childbearing in women's withdrawal from the labor force are important factors to be considered.

2 PERIOD ANALYSIS OF LEVELS AND PATTERNS OF LABOR FORCE PARTICIPATION: REGIONAL AND BRAZILIAN EVIDENCES

Studies dealing with women's changing participation in the labor force in a world perspective focus either on the level of female participation in the labor force or on their age patterns of participation.

The studies related with women's level of participation measure this process using the crude or standardized participation rates. These regional or international perspective studies evaluate the relationship between development patterns or intersectoral shifts in the distribution of employment and women's participation in the labor force.

The famous discussion about the U-shaped pattern between women's participation in the labor force and the levels of economic development was revised by Durand (1975). He suggested that the increase in non-agricultural employment would raise the level of female activity in countries where the share of agricultural employment were not predominant, while the opposite would occur in countries with predominance of agricultural employment. Schultz (1990) takes the issue of sectoral employment and female labor force participation, but he extends his study to women's status through the analysis of the fraction of female workers who are wage earners.

We will not emphasize the literature focused on the level of economic activity in regions and countries[1] mainly because the Brazilian development process, at this point, has already produced a growing trend in the level of female labor force participation, in combination with a speedy pace of urbanization and signifcative shifts in sectoral employment.

The following sub-section will focus on the international literature dealing with the point that is more uncertain in terms of projecting aggregate female labor supply in Brazil: the projection of age patterns of female labor force participation.

2.1 Patterns of activity rates: a world perspective

The seminal piece on the discussion of age patterns given by age-curves of female acitivity in national or regional populations is Durand (1975). Durand classified male and female age patterns and indicated that the female patterns were more diverse because women's active life cycle do not present the same typical pattern across countries and cultures.

He suggested four types of age patterns of female activity rates. *Type A* describes a central peak or plateau similar to the pattern found among males. *Type B* represents a late peak. *Type C* is characterized by an early peak that can be or can not be followed by a shoulder (C-1 and C-2, respectively). *Type D* is a pattern marked by a double peak: D-1, when the first peak is the highest, or D-2 when the second peak is the highest.

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[1] For other approaches in this perspective see Collver and Langlois (1962) and Youssef (1971).

Durand (1975) suggested that these types were found in groups of countries that have either cultural or economic similarities. Type A countries were more common in Tropical Africa, Thailand, and India. Type B countries were also found in Africa. Type C-1 countries were frequent in Latin America, Spain, and Portugal. Type C-2 countries were recurrent in Middle Europe. Type D countries were typical of Northwestern Europe and the USA.

Inspired on the work of Durand, we updated female age specific activity rates for 64 countries. The data source was the Yearbook of Labour Statistics edited by the International Labour Office (ILO). The vast majority of the data were collected from national demographic censuses applied in the eighties.

Visual inspection of the patterns observed among the countries allowed us to classify them in seven types. The last group is residual. In Table 1 and Figure 1 we describe all types observed.

The first group comprises African countries. The pattern of female age specific rates is marked by high rates among all age groups. These countries have the predominance of agricultural employment.

The second group is composed by Eastern European Former Socialist countries. The pattern and level of female labor force participation in these countries resemble the one found among males.

The third group is composed by highly industrialized or developed countries. Three different patterns were found among the countries of this group. These three patterns are described in Figure 2. The first pattern (developed 1) is similar to the one found among Eastern European and socialist countries. The second pattern (developed 2) looks almost as an early peak and shoulder pattern at higher levels of participation. Finally, the third pattern (developed 3) is the double peak pattern formerly described by Durand.

The fourth group is formed by European Latin countries. It presents an early peak pattern which is followed by a shoulder that is not very pronounced.

In the fifth group, which is called the Latin American group, the female labor force participation pattern shows an early peak and shoulder. This pattern is similar to the one found in European Latin countries, but it is observed at lower crude levels of participation rate.

The similarity between the fourth and the fifth group is surprising, because the level of economic development is diverse among the countries comprising these groups. It is possible that cultural aspects play an important role to explain the similarity between these two patterns.

The sixth group is composed by countries with low levels of female labor force acitivity rates. The Arab countries are the majority in this group. Lastly, the seventh and residual group is primarily formed by Asian Countries.

The question to be asked now is how the Brazilian age specific activity rates fit into these groups in the past, and to which extent we would benefit from comparative perspective to project future patterns.

2.2 Patterns of activity rates: the brazilian case

Let us begin the Brazilian case with a level analysis, pointing the historical growth trend in female labor force participation during the last forty years. Tables 2 and 3 present the evolution of age-specific activity rates and the refined labor force participation rate. From 1950 to 1980 the numbers were provided by the Demographic Censuses while the numbers for the eighties derive from the Brazilian Household Surveys (PNADs). The definition of female labor force participation varies between the two sources. Although the latter presents higher coverage, the numbers are inequivocally pointing out a growing trend in the level of female labor force participation rate.

Table 2 and Figure 3 present the evolution of the Brazilian pattern between 1950 and 1980, as measured by the age specific activity rates. Figure 3 clearly indicates that after 1950 Brazil fits well in the so called Latin American group. Using Figure 2 in a prospective fashion and comparing the last three curves, one could easily make a projection assuming a constant pattern combined with a historical growth in the level of female labor force participation.

Table 3 and Figure 4, which are based on household surveys (PNADs), show a different picture for the most recent experience of Brazilian urban women. Comparing the patterns of 1976, 1978, and 1981, we would confirm that Brazil remained in the Latin American group. Even the different pattern observed in 1984 could be interpreted as an indication of a transition from the Latin American to the Latin European pattern of female labor force participation. Indeed, projections that were done in the past assumed that the Brazilian trend in female labor force participation would grow in level until year 2000 accompanied by a shift in pattern from the Latin American to the Latin European group.

The data seemed consistent with the idea that the path of modernization and enhancement of women's status were building up within cultural boundaries that showed a clear pattern. Nevertheless, the data for the last half of the eighties indicate a clear shift in pattern that could not be foreseen before using this type of analysis. In a five year span Brazil moved from the Latin American group to a pattern similar to the developed 3 group.

This striking and fast change in pattern made us think about the kind of forces that would explain a shift in the pattern of labor force participation and the validity of using life cycle reasonings for the analysis of synthetical cohorts obtained from period populations.

According to Durand (1975) the life cycle of female participation in the labor force relates with the life cycle of marriage and family formation. Therefore, marital status transitions and differentials in labor force participation by marital status as well as fertility concentration in the life cycle could have implications in the determination of a specific pattern.

3 PERIOD ANALYSIS OF LEVELS AND PATTERNS OF LABOR FORCE PARTICIPATION BY MARITAL STATUS AND FERTILITY

3.1 Marital status and fertility

The association between marital status and the pattern of labor force participation has been stressed for long time. Durand (1975) himself indicated that the early-peak pattern implied a compositional effect where the entire labor force is almost entirely composed by single or married women without children. The early-peak and shoulder pattern similar to the Latin American group suggests a reenter pattern after dropouts due to childbearing. This pattern of reentering after childbearing is even more pronounced in the double peak pattern. As we will discuss itn the next section, it seems that this kind of interpretation on patterns only makes sense when there is a steady-state equilibrium between the cohort and the period. In any case Durand indicated that the composition of the labor force by marital status is highly correlated with the observed pattern. He mentioned the case of the United States in 1960, when the double peak pattern implied that 60.7% of the female labor force were comprised by married women, while in Switzerland the early peak pattern found in 1960 indicated that 62.5% of the active women were single (Durand, 1975, p.42).

In a more recent survey of female labor supply Killingsworth and Heckman (1986) present a review of trends of female labor force participation among developed countries during this century. They conclude that the participation rate of married women is responsible for most of the increase in aggregate female labor force participation rate in recent years. Evidences were presented for countries such as the United States, Canada, Great Britain and Germany.

In the case of Latin America, Elizaga and Mellon (1971) pioneered applications of the interaction between marital status and patterns of labor force participation. They suggested a decomposition technique to evaluate trends over time. Their empirical evidence applied to some Latin American countries in the 1960s is consistent with the view that the labor force participation of married women is much lower than the one found among single women.

In the Brazilian case, empirical evidences about the role of marital status are not pervasive. Zylberstajn, Pagotto and Pastore (1985) compared the share of active married women among the number of women in the labor force between 1970 and 1980. The share increased from 23% to 28% in the age-group 25-29, remained at 21% in the 30-39 age-group, and increased from 20% to 24% in the 40-49 age group.

Sedlacek and Santos (1991) described the trends observed in the eighties. They showed that the share of married women in the age-group 15-54 among all women occupied in the same age group remained pratically constant in the eighties (around 46%). The occupation participation rate of married women increased 5.3% between 1983 and 1988 (from 33.54% to 38.81%). The participation of daughters (the vast majority of non-married women and a proxy for single) increased 2.7% in the same period (from 49.47% to 53.0%).

We are left with some questions that will be adressed in the following parts of the paper. They are important both for projections and theoretical insgihts. The questions are:

(1) What is the role of marital status differentials in labor force participation in the determination of shifts in patterns during the period? We need to make a comparison between the early peak associated with the labor force participatiogn of single women and the profile of labor force participation of married women.

(2) What is the role of fertility in the pattern of labor force participation among married women? Is this association changing over time? Does it have implications in the pattern observed in the period?

(3) Can we infer life cycle conclusions from the pattern observed in the period? For example:- Is the early peak observed in the Latin American group and Brazil until mid-eighties suggesting that women leave the labor force after they marry and start to have children? Then, can we conclude that after the mid-eighties women are no longer withdrawing from the labor force after they reach the age-group 20-24?

(4) If the answer for the questions in number 3 are negative, then we ask:- When is it that life cycle conclusions may be inferred from period or synthetical cohort patterns of female labor force participation?

(5) What is the conncection between period and cohort analysis that will help us to answer some of these questions?

In the next section we address the role of marital status and marital fertility in the determination of a period analysis dealing pattern of women's activity rates. We also suggest measurements of these changing trends over time. In the latest section we try to indicate how the life cycle perspective of a cohort may affect the period analysis on the pattern of women's activity rates.

In Table 4 and Figure 5 we can compare the growth in the activity rate of wives and daughters between 1980 and 1986. The group of wives presented higher rate of growth in labor force participation than the group of daughters.

As the composition of single women and daughters by age is concentrated below age 25 and the vast majority of married women and wives are concentrated in the 25-49 age group, the observed pattern of increase in female labor force participation in the 25-49 age-group has to be associated with the observed trends of increasing labor force participation of married women. But if we are dealing with activity rates of married women, then we are compelled to discuss the relationship between female labor force participation and fertility[2].

