

Notes on the Brazilian population and labor force

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The following paper is being distributed for information and criticism. It draws on work already carried out within IPEA and is not intended to be either a duplication or extension of such work. Instead it is an attempt to draw together as much as possible of the available information pertaining to the Brazilian labor force which information can be useful as background to any analysis and projection of the labor force. No specific analysis is undertaken here but speculation is offered about some of the relevant questions. The paper is organized as follows:

- 1) Sources of data and problems in interpreting the data.
- 2) Population growth.
- 3) Relationship between population and labor force.
 - a) Age composition of the population and labor force.
 - b) Labor force participation by sex.
- 4) Projection of labor force to 1970.
- 5) Sectoral distribution of the labor force.
- 6) Comparison of supply and demand for labor.

I - Sources of Data and Data Problems

The discussion of population and labor force trends in Brazil will be confined almost entirely to the period since 1940 and will be based primarily on the demographic censuses of 1940, 1950, and 1960.⁽¹⁾ In addition it will make use of the research already carried out by IPEA and published in the *Diagnóstico on Demography*, the preliminary *Diagnóstico on Employment* and in other mimeographed material.

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(1) The complete 1960 demographic census has not been published at this time; there is presently available only preliminary information derived from a 1.27 percent sample of all census returns. Conclusions which have been based on the information derived from this sample may have to be substantially modified when the complete census is available. It should also be mentioned that the enumeration dates of the 1940, 1950 and 1960 censuses were 1 September, 1 July, and 1 September respectively. For this reason the average rates of growth given in this report will differ slightly from those which are calculated by treating the inter-census periods as exactly ten years in each case.

It is difficult to analyze population and labor force statistics for the period before 1940. No population census was taken in 1930 and the 1920 census is generally considered to have been an over-estimate. (1) For the 1940-60 period I have accepted the published census figures.

A problem arises in the definition of the labor force or "população economicamente ativa" which was employed in the various demographic censuses. The 1940 and 1950 censuses defined the economically active population (hereafter designated PEA) as consisting only of those persons actually employed:

"Pessoas economicamente ativas são tôdas as pessoas ocupadas, exclusive as que exerciam atividades domésticas não remuneradas e atividades escolares, discentes, sem possuírem ocupação suplementar em outro ramo de atividade."

In other words, the unemployed were excluded from the economically active population in these censuses if this definition was followed. The 1960 census, on the other hand, explicitly included the unemployed in the PEA according to the definition adopted in that year:

"A população economicamente ativa compreende tôdas as pessoas que, na data ou período de referência adotado nacionalmente: (1) exerçam ou tenham exercido uma ocupação remunerada em dinheiro ou espécie; (2) exerçam ou tenham exercido uma ocupação, remunerada ou não, na produção de bens ou serviços de valor comercial em uma empresa explorada por membro de sua família; (3) tenham um emprego, ou seja, uma ocupação remunerada assegurada, que não estejam exercendo por circunstancia transitória, como enfermidade ou acidente, conflito de trabalho, férias ou outro tipo de licença, ausência com permissão, interrupção de trabalho por causa de mau tempo ou avaria de maquinaria; (4) procurem trabalho remunerado por se encontrarem disponíveis em virtude de contrato expirado ou suspenso temporariamente; ou por terem perdido a situação de "empregador" ou de "trabalhador por própria conta" ou ainda por nunca haverem trabalhado; (5) não procurem trabalho, embora não tenham emprego, por terem obtido emprego que deve começar em data posterior ao período de referencia adotado ou por padecer de enfermidade benigna, ou por terem sido suspensos temporariamente do seu trabalho sem remuneração, por um período especificado ou não".

(1) The total population in 1920 was reported in the census of that year to be 30,635,605. The IPEA Diagnostico on Demography uses a revised figure of 27.5 million for 1920. The difference of over 3.1 million is slightly more than 10 percent of the census total.