Demographic transition is almost completed in Brazil. A sharp fertility decline was observed in Brazil between the second half of the seventies and the first half of the eighties. Total fertility rate declined from 5.8 in 1960/70 to 4.3 in 1975/80, reaching 3.6 in 1979/84 (Alves, 1994). CELADE projects that total fertility rate will be 2.44 in the 1995/2000 period.

Empirical evidences of labor force participation rates by parity and total fertility rates by female labor force status are not pervasive in Brazil. Micro level probit estimates indicate that parity affected negatively the labor force participation of married women in metropolitan areas in 1984 (Sedlacek and Santos, 1992). Another micro level study applied for the same period indicated that female labor force participation affects negatively the total number of children ever born among married women. The negative impact in fertility is larger when working women are wage laborers (Diniz, 1994).

Table 5 and Figure 6 indicate the activity rate of married women by age and parity between 1970 and 1986. Activity rate is higher in the group of lower parity (0 or 1 child) as compared with the group of higher parity (2 children or more). In 1970, the age-specific activity rates of the low parity group increased until the 25-29 age-group, remaining constant in this plateau. The rates for the highest parity group increased until the 35-39 age-group.

Three aspects shown in Table 5 and Figure 6 highlight the shifts that occurred until 1986. First, the level of participation increased in both high and low parity groups of married women. Second, the rate of growth in the age-specific activity rate were higher within the high parity group than in the low parity; as a corollary, the participation gap between the two groups declined among all age-groups. Third, the pattern of a growing trend in the age-specific activity rate by age until the age-group 35-39 is more pronounced in 1986.

This descriptive part of the section indicated that both marital status and fertility are likely to be associated with the shifts in pattern observed in the Brazilian female labor force participation in the eighties. The question then is the following: Is there a simple statistical technique that can highlight these structural shifts? We will try to illustrate it positively by appliying a simple model for interpreting cross-tabulations.

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[2] We are not talking about causality in this paper. The micro level models of labor force participation deal with simultaneous determination of time allocation and fertility. Our analysis is focused at the macro level.

3.2 A simple model for interpreting cross-tabulations and results

Blanchet (1992) and Blanchet and Pennec (1993) proposed a simple and ingenious model of cross-tabulations based on 2 x 2 contigency tables. It is a log-linear model which does not allow any kind of conclusion about causality between the two aspects studied. The model is fully saturated and presents the same number of parameters and independent cells in a cross-tabulation. Thus, it provides tautological but useful descriptive information when we perform different cross-tabulations for different periods or situations (Blanchet and Pennec, 1993, p.122).

The model assumes that a population can be divided into 2 x 2 categories. For example, women's marital status may be broken down into wife and daughter (or high and low fertility), while female status of labor force participation may be divided into active and out of the labor force categories. As in Blanchet's case, the relative frequencies of these situations will be a, b, c, and de, as shown in the example of contingency table illustrated in Table A.

TABLE A

CROSS-TABULATION OF MARITAL STATUS (FERTILITY) AND ACTIVITY

	ACTIVE	OUT OF LF
- Wife (High Fertility)	a	b
- Daughter (Low Fertility)	c	d

The distribution of a given population among the four cells can be explained by qualitative choice models (multinomial logit models) that assign values to each corresponding state, and parameters can be associatied to value and costs attached to each behavior. The basic reference for individual choice, that is, the initial situation (baseline), is represented by cell "d" (daughter out of the labor force or low fertility out of the labor force). A value index "0" is assigned to this reference cell. A value α (the value of being married or having high fertility) is assigned to women being married (or high fertility) and continuing out of the labor force. A value β (the value of being active independently of marital status or fertility) is imputed to daughters (or women with low fertility)[3]. To a change representing both being married (high fertility) and being active, simultaneously, it is attributed a value that adds the two former values (α plus β), subtracted by the costs associated with the simultaneous shift in both states (γ). An illustration of such situation is presented in Table B.

[3] In Blanchet and Pennec's paper the parameter α explains the value of labor force participation and β the value of high fertility. γ has the same meaning as ours. In fact, the meaning of these parameters depends on the way the contingency table is constructed.

TABLE B

VALUES AND COSTS ATTACHED TO EACH STATE

	ACTIVE	OUT OF LF
- Married (High Fertility)	$\{\alpha + \beta - \gamma\}$	α
- Daughter (Low Fertility)	β	0

The values of these parameters are only average and cannot be assigned identically to all individuals. The actual parameter for the individuals should have a disturbance term added to each cell. Because the model is fully saturated, α, β, and γ can be calculated directly from the frequencies "a", "b", "c", and "d", as follows:

$\alpha = \log(b) - \log(d)$
(value given to marriage or fertility)

$\beta = \log(c) - \log(d)$
(value given to labor force participation)

$\gamma = \log(c) + \log(b) - \log(a) - \log(d)$
(incompatibility factor)

These parameters can also be interpreted in terms of association measurements in a contigency table. In this case the incompatibility factor is just a measure of the diagonal in the 2 x 2 matrix. Interpreting the results in terms of odds ratios, the odds for marriage or fertility with respect to the reference state would be b/d . The odds for activity related to the reference state would be c/d. The odds ratio as the measurement of association between the two aspects of marriage status (or fertility) and labor force participation can be interpreted as a factor of incompatibility. The odds representing the measurement of activity in the daughter (low fertility) state with respect to the wife (high fertility) state would be equal to c/d divided by a/b. When this odds ratio increases we can say that marriage (or high fertility) is becoming less compatible with labor force participation.

If we take natural logarithm of the odds ratios discussed above, we find precisely the values of the parameters α, β, and γ suggested by Blanchet and Pennec (1993).

3.3 The results for marital status

The basic idea of performing contigency table tests between marital status and female labor force participation is to assess the value given to marriage in comparison to remaining single (α), to the value attributed to female labor force participation β, and γ , the incompatibility between marriage and female labor force participation.

The two most important age-groups for this kind of analysis are 15-19 and 20-24, because this is the timing of women's transition from singlehood to marriage in Brazil. We do not have an expected sign for the value of α. We do expect an increase in β (the pure value of female labor force participation). To the extent that the activity rate of married women increased in the period without major changes in nuptiality and the mean age of marriage, we expect that period analysis of the incompatibility factor (γ) must have declined.

Analyzing the results in Table 6 for the 15-19 age-group, we conclude that the value of marriage (α) presented a small increase between 1970 and 1986. As we expected, there was a sharp increase in the value of β. As a corollary there was a decline in the incompatibility factor γ between married women and daughters or single women.

The results obtained for the 20-24 age-group are similar to the previous, except by the fact that there was a higher increase in the valor of marriage (α), and consequently, a lower decline in the incompatibility factor (γ).

Comparing the value of the three parameters among three age groups, we conclude that, as expected, α increases with age. β also increases with age, which implies an increase in γ with age. In other words, in the case of an increase in age a share of those women who have never married needs to choose between participating in the labor force or getting married. On the other hand, we have shown that this incompatibility factor is slowly declining over time.

Married women are increasing their participation in the labor force over time, and we suggest that this owes more to the sharp increase in β (value of activity) than to the decline in the degree of incompatibility between marital status and female labor force activity. Notice that γ presents a larger decline in the case of the 15-19 age-group, where single women are more prevalent.

3.4 The results for fertility

We have seen in the descriptive part of this section that fertility has declined sharply in Brazil. On the other hand, female labor force participation has increased steadly in all age group of married women and in all parities. Thus, we would expect both a decline in α (the value of fertility) and an increase in β (the value of economic activity) and, as a corollary, these two things could only happen if the incompatibility factor (γ) declined sharply in the period.

The empirical results presented in Table 7 and Figure 7 can be analyzed in two ways: by age-group over time or among age groups in a period.

In terms of each age group over time, Figure 7 shows that none of the results contradicted our expectations. There was a decline in α, an increase in β and a decline in γ. The main conclusion is that the process of "modernization and cultural change" observed in Brazil between 1970 and 1986 was such that favored pure or independent effects in the fertility transition and women's status. The corollary was a sharp decline in the incompatibility factor, which means that now neither an increase in female labor force participation is a necessary condition for fertility decline nor fertility decline is a necessary condition for the increase in female labor force participation.

As we are not dealing with the causality issue, . This conclusion just suggests that the independent causal factors determining the fertility decline and the increase in female labor force participation acted in a way that the trade-off or the incompatibility factor between fertility and economic activity of married women declined over time.

Looking at the value of α across ages in each year, we notice that the value of fertility increases with age of wives. The shape of the 1970 curve is steeper than the one observed in 1986. We conclued that the value of fertility between 1970 and 1986 declined more among higher age-groups.

The value of β in 1970 increased with age until the 25-29 age-group, and after that point it remained almost constant. Not only there was an upward shift in the β curve between 1970 and 1986, but also a change in its shape. The value of female activity increase steadly with age steadly until the age-group 40-44. Therefore, the younger cohorts of married women that are now in the older age-groups tend to value economic activity more than the older cohorts that were in these age-groups in the past.

Finally, the γ curve in 1970 shows an inverted "V" pattern with the maximum at the 25-29 age-group. In other words, while the value of fertility and economic activity were increasing, the incompatibility factor also increased. Nevertheless, after the 25-29 age-group the value of fertility continue to increase but the value of economic activity remained constant. As a consequence, the incompatibility factor declined after that age group.

A comparisson of the γ curves between 1970 and 1986, shows not only a decline in level but also a change in its shape. In 1986 the γ curve presented a pattern with an early peak in the 20-24 age group. The α curve (value of fertility) presents a sharp increase between the 15-19 and 20-24 age-groups, but the increase is diminushing with age. On the other hand, the β curve increases with age until at least the 30-34 age group.

Thus, the peak of incompatibility is in the 20-24 age-group, a result which is in line with the observed decline in fertility and a decline in the mean age of childbearing. It is also a result compatible with the notion that age specific activity rates of married women increase with age.

3.5 Empirical results and projections

We now turn to the implication of these exercises to the projection of female age-specific labor force participation rates.

We conclude that marital status (married versus single women) used to be an important factor determining shifts in the period analysis of age-specific participation rate of women between the 15-19 and 20-24 age group. A look at the incompatibility factor does not suggest any change in this pattern, but the sharp increase observed in the value of economic activity (β) regardless marital status indicates a different trend. Marital status may not determine a decline in age-specific activity rates among the earlier age groups as it did in the past.

The exercise of controlling for fertility suggested that the age-specific participation rate of married women will continue to grow due to the decline in α, increase in β, and decline in γ over time. The profile of participation will increase with age due to the decline in the incompatibility factor, but the rate of growth in the profile will be smaller between the 20-24 and 25-29 age- groups, due to the concetration of fertility in these age groups and to the peak of the incompatibility factor among women aged 20-24 years.

4 LEVELS AND PATTERNS: AGE-COHORT IMPLICATIONS FOR AGE-PERIOD PROJECTIONS

The link between life cycle and pattern of female labor force participation was briefly mentioned in section two, where we stressed that one can make misleading conclusions by interpreting period analysis of synthetical cohort patterns through arguments derived from the life cycle dynamics of labor force participation observed among the actual cohorts.

This link between life cycle and period analysis of synthetical cohort can only be made if the life cycle female labor force participation profile is in steady state, or does not change over time, that is, if the level and pattern of female labor force participation of different birth cohorts is approximately stable. This may be a reasonable assumption in the case of males, but there is no reason to expect a near-steady state pattern in the case of female labor force participation in developing countries or, for that matter, even in the case of developed countries.

By comparing the results in section two, related to the observed change in the pattern of female labor force participation in Brazil, with the results in section three concerning the growing participation of married women in the labor force of married women and the decreasing impact of high fertility in the process, we are tempted to jump into fast and wrong conclusions.

It is wrong to interpret these period shifts in the pattern as an indication that married women are no longer withdrawing from the labor force after marriage and childbearing. This kind of inference would be true only if the pattern of labor force participation based on cohort level were similar to that based on period level. Even when the majority of the participating women of a given birth cohort never withdraws from the labor force after marriage, the period profile may show a decline due to a mere compositional effect of different birth cohorts in the same period.

This kind of connection between cohort and period patterns of age specific activity rates is not new in studies dealing with labor force participation. Nevertheless, it is striking how often authors ignore it when they are doing aggregate projections of female labor supply.

Recchini de Lattes (1983) studied cohort and period age-specific activities in Argentina. She analysed birth cohorts between 1910 and 1950 obtained from periods going from 1945 to 1970. She indicated that young birth cohorts of women in Argentina started to present a pattern that is similar to the one observed in developed countries, with re-enterance of mature women (between 30 and 49 years) in the labor force. This new pattern is not observed in period analysis, which shows patterns similiar to the ones observed in the Latin American Group.

The difference between the cohort and period patterns is associated with the changing pattern of womens's labor force participation over time, that is, the lack of steady state in the cohort profiles. The level of participation is growing among the young cohorts and so is the re-entrance pattern of mature women. We would expect that the period pattern of Argentina would change in the long run from the Latin American Group to the first group of developed countries (double peak).

Killingsworth and Heckman (1986) present cohort and period age-specific activity rates in the United States calculated for birth cohorts between 1886 and 1960 and for the period between 1920 and 1980. The cohort pattern is u-shaped with a low plateau between 25 and 34 years of age. The corollary of this cohort pattern is the double period pattern classified in the first group of developed countries in section two. The authors suggest a pattern of "dampening or even disappearance of the decline in market activity at childbearing and childrearing ages that was characteristic of earlier cohorts" (Killingsworth and Heckman, 1986, p.111). The corollary of this process in terms of period projection of the labor supply discussed in the second section is a shift in the US pattern from the first group of developed countries to the second group of developed countries.

One may ask why nobody did this connection between cohort and period female labor force participation in Brazil using the 1940 to 1980 Demographic Censuses. Paiva (1984) concluded, however, that comparability among these censuses would be severely damaged because of changes in some definitions. Begining in the seventies, the Brazilian Census Bureau (IBGE) applied annual household surveys in the style of the American CPS (PNADs). By concatenating the 1976 to 1990 PNADs we could finally interact cohort and period analysis.

Figure 8 depicts the age-specific activity rate among birth cohorts between 1912 and 1966. Surprisingly, we notice that a representative woman of the cohorts does not withdraw from the labor force during the childbearing and childrearing period. In addition, as the younger cohorts increase their level of participation, the slope of participation also increases with age but the peak of participation is reached at younger age-groups (in the forties).

Figure 9 portrays the shift in pattern observed between 1976 and 1991. There is a move from the Latin American Group pattern to the third pattern observed in the group of developed countries. It is obvious from the figure that the shifts in level and pattern of age-specific participation of the younger cohorts is responsible for this change in the period pattern.

In order to assess the full profile of age-specific activity rates among the several birth cohorts, we developed a crude method of backward and forward projection of age-specific activity rates.

The first step was the backward projection. Starting from the activity rate in the 60-64 age-group observed in the 1912-16 birth cohort, we performed a backward projection for the other rates based on the increment/decrement from the previous age-group and the information of the younger cohorts.

The second step was the forward projection. Starting from the activity rate in the 20-24 age-group observed in the youngest birth cohort (1962-66), we projected the subsequent rates based on the increment/ decrement from the following age-group and the information of the older cohorts.

Figures 10 depicts the projected profile of female labor force participation rate of the several birth cohorts. By completing the rates for all age groups and birth cohorts through backward and forward projection, we are able to project age-specific labor force participation in future periods.

Figure 11 draws the observed profiles of labor force participation observed in 1976 and 1991. The projected profiles for 1971 and 2001 seem consistent with the observed figures.

We conclude that the interaction between period and cohort profiles of labor force is an important tool for the projection of female labor supply. Nevertheless, techniques for integrating these two aspects should be refined. In the future we intend to use yearly information for annual age-intervals of female labor force participation rate and smoothing techniques in order to define a pattern of age-cohort labor force participation rates (see figure 12).

5 CONCLUSIONS

Our first conclusion is in line with the motivation for writing this paper. It says that there is not a single technique or a clear set of procedures that could serve fully as guideline during an exercise of projecting female labor supply. On the other hand, we reached positive conclusions about several steps that should be taken into consideration during a projection.

Second section told us that the profiles (levels and patterns) of female labor force participation in the period populations vary a lot among different countries. An update of the profiles developed by Durand confirmed that changes in the classification or clustering of a country over time is quite likely to happen. This paper explored ways to predict changes in the profile of period analysis of labor force participation.

We concluded that three aspects are crucial for the projection of period activity rates: marital status, fertility and cohort.

Marital status and fertility are likely to determine the pattern of period age-specific female activity rates. Differences in levels of female labor force participation by marital status suggest that a composition effect operates between the 15-19 and 20-24 age groups. The impact of this effect in the age-specific labor force activity rate is declining over time, as the activity rate of married women approaches that of single women.

Fertility will continue to decline in the near future, the value attached to high fertility declined while the value attached to female labor force participation increased. The prediction is that Brazilian fertility will not affect period activity rates. Nevertheless, the concentration of fertility and childrearing in the 20-29 age group might explain why there is a small growth of activity rate in this age-group.

The impact of marital status and fertility in the profile of female labor force participation is related with the life cycle, but it is assessed in the period and affected by compositional effects. Another way to look at the life cycle is focusing on each birth cohort. The main conclusion for projections is reached with the link between cohort and period.

The link between cohort and period is given by the notion of steady state. If the profile of several birth cohorts stabilizes, then we would expect that the profile of synthetical cohort obtained through period analysis will be stable and similar to the one found among the cohorts. If there is not a steady state among birth cohorts with changes in the life cycle profile, then the observed profile of period analysis will reflect these shifts and compositional effects. We operationalized a simple method of forward and backward projection to be applied in cohort age-specific activity rates with the purpose of completing the age profile of a birth cohort. We showed that complete age-profiles of birth cohorts can be used to project period age-specific activity rates.

Finally, we expect to have shown the relevance of comparing different approaches to illuminate the projection of female labor force activities and to improve the design of scenarios. We did not deal explicitly with the micro/macro link; we suspect that women's education and husbands' income of married women are the key variables to be studied. Nevertheless, we believe that these variables affect more the level than the pattern of labor force activity.

6 APPENDIX

TABLE 1

CLASSIFICATION OF COUNTRIES BY REGIONAL GROUPS
BY PATTERNS OF FEMALE AGE
SPECIFIC RATES

GROUPS	COUNTRIES
Developeds 1	Rep. Federal of Germany, Austrian, United States of America, Canada, Switzerland
Developeds 2	Australia, United Kingdom, Japan, Hong Kong, New Zealand
Developeds 3	Netherlands, Finland, Denmark, Israel
Eastern Europe and Socialist	Czechoslovakia, Hungary, Poland, Rep. Democratic, German, Cuba, China, Yugoslavia
Arabian Countries	United Arab Emirates, Turkey, Jordan, Kuwait, Bangladesh, Guine-Bissau, Tunisia, Iraq, Sudan, Morocco, Comores
African	Malawi, Ethiopia, Madagascar, Rwanda, Tanzania, Zimbabwe, Congo, São Tome and Principe
Latin-America	Chile, Costa Rica, Argentina, Dominican Republic, Guyana, Haiti, Mexico, Paraguay, Peru, Trinididad and Tobago, Brazil, Uruguay, Venezuela, Panama, Guatemala
Latin-European	Spain, Greece, Portugal, Italy
Asia	Thailand, Indonesia, Nepal, Malaysia, Sri-Lanka

TABLE 2

AGE SPECIFIC ACTIVITY RATES OF BRAZILIAN FEMALE
(1950-1980)

AGE	1950	1960	1970	1980
10-19	15,64	15,05	14,86	19,90
20-29	16,56	20,92	26,10	37,70
30-39	11,44	17,00	20,79	34,20
40-49	10,68	16,72	19,56	30,10
50-59	9,48	14,62	15,49	21,40
60-69	7,78	11,56	10,30	10,60
RAR*	13,60	16,60	18,40	26,90

SOURCE: Demographic Censures

* Defined as the ratio between the total number of active women and the total population of women ten years of age or older.

TABLE 3

AGE SPECIFIC ACTIVITY RATES OF BRAZILIAN FEMALES URBAN POPULATION
PNADs 78, 81, 84, 88 e 90

AGE	1976	1978	1981	1984	1988	1990
10-14	6,55	8,53	8,63	8,32	8,43	7,66
15-19	35,22	37,62	37,48	38,94	40,88	40,90
20-24	45,09	47,36	49,10	52,11	56,50	55,51
25-29	40,74	43,67	45,80	49,80	54,16	55,59
30-34	36,97	42,22	45,28	49,25	54,58	56,01
35-39	36,98	41,63	44,46	49,50	54,42	56,86
40-44	32,60	39,87	41,20	47,73	53,01	53,41
45-49	27,99	33,70	36,74	40,19	47,60	47,80
50-54	24,11	28,43	30,60	32,53	38,22	37,68
55-59	16,88	22,55	22,62	24,99	26,89	29,11
60-64	12,19	15,23	15,19	15,32	17,28	18,01
RAR*	30,25	34,02	35,47	38,49	42,34	42,66

SOURCE: Household surveys (PNADs)

* Defined as the ratio between the total number of active women and the total population of women ten years of age or older.