If these definitions had been rigorously adhered to in enumerating the labor force in each census there should have been a noticeable rise in the labor force participation rate (hereafter designated LFR) between 1950 and 1960 due to the inclusion of the unemployed in the definition only in the latter year. The rate did not increase between these years but declined slightly, at a rate quite consistent with the change in the LFR between 1940 and 1950. From this it would appear that one of the following must have been the case:

(i) Both the 1940 and 1950 censuses excluded the unemployed from the PEA while the 1960 census included them. This change did produce an increase in the LFR between 1950 and 1960 but there were stronger forces operating in the opposite direction.

(ii) There was actually little unemployment in Brazil at the time of the 1940 and 1950 censuses and thus the employed population and the PEA were roughly equal in each of these years.

(iii) There is little overt unemployment in Brazil, only under-employment or disguised unemployment. Everyone who wants to work can do something - selling lottery tickets, collecting old papers and bottles, etc. Thus the PEA does not include unemployment which is comparable to that found in other countries.

(iv) The definition of employment was broadly interpreted in 1940 and 1950 so that people who normally worked or who were without a job but seeking employment were included in the employed population even if they did not have a job at the time of the census. In other words, the 1960 definition of the labor force was actually applied in the earlier censuses and not the more limited definition given.

I would argue that only (iv) of the above hypotheses is reasonable. Number (i) seems unlikely for reason which will be brought out in the more detailed discussion of the labor force which follows. Number (iii) seems unlikely in an economy with the developed secondary and tertiary sectors and the degree of urbanization of Brazil. Unemployment rates which have been measured in developing countries, including many with per-capita incomes below Brazil's, have generally been in the range of 5 to 15 percent. (1)

(1) Reported in Fred Dziadek, "Unemployment in the Less Developed Countries," USAID Memorandum (mimeographed), December 29, 1966, Appendix A.

Number (ii) is a possible explanation, but unemployment rates below 3 or 4 percent are uncommon in higher income countries even in years of high levels of economic activity. An addition of 3 or 4 percent to the labor force between 1950 and 1960 would certainly have been detectable. For the present I will accept the last hypothesis that the definitions of the labor force applied in 1940, 1950 and 1960 all more or less coincided with the definition published in the 1960 census and that these measures of the labor force are thus internally consistent.

A further problem arises from the lack of comparability between the labor force statistics from the demographic censuses and the various sectoral economic censuses for agriculture, industry, commerce and services. The greatest divergence is that between the agricultural and demographic censuses; a comparison of the agricultural PEA according to these two sources is given in Table 1.

TABLE 1

ECONOMICALLY ACTIVE POPULATION ACCORDING TO THE
DEMOGRAPHIC AND AGRICULTURAL CENSUSES
 (1,000 Persons)

CENSUS	MEN			WOMEN			TOTAL		
	1940	1950	1960	1940	1950	1960	1940	1950	1960
Agricultural	7684	7874	N.A.	3659	3123	N.A.	11343	10997	15522
Demographic	8183	9154	10523	1270	733	1175	9457	9887	11698

Note that the demographic census reported more men employed in agriculture in 1940 and 1950 than the agricultural census did. The divergence is probably due to two factors. First, boys of 10-14 years of age who worked on farms part time and also attended school were included in the labor force in the agricultural census but were excluded by the demographic census. This would, of course, tend to raise the labor force in the first relative to the second. On the other hand the demographic census is a census of persons ("where do you work") while the agricultural census is a census of producer units ("how many employees do you have"). There may be a tendency for producers to underreport their labor force and, also, laborers who worked as seasonal or migrant workers on several farms during the course of the year would report themselves as part of the agricultural labor force but no single producer would be certain to report them as part of his labor force in the agricultural census. Since migrant farm workers are common in various parts of Brazil this could explain the difference between the censuses.