TABLE 4

AGE SPECIFIC ACTIVITY RATES OF FEMALES BY MARITAL STATUS*
(1970-1986)

AGE		1970	1986
15-19	Wives	5,45	20,64
	Daughters	21,30	41,19
20-24	Wives	8,21	28,48
	Daughters	38,85	68,41

* Wives and daughters as a proxy of married and non-married women

TABLE 5

AGE SPECIFIC ACTIVITY RATES BY PARITY (1970-1986)

AGE	1970		1986	
	0 - 1 CHILD	2+ CHILDR	0 - 1 CHILD	2+ CHILDR
20-24	11,12	5,71	29,94	21,74
25-29	19,54	8,49	35,77	30,55
30-34	20,35	10,87	43,12	37,69
35-39	19,40	12,23	44,46	40,71
40-44	18,83	11,31	42,66	40,68

TABLE 6

DISTRIBUTION OF MARITAL STATUS* AND ACTIVITY (IN %) BY AGE AND CORRESPONDING ESTIMATION OF MODEL'S PARAMETERS

YEAR	AGE	A	B	C	D	ALFA	BETA	GAMA
1970	15-19	0,776	13,473	18,267	67,483	-1,611	-1,307	1,548
	20-24	4,529	50,656	17,412	27,402	0,614	-0,453	1,961
	25-29	8.891	72,411	8,722	9,976	1,982	-0,134	1,963
1986	15-19	2,946	11,330	35,311	50,414	-1,493	-0,356	0,991
	20-24	15,105	37,938	32,121	14,836	0,939	0,772	1,693
	25-29	27,342	52,227	15,443	4,988	2,349	1,130	1,777

TABLE 7

DISTRIBUTION OF MARITAL FERTILITY STATUS* AND ACTIVITY (IN %) BY AGE AND CORRESPONDING ESTIMATION OF MODEL'S PARAMETERS

YEAR	AGE	A	B	C	D	ALFA	BETA	GAMA
1970	15-19	0.837	19.998	4.579	74.587	-1.316	-2.791	0.383
	20-24	3.119	51.508	5.048	40.326	0.245	-2.078	0.726
	25-29	6.615	71.311	4.312	17.762	1.390	-1.416	0.962
	30-39	9.439	77.406	2.677	10.479	2.000	-1.365	0.739
	35-39	10.984	78.799	1.982	8.236	2.258	-1.424	0.546
	40-44	10.040	78.761	2.109	9.090	2.159	-1.461	0.599
1986	15-19	1.404	5.981	19.231	73.384	-2.507	-1.339	0.11
	20-24	3.879	13.963	24.597	57.561	-1.416	-0.850	0.431
	25-29	8.255	18.762	26.108	46.875	-0.916	-0.585	0.236
	30-39	12.129	20.052	29.243	38.576	-0.654	-0.277	0.226
	35-39	14.065	20.487	29.100	36.348	-0.573	-0.222	0.154
	40-44	14.177	20.672	27.793	37.359	-0.592	-0.296	0.081

* High Fertility = 2 and more children and low fertility = 0 and 1 child.

TABLE 8

PROJECTED AGE SPECIFIC ACTIVITY RATES OF BRAZILIAN FEMALES BY BIRTH COHORT - URB. POPULATION ACTUAL RATES HIGHLIGHTED

AGE	BIRTH COHORT										
	62-66	57-61	52-56	47-51	42-46	37-41	32-36	27-31	22-36	17-21	12-16
10-14	**0,0655**	0,0615	0,0565	0,0503	0,0410	0,0341	0,0270	0,0206	0,0194	0,0127	0,0102
15-19	**0,3748**	**0,3522**	0,3234	0,2877	0,2349	0,1953	0,1546	0,1178	0,1109	0,0729	0,0585
20-24	**0,5494**	**0,4910**	**0,4509**	0,4011	0,3274	0,2723	0,2155	0,1642	0,1547	0,1016	0,0815
25-29	**0,5559**	**0,5085**	**0,4580**	**0,4074**	0,3326	0,2766	0,2189	0,1667	0,1571	0,1032	0,0828
30-34	0,6123	**0,5601**	**0,5305**	**0,4528**	**0,3697**	0,3074	0,2433	0,1853	0,1746	0,1147	0,0920
35-39	0,6563	0,6003	**0,5686**	**0,5288**	**0,4446**	**0,3698**	0,2926	0,2229	0,2100	0,1379	0,1107
40-44	0,6630	0,6064	0,5743	**0,5341**	**0,5091**	**0,4120**	**0,3260**	0,2483	0,2340	0,1537	0,1233
45-49	0,6224	0,5693	0,5392	0,5015	**0,4780**	**0,4224**	**0,3674**	**0,2799**	0,2637	0,1732	0,1390
50-54	0,5552	0,5078	0,4809	0,4473	0,4263	**0,3768**	**0,3373**	**0,3060**	**0,2411**	0,1584	0,1271
55-59	0,4791	0,4382	0,4151	0,3860	0,3679	0,3252	**0,2911**	**0,2569**	**0,2262**	**0,1688**	0,1355
60-64	0,3360	0,3073	0,2911	0,2707	0,2580	0,2280	0,2042	**0,1801**	**0,1551**	**0,1519**	**0,1219**

FIGURE 1- Age patterns of female activity rates

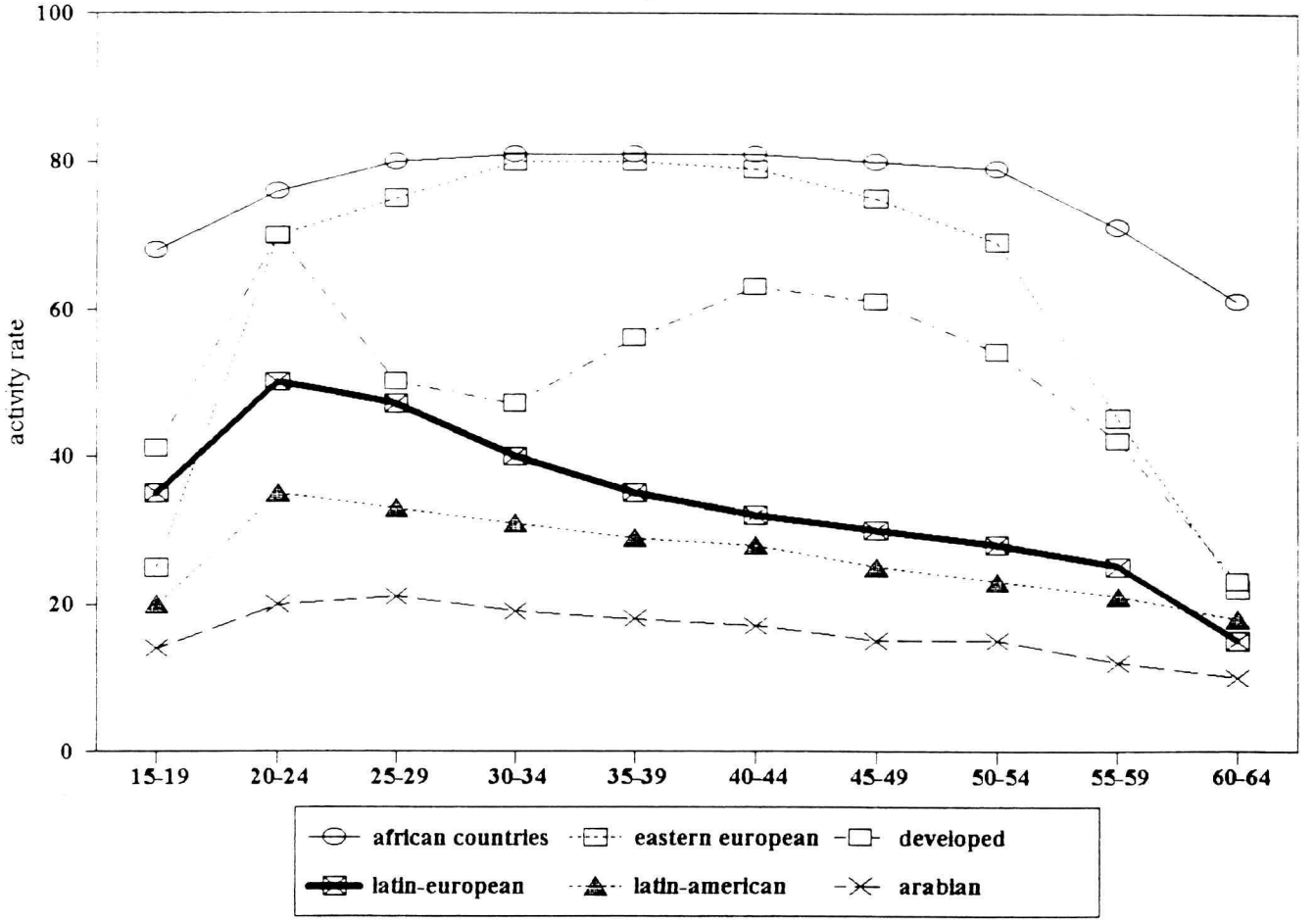


FIGURE 2 - Age patterns of female activity rates in developed countries

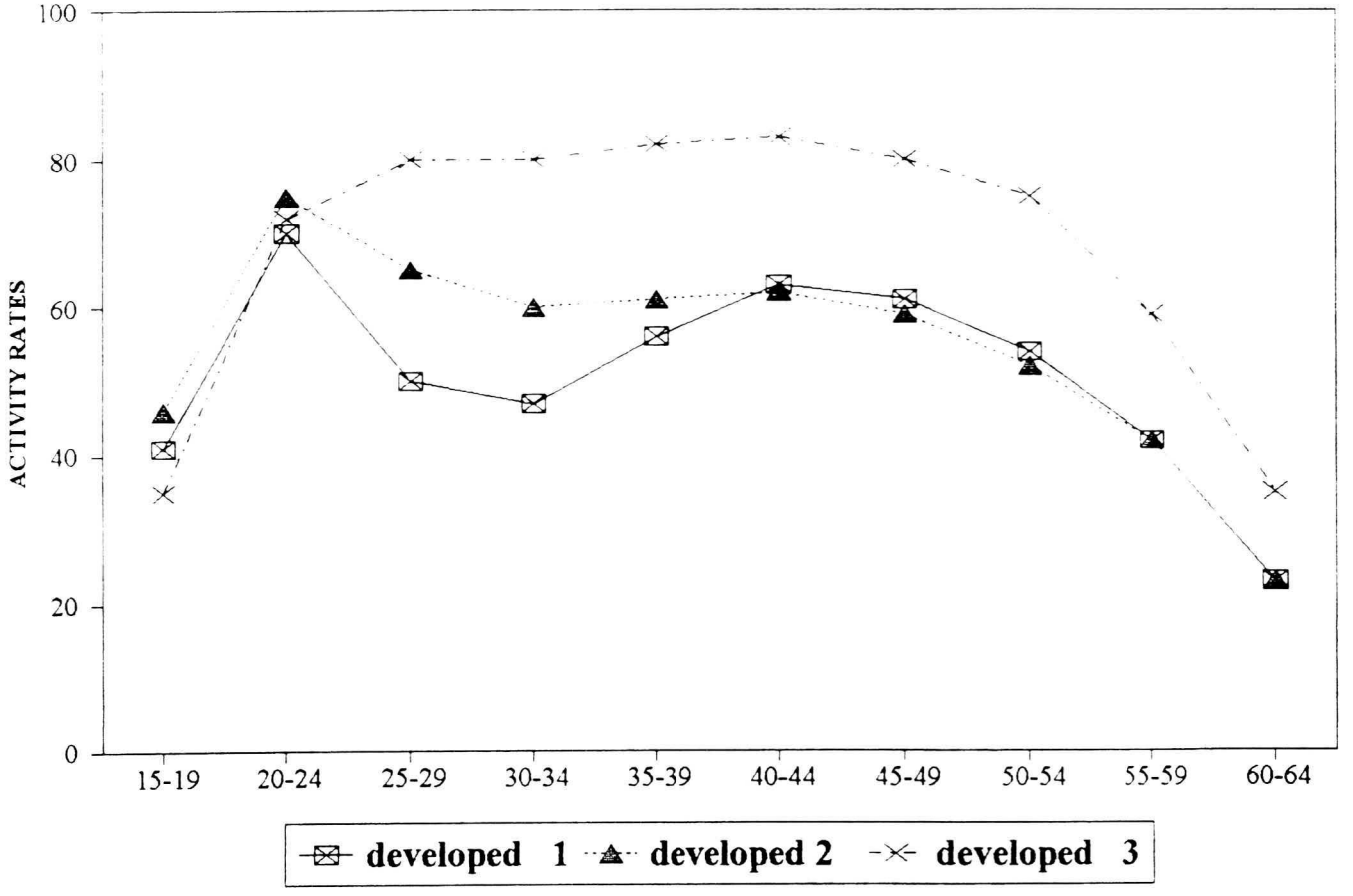


FIGURE 3 - Age specific activity rates of females (Brazil : 1950 - 1980)

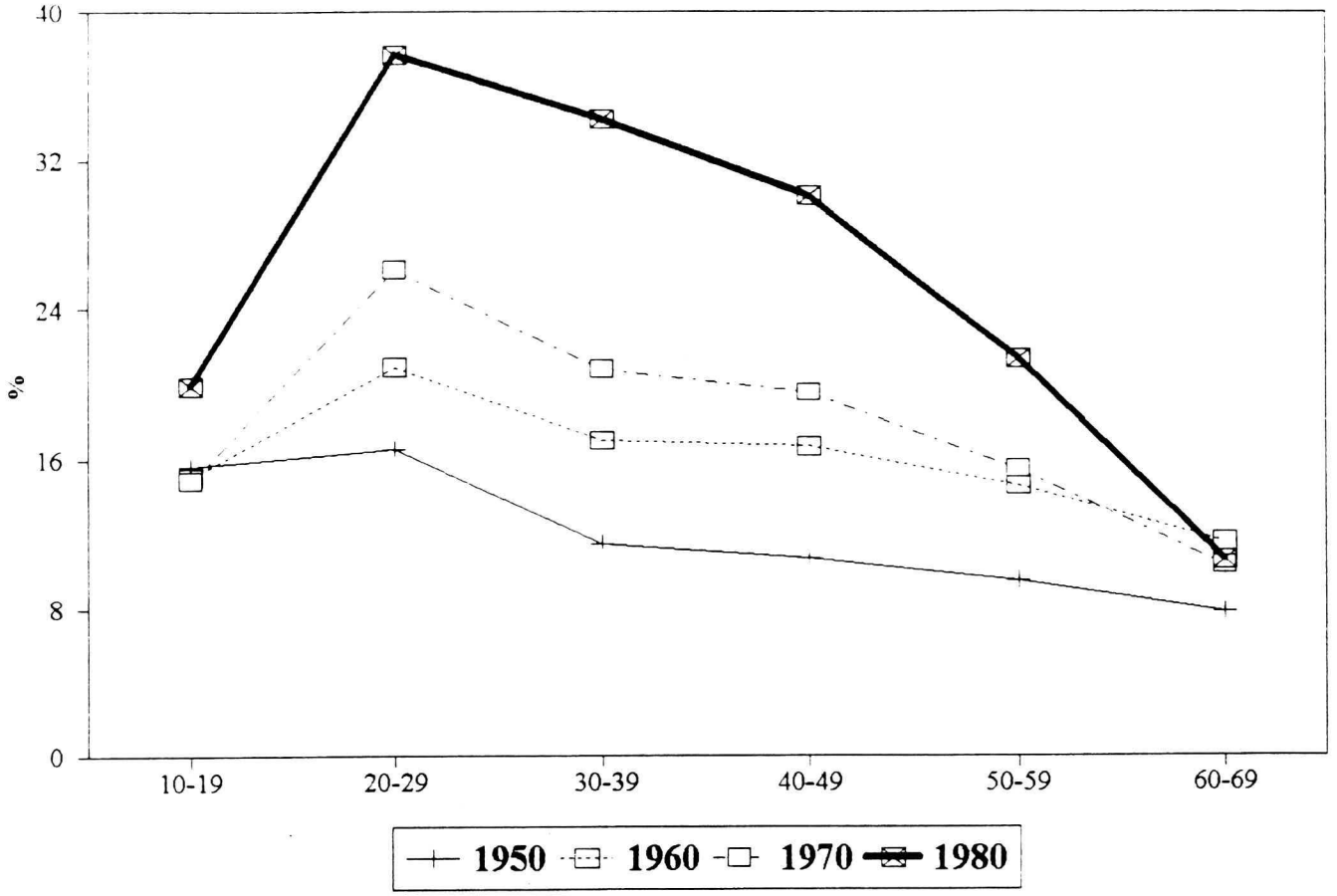


FIGURE 4 - Age specific activity rates of urban females - Brazil (1976-1990)

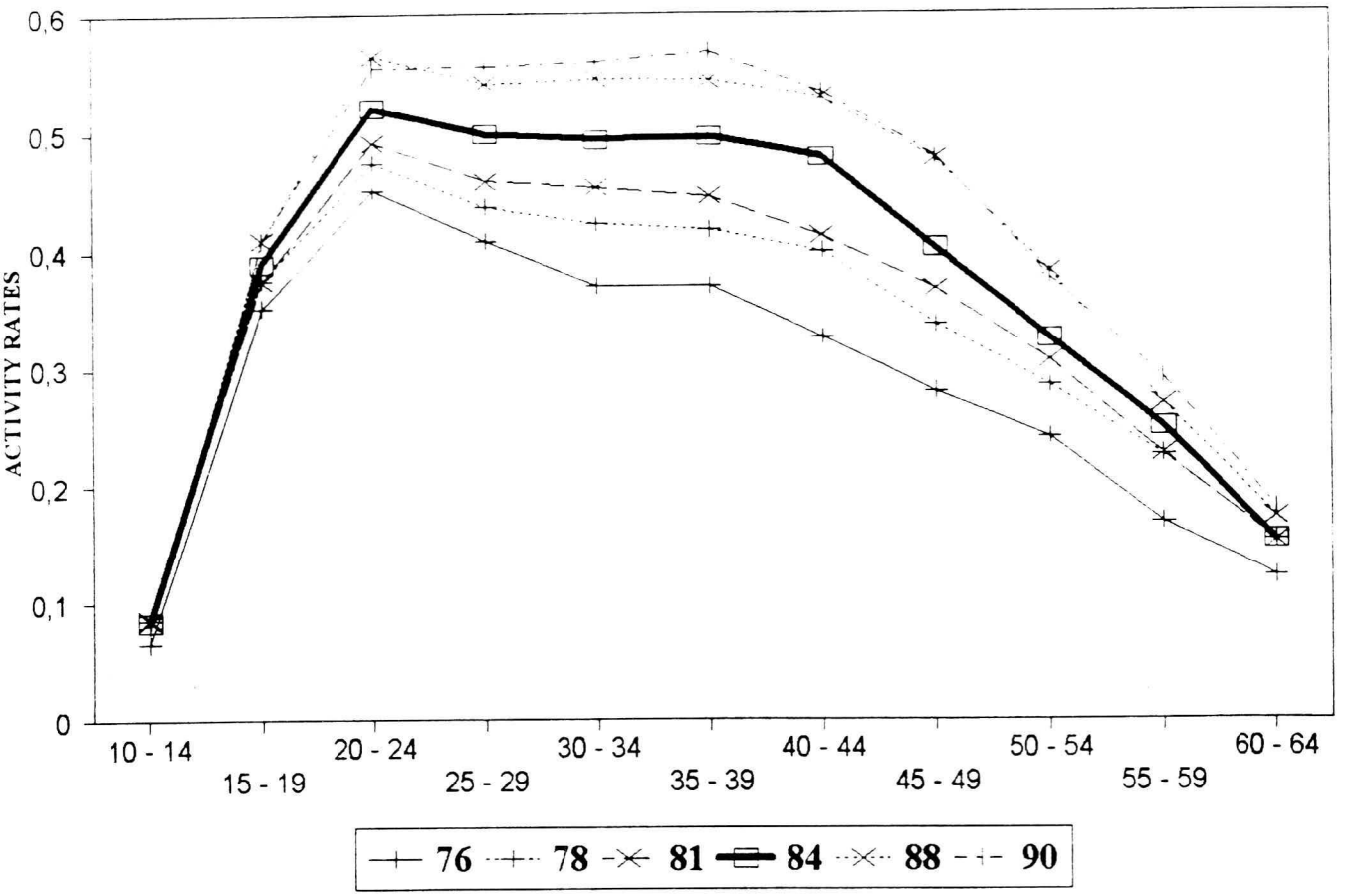


FIGURE 5- Age specific activity rates of married women & daughters (1970-86)