The divergence is even greater in the case of women; here the FEA is much greater in the agricultural census. This difference is explained by the conflicting definitions of employed persons which are used. The agricultural census defines persons engaged in agriculture to include "all persons engaged in work connected with agriculture or animal husbandry including the person responsible for the management of the farm and the members, paid or unpaid, of his family." Thus all women and girls who perform farm work, including most farm housewives, are counted as part of the labor force. The demographic census includes only those female workers in agriculture who are directly remunerated. (1)

There are further problems of consistency within the agricultural census itself. Note that according to this census the

(1) Table 1 actually shows female workers directly remunerated in 1950 and 1960 but includes both directly and indirectly remunerated in 1940. This accounts for the sharp decline shown in the female agricultural labor force between 1940 and 1950. If the 1940 census is adjusted to make it comparable with the later ones the resulting figure for female labor force in that year is 512,000. See Fundação Getulio Vargas, Conjuntura Económica, September 1953, pp. 68-69. This revised figure is used in this paper.

total agricultural labor force fell by almost 350,000 between 1940 and 1950 - the female labor force fell by 536,000 and the male labor force rose only 190,000. A part of this decline could possibly be accounted for by the difference in census months; the 1940 census was taken in September (spring) when seasonal employment could have been higher than in July (mid-winter) when the 1950 census was taken. However, most of the decline must have been due to inconsistencies in enumeration between the two years; this was in fact admitted in the preface to the 1950 agricultural census. It would seem difficult otherwise to explain a decline in the agricultural labor force from 40 percent of the rural population in 1940 to 33 percent in 1950. Then, between 1950 and 1960 the agricultural labor force, according to the agricultural census, increased by over 4.5 millions, or by 41 percent while the rural population increased by only 17.5 percent so that the agricultural labor force rose to 40 percent of the rural population once again.

Part of this abnormally high growth of the agricultural labor force is due to definitional changes. First, workers in agricultural establishments who carried out activities of an industrial nature were regarded as industrial workers in the 1950 census but were excluded from the industrial labor force and were presumably included with persons engaged in agriculture in 1960. Second, the agricultural census of 1950 explicitly excluded from the population engaged in agriculture the two categories of agricultural laborers known as *moradores* and *agregados*. (*moradores* are squatters who generally cultivate subsistence crops in the middle of the forest. When they settle and establish some sort of relationship with the owner of the land they become *agregados*). However, these groups were included among persons engaged in agriculture in 1960 (1). These two factors would account for a spurious increase in the agricultural population between 1950 and 1960.

(1) These and other difficulties of interpretation of the census data are discussed in Raoul Kahil, "The absorption of Manpower by the Urban and Rural Sectors of Brazil", Bulletin of the Oxford Institute of Statistics, February 1965 - pp. 45-53.

In addition the above figures for the growth of the rural population between 1950 and 1960 are biased downward. The census bureau considers as urban all "ciudades" and "villas" and all seats of municipios are considered ciudades, regardless of size. Many new municipios were created after 1946 because of a new constitutional provision which provided that 10 percent of all federal income tax revenues were to be distributed in equal parts among all municipios. If correction for the resulting proliferation of municipios and ciudades is made by considering as urban only persons living in towns of 2,000 population and over the rural population is increased to 35.532 million in 1950 and 45.687 million in 1960. The growth of the rural population between 1950 and 1960 is raised to 28.5 percent and the ratio of the agricultural PEA (still according to the agricultural census) to the rural population is changed to 30.9 percent in 1950 and 34.0 percent in 1960. (1) If we use the population census figures for the agricultural PEA and the revised figures for rural population the ratio of labor force to population is 33.5 percent in 1940, 27.8 percent in 1950, and 25.6 percent in 1960. It is clear from all of this that there are considerable difficulties involved in measurement of the agricultural labor force.

There are also discrepancies between the labor force estimates given by the other economic censuses and the totals reported for these sectors in the demographic censuses. The labor force data for industry (indústrias de transformação or manufacturing) from the two census sources are compared in Table 2.