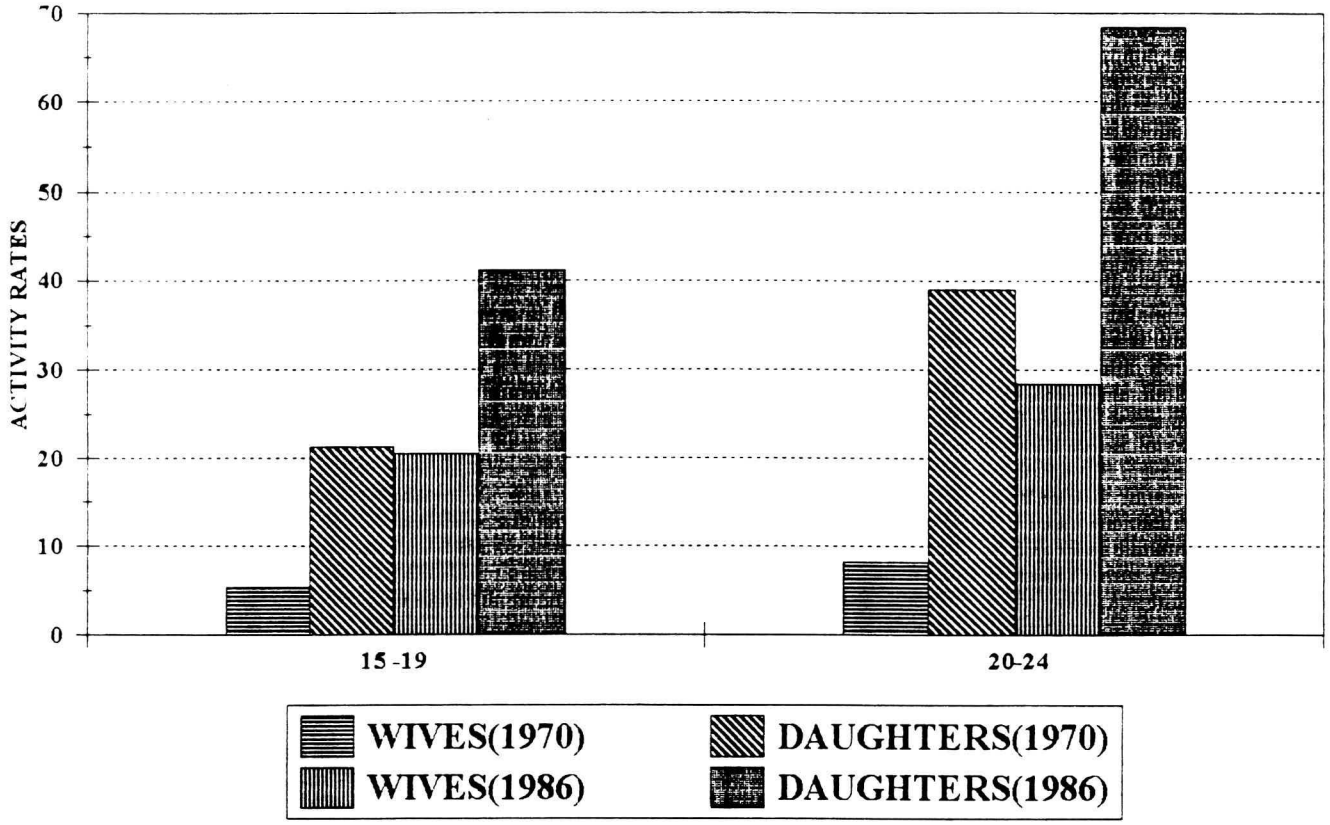


FIGURE 6- Age specific activity rates of married women by parity (1970-1986)

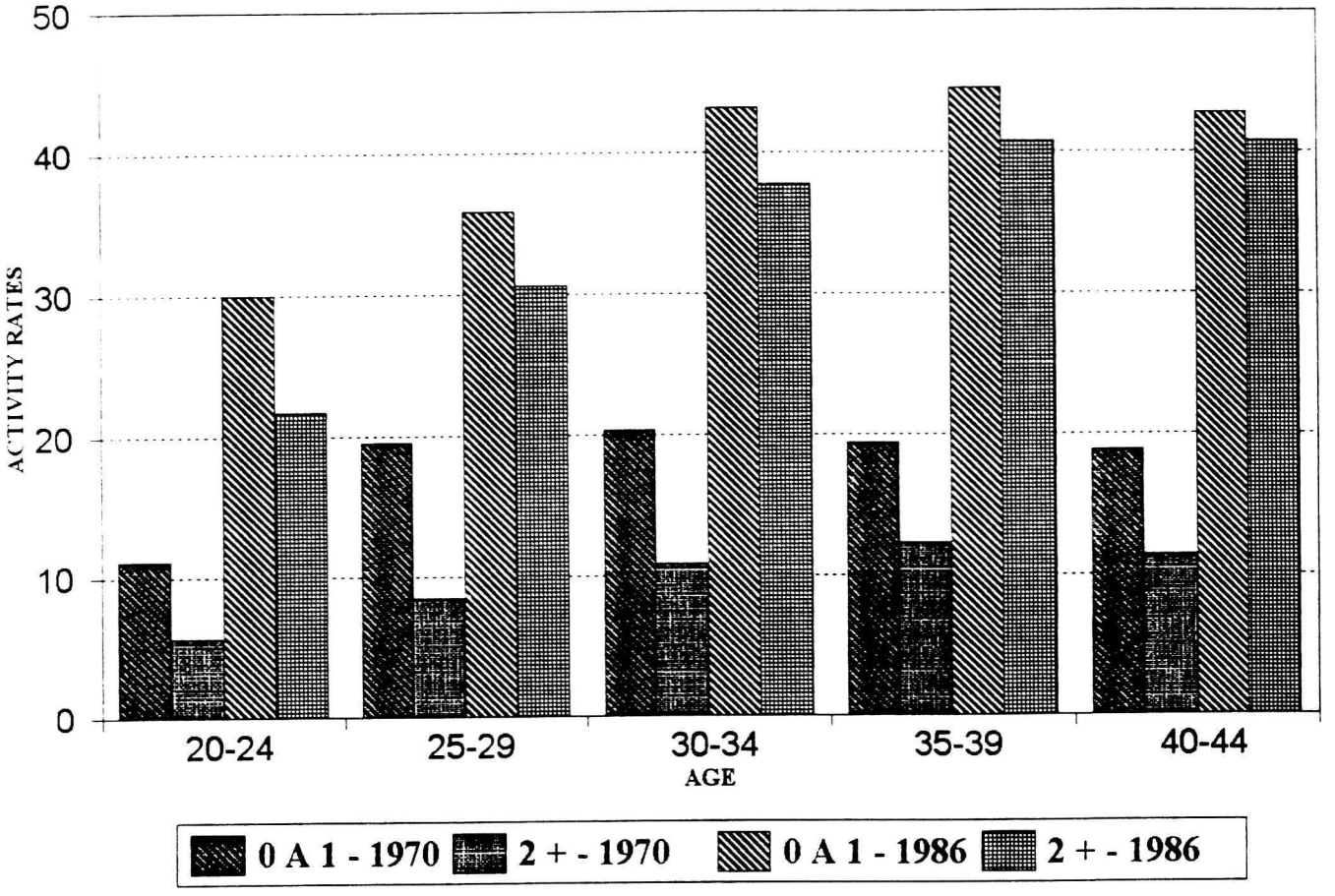
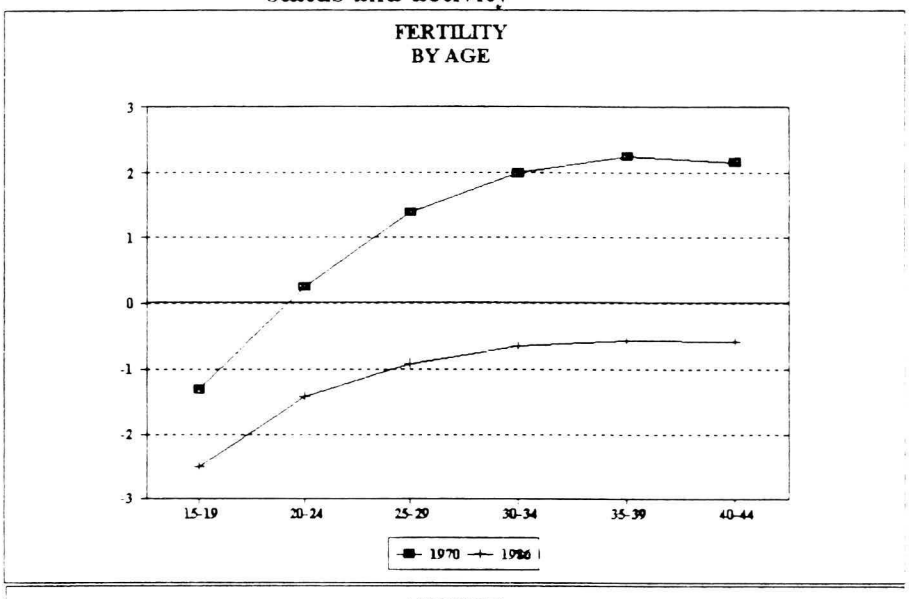
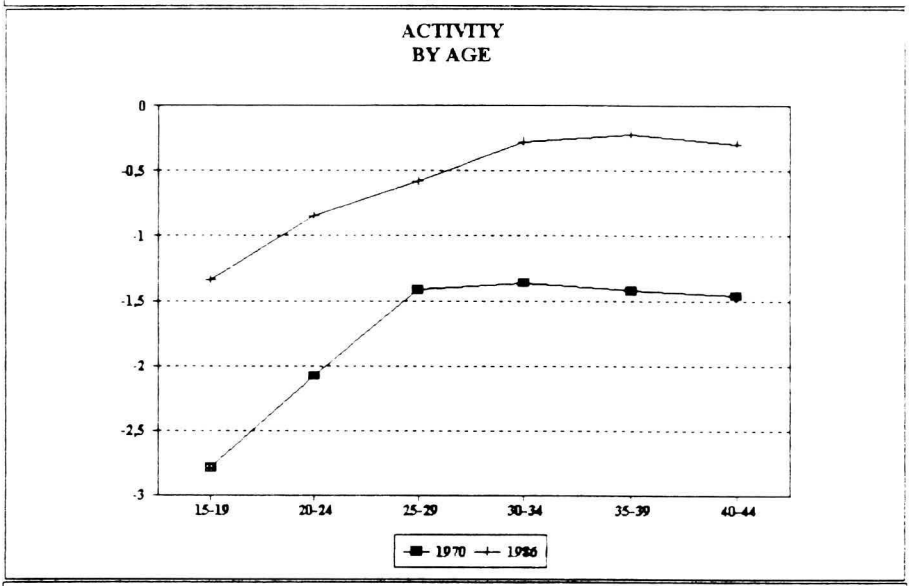
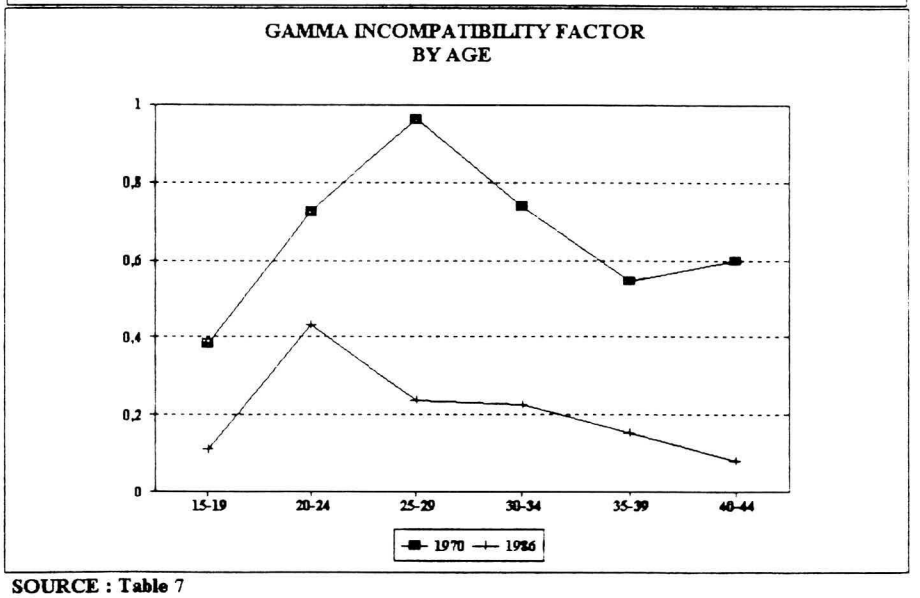


FIGURE 7

Model's parameters by age - marital fertility status and activity







SOURCE : Table 7

FIGURE 8- ASAR of Brazilian females by birth cohort - urban population

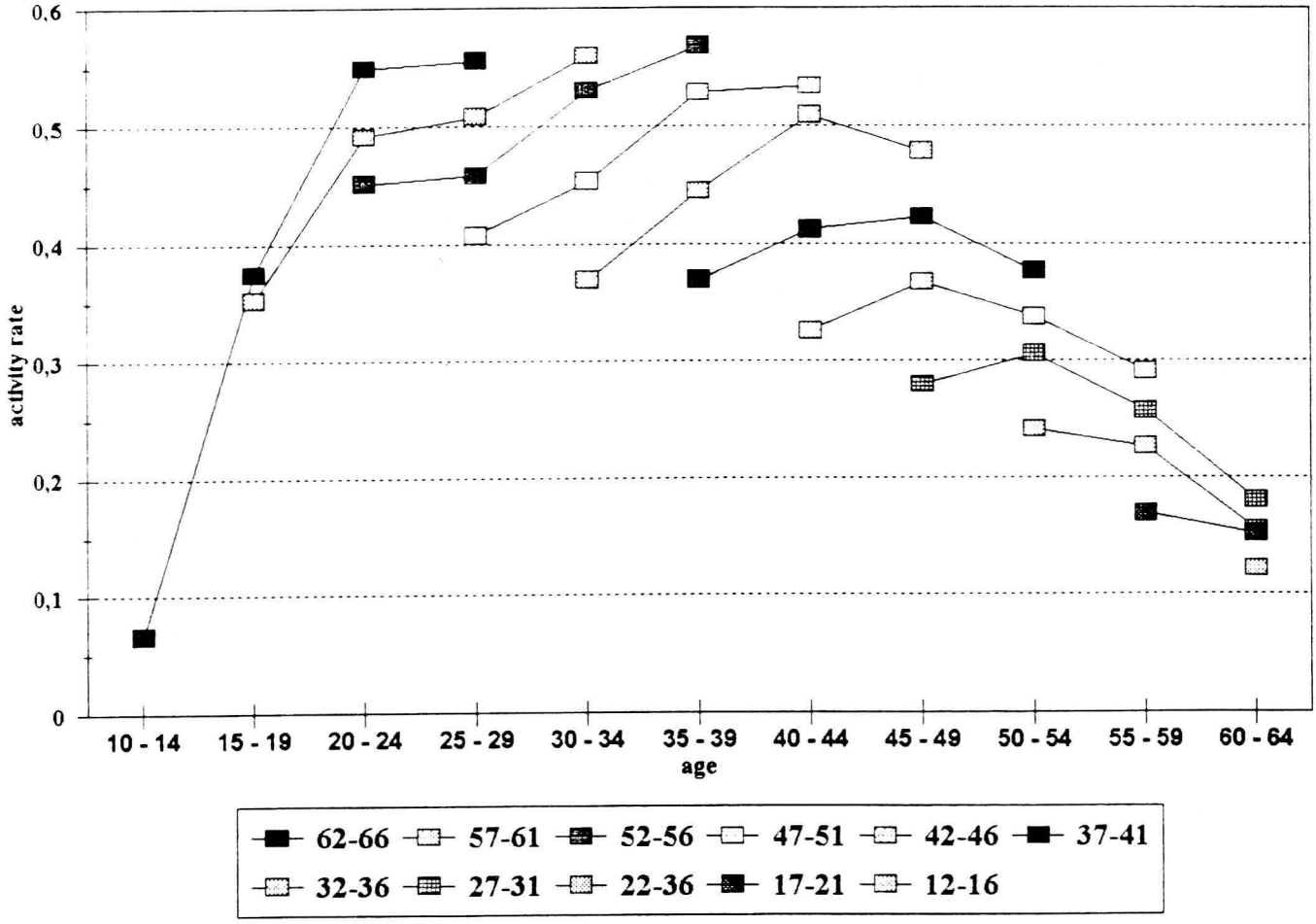


FIG.9- ASAR of Brazilian females by birth cohort and period (1976 & 1991)