(1) Kahil, op.cit., p. 47.

TABLE 2

COMPARISON OF POPULATION ECONOMICALLY ACTIVE IN MANUFACTURING
ACCORDING TO DEMOGRAPHIC CENSUS WITH POPULATION
EMPLOYED IN INDUSTRY ACCORDING TO INDUSTRIAL CENSUS
(1,000 PERSONS)

CENSUS	1940	1950	1960
Demographic	995	1 608	2 006
Industrial	815	1 310	1 754

In each case the demographic census figure is larger, by about 22 percent in 1940 and 1950 and by slightly over 14 percent in 1960. Several reasons may be advanced for these variations: the census dates differed in 1950 and 1960 (although they coincided in 1940); there may have been the above-mentioned bias toward underreporting of the number of employees on the part of employers; there may be a bias for employees who actually work in other sectors to say that they work in industry because of the prestige attached to industrial employment and, finally, the industrial census reports actual employment only while the demographic census presumably reports total labor force including unemployment for each census year (1). While it is impossible to determine which of the two census figures is more accurate, I will assume that unemployment did account for some of the differential and that for this reason the demographic census provides the better estimate of the actual labor force attached to manufacturing.

(1) - Note that if the demographic census had excluded industrial unemployment from the industrial labor force enumerated in 1940 and 1950 but had included unemployment in 1960 we could expect the demographic census to exceed the industrial census figure for employment by relatively more in 1960 than in the earlier two years. In fact the reverse was the case. There is, then, no evidence here that the demographic census included the unemployed in the labor force in 1960 but excluded them in 1940 and 1950.

The population census can be shown to provide more comprehensive estimates of the labor force for the commerce and service sectors than the respective economic censuses for these activities. Since the demographic census seems the preferable source for industry and agriculture and since there are no economic censuses for certain sectors (transportation and communications, finance, government, and mining), I will use the demographic censuses as the source of the labor force data for the sections which follow.

2 - Overall Population Growth

Some basic facts about the Brazilian population since 1900 are given in Table 3. The population growth rate has been accelerating during the present century, almost entirely due to an increase in the rate of natural increase. (Since 1900 migration has not been responsible for more than 10 percent of net population growth in any single decade and since 1940 its influence has been negligible.) This acceleration has been in conformity with the more or less

TABLE 3
BRAZILIAN POPULATION AND POPULATION GROWTH SINCE 1900

YEAR	POPULATION (000)	AVERAGE ANNUAL RATE OF GROWTH	BIRTH RATE	DEATH RATE
1900	18,200.0	2.12	4.50	2.64
1920	27,500.0	2.05	4.40	2.53
1940	41,236.3	2.38	4.35	2.01
1950	51,944.4	3.00	4.15	1.15
1960	70,119.1	2.89	3.95	1.06
1970	93,292.1 (1)			

SOURCE: IPEA, Demografia (Diagnóstico Preliminar), August 1966.

(1) The Anuário Estatístico do Brasil for recent years carries an estimate of the population for 1970 of 95,262,000. This estimate was obtained by projecting forward the first preliminary census estimate for 1960 of 70,967 million at a 3.0 percent annual rate of growth for the 1960-70 decade.

typical developing country patterns of the present century, that is a rapidly falling death rate and a constant or slowly falling birth rate. In Brazil the estimated death rate fell only slightly from 1890-1960 (27.8 per 1000) to 1920-40, but then dropped sharply in 1940-50 and 1950-60. The estimated birth rate, on the other hand, has declined slowly but steadily throughout the past sixty or more years. However, the birth rate was at such a high level in the last century that Brazil's rate of population growth was already high relative to the rest of the underdeveloped world. The decline in the death rate since 1940 has been so much greater in relative terms than the decline in the birth rate (55 percent vs. 6 percent) that the gap between the two has widened to 3 percent, giving Brazil one of the highest rates of natural population growth in the world.