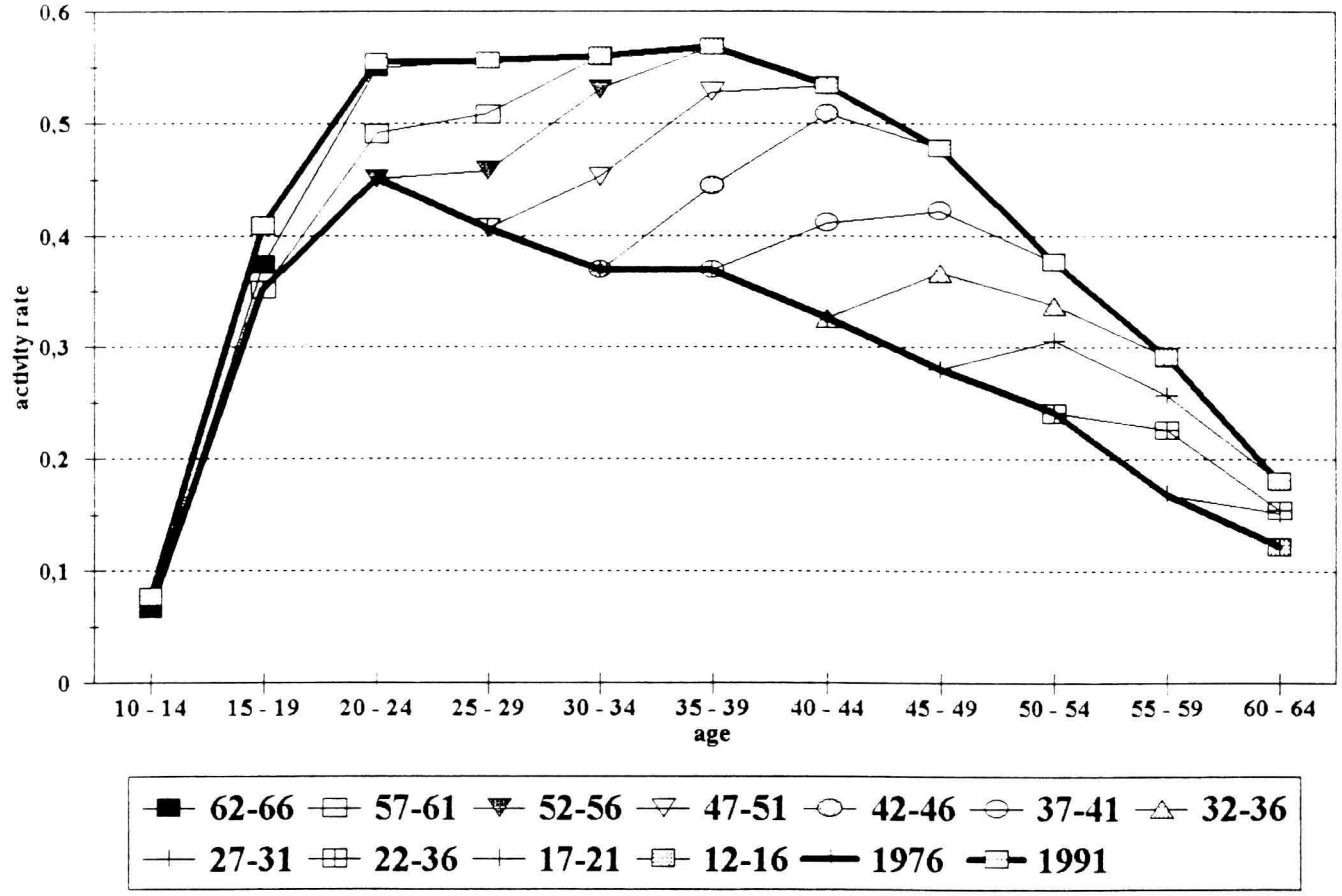


FIGURE 10- Observed and projected activity rates by birth cohort 1912/62

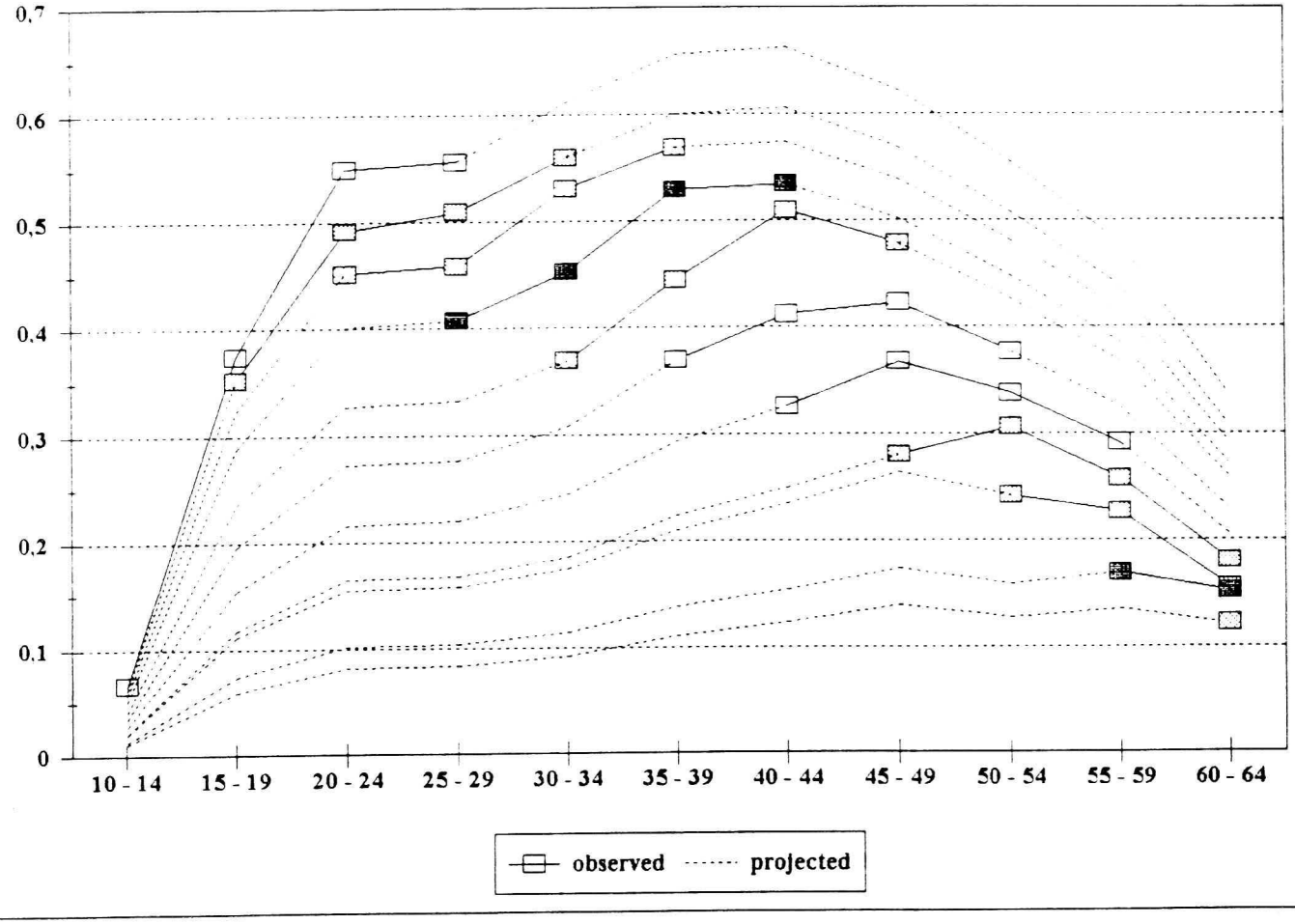


FIGURE 11- Observed 1976-91 and projected 1971-2001 activity rates

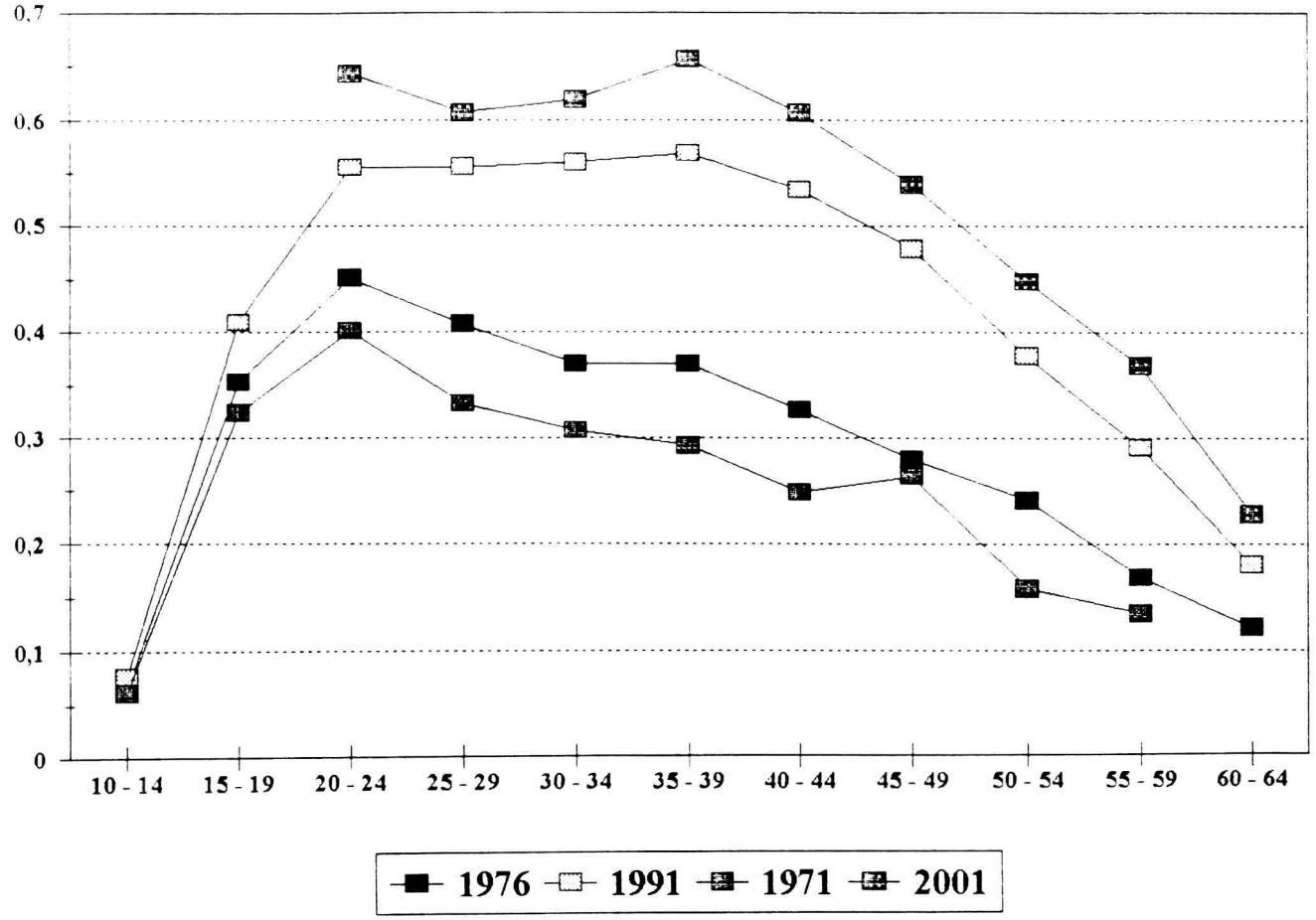
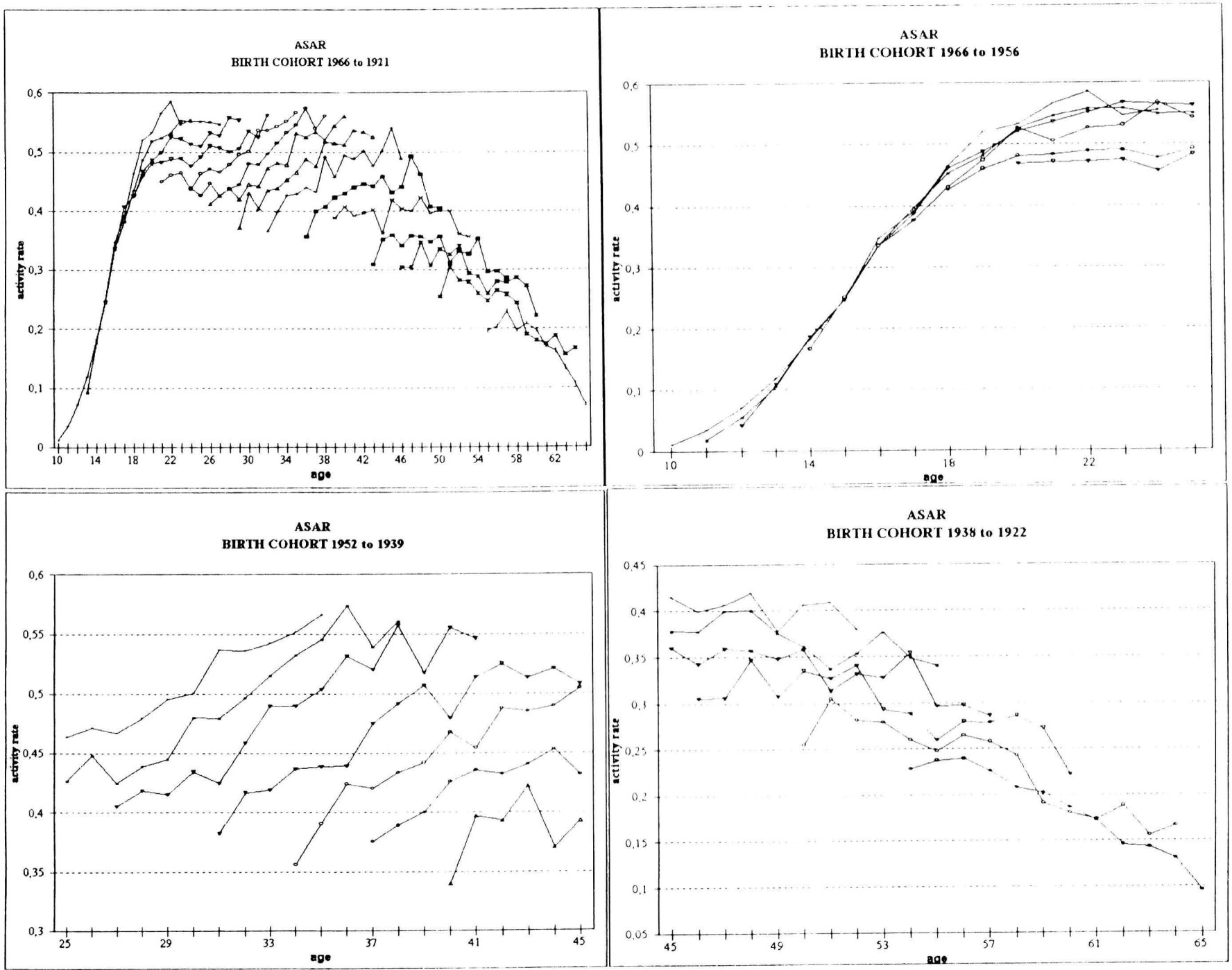


FIGURE 12
AGE SPECIFIC ACTIVITY RATES OF BRAZILIAN FEMALES BY BIRTH COHORT



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