The rate of population growth is projected to level off and then decline slightly in the 1960-70 decade. (1) It is assumed that the birth rate will decline to 40.7 per thousand in 1960-65 and to 38.4 per thousand in 1965-70 while the death rate will fall imperceptibly to 11.4 per thousand in 1960-65 but then to 9.9 per thousand in 1965-70, resulting in net rates of growth of population of 2.93 and 2.85 percent, respectively, in these periods.

3 - Relationship Between Population and Labor Force

In Table 4 the Brazilian population is broken into three groups: those in ages 0 to 9 (who are not considered to be a part of the economically active population), those 10 and over who are economically active, and those ten and over who are economically inactive. This division of the active and inactive population is not entirely accurate, of course, since there are

TABLE 4
BRAZILIAN POPULATION AND LABOR FORCE 1940-1960

	THOUSANDS OF PERSONS			PERCENTAGES		
	1940	1950	1960	1940	1950	1960
Population 0-9	12,208	15,421	21,391	29.6	29.7	30.5
Population 10 +	29,028	36,523	48,728	70.4	70.3	69.5
Econ. Active	14,002	17,117	22,651	34.0	33.0	32.3
Inactive	15,026	19,406	26,077	36.4	37.3	37.2

(1) IPEA, Demografia, op.cit., pp. 100-104

undoubtedly some children younger than 10 who are engaged in economic activity. However, the participation rate of those less than 10 must certainly be less than that of the 10-14 group which is itself relatively low, and thus the below 10 group can make up only a very small fraction of the total labor force.

The PEA has comprised about one-third of the total population. In recent decades and the participation rate has declined since 1940. This average level of LFR is definitely low in comparison with those of other countries as is shown by a comparison between Brazil and the major geographic regions of the world in Table 5. (1)

The low overall LFR for Brazil is in part explained by the relative youth of the Brazilian population. Brazil's high birth rate and, until recently, high death rate have produced a population with a relatively high percentage of persons still in the pre-working age groups. The 0-9 group makes up over 30 percent of the Brazilian population compared with only 24 percent in Argentina, 21 percent in the United States, and 16 percent in France. (2)

TABLE 5

LABOR FORCE PARTICIPATION RATES FOR REGIONS
1960

REGION	TOTAL	MALE	FEMALE
Europe	45.0	64.1	27.6
North America	39.7	58.2	21.3
Asia	42.5	56.4	28.1
Africa	35.8	56.8	14.5
South America	35.2	57.3	13.1
Central America	35.2	56.6	14.2
Brazil (1950)	33.0	56.4	9.6

SOURCE: IPEA, "Aspectos Demográficos da População Economicamente Ativa," p. 14. Data taken from U.N., Demographic Aspects of Manpower, Report I, Sex and Age Patterns of Participation in Economic Activities, 1961.

(1) The 1950 figures for Brazil are used because of the possible unreliability of the preliminary information for 1960 based on the 1.27 percent sample of census returns.

(2) IPEA, Demografia, op. cit., p. 49.

The lower participation rate for Brazil can also be attributed to a lower than average participation rate for women than is to be found in most other countries. This is indicated in Table 6 where the Brazilian female LFRs for different age groups are compared with average rates calculated by the United Nations for representative "agricultural" and "industrial" countries. Note that for all age groups except 10-14 the female LFR for Brazil lies completely outside the range encompassed by these representative rates.⁽¹⁾ The peak in the female LFR comes at the same point in Brazil as it does in the other two representative distributions - the 15-19 age group - but the percentage in the labor force from this group in Brazil is less than half that for the industrialized countries. It is also evident that female participation in the rest of the population

TABLE 6

AVERAGE FEMALE LABOR FORCE PARTICIPATION RATES BY AGE FOR INDUSTRIALIZED AND AGRICULTURAL COUNTRIES AND FOR BRAZIL (1950)

AGES	INDUSTRIALIZED	AGRICULTURAL	BRAZIL
10-14	2.4	10.2	8.6
15-19	53.6	30.9	23.5
20-24	51.9	31.5	18.9
25-34	30.3	29.9	12.6
35-44	28.3	30.6	11.0
45-54	28.1	28.9	10.3
55-64	20.8	23.7	8.8
65 +	7.1	14.3	5.5

SOURCE: IPEA, "Aspectos Demográficos da População Economicamente Ativa." Data taken from U. N., Demographic Aspects of Manpower.

(1) Note also that the distribution for these age classes is more sharply peaked in the industrial countries. A higher proportion of the women in ages 15-24 are in the labor force, presumably because of greater employment opportunities for women in industry, office work, and other services. In the agricultural countries about 30 percent of women in all ages from 15 to 54 are in the labor force. The proportion of young girls and older women in the labor force is much lower in the industrialized countries primarily because urbanization and higher per-capita incomes permit more schooling on the one hand and more retirements from the labor force on the other.

falls off more rapidly in the higher age groups in Brazil, indicating that in 1950 there was very little participation of married women in the Brazilian labor force. The tendency that has appeared in the United States for women to reenter the labor force when their children reach school age seems not to have become common in Brazil. The female LFR's for ages 20 and above increased sharply between 1950 and 1960 but remained still well below the range in Table 6.

The male LFR for Brazil in 1950 was much closer to the range shown in Table 5 and thus the lower LFR in Brazil is not attributable to this factor. This is confirmed by Table 7 where the same comparison is made for males as was made for females in Table 6. The male LFRs by age groups were all within the range shown and were even above the range for ages 10-24. (1)

As was stated above the LFR for Brazil has fallen by about two percentage points since 1940. Since the LFR was already low in comparison with those of other countries, including South American countries, it would seem to be somewhat surprising that

(1) Table 7 shows that the difference between agricultural and industrial countries is similar for males and females at the upper and lower ages (higher participation rates in agricultural countries) but for males the rates are almost identical within the primary working ages. With the transformation from an agricultural to an industrial economy the overall male LFR could either rise or fall since there would be forces operating in each direction. With development the LFR should fall because more people live to retirement age (falling death rate) and the retirement rate for this group should rise with higher per-capita incomes, more social security programs, etc. The rate should also fall because of lower participation by young men (more schooling). The LFR should rise due to greater longevity (more men live through a full working life) and a resulting increase in the ratio of the working to non-working population (the combination of lower death and birth rates reduces the share of the pre-working age group in the population by more than the increase in the share of the post-working group.) Finally, the income and substitution effects of higher per-capita incomes could cause men to either enter or withdraw from the labor force. However, Table 7 indicates that this is not an important effect; men who are in the primary working ages are in the labor force in the same proportions whatever the level of per-capita income. (The hypothesis generally advanced about the income and substitution effects in the labor market is that workers tend to offer less hours of work as real incomes rise, not that some individuals withdraw entirely from the labor force.) The net effect of the other factors mentioned above is probably to increase the overall male LFR; the rates for North America and Europe are above those for Africa, Asia, South America and Central America in Table 5.

TABLE 7

AVERAGE MALE LABOR FORCE PARTICIPATION RATES BY AGE FOR
INDUSTRIALIZED AND AGRICULTURAL COUNTRIES AND FOR BRAZIL - 1950

AGES	INDUSTRIALIZED	AGRICULTURAL	BRAZIL
10-14	4,1	23,9	30,8
15-19	72,4	78,4	80,7
20-24	91,5	91,2	93,8
25-34	96,7	96,3	97,4
35-44	97,5	97,5	97,1
45-54	95,9	96,3	94,8
55-64	85,6	91,6	88,4
65 +	31,7	70,1	66,0

SOURCE: EPEA, "Aspectos Demográficos da População Economicamente Ativa" p. 18. Data taken from U.N. Demographic Aspects of Man-POWER

the rate is falling rather than rising. This decline could be due either to increased importance of the non-working age group over this period or to reduced participation of males or females or both in the working ages. Table 8 shows that both reduced participation and reduced relative importance of the working age population have occurred since 1940; the 0-9 population has grown more rapidly and the 10 and over population less rapidly than the total population, with the differences magnified since 1950, while the economically active population has grown less rapidly and the inactive population more rapidly than the population 10 and over. Each of these trends is discussed in detail in the sections which follow.

TABLE 8

ANNUAL RATES OF GROWTH OF BRAZILIAN POPULATION

	1940-50	1950-60	1940-60
Population 0-9	2,40	3,28	2,84
Population 10 and over	2,38	2,86	2,62
Inactive	2,63	2,95	2,79
Economically active	2,07	2,79	2,43
Total population	2,38	3,00	2,69

3a. Age composition of the population and labor force. (1)

I will deal first with the effects on the participation rate over time of changes in the share of the 0-9 age group in the total population. Since 1940 this group increased its share in the total population from 29.6 percent to 30.5 percent, as was shown in Table 4. The effects of this change on the LFR have been calculated in Table 9. The adjusted LFR, shown in the next to the last column of the Table, is that which would have been found if the share of the 0-9 population in 1940 had been maintained in 1950 but with the same LFR within the 10 and older group, and similarly for 1950 to 1960.

According to the unadjusted census age distribution data the share of the 0-9 group hardly changed from 1940 to 1950 but rose by about one percentage point between 1950 and 1960. Thus the change in the share of this group can explain virtually none of the

(1) There are numerous errors in the age distribution of the population given in the demographic censuses resulting primarily from the need to estimate the ages of a large segment of the total population. There is considerable bunching of the population at 5 year and 10 year points. A more detailed evaluation of the effects of changes in the age distribution of the population on the LFR should be based on a corrected age distribution. Such adjusted data do exist; a corrected distribution for 1950 appears in Contribuições Para o Estudo da Demografia do Brasil, (IBGE, Conselho Nacional de Estatística), pp. 158-160; and corrected distributions for 1950 and 1960 appear in IBGE, Demografia, op.cit. I did not use these corrected data here for several reasons. First, I wished to discuss trends since 1940 and I do not have presently available a corrected age distribution for that year (although I have seen reference to an article entitled "Les erreurs dans les déclarations d'âge dans les recensements brésiliens de 1940 et de 1950," Prof. G. Mortara, IBGE, 1953.) Second, I do not have adjusted participation rates by ages to accompany the adjusted age distribution. Third, the use of the unadjusted data should not affect trends unless the degree of bias in the reporting of estimated ages were to somehow change from one census to another. Finally, some of the errors are compensated for by the age groupings used; if, for instance, all of those from ages 27 to 33 had given their age as 30 they would still be included in the 25-34 group.

TABLE 9

EFFECT OF CHANGE IN AGE DISTRIBUTION
ON LABOR FORCE PARTICIPATION RATE 1940-1960

YEAR	TOTAL POP. (000)	POP. 0-9 (000)	PERCENT 0-9	LABOR FORCE (000)	LABOR FORCE PER 100 POP.	LABOR FORCE PER 100 POP. 15-64	LABOR FORCE PER 100 POP. 15-64
1940	41,236	12,208	29.6	14,002	34.0	34.0	34.0
1950	51,914	15,423	29.7	17,117	33.0	33.0	33.0
1960	70,119	21,391	30.5	22,651	32.3	32.3	32.3

decline in the participation rate between 1940 and 1960, we can account for about 60 percent of the reduction in the LFR over the 1950 and 1960. If we sum the explained declines over the 1940-1950 we get 0.4/1.7 percentage points or 23.5 percent of the total. Thus about one-fourth of the total fall in the LFR over the twenty-year period is explained by the increased relative weight of the population in the 0-9 age group.

Broadening the definition of the economically inactive population to take account of the possible change in the relative weight of the 10-14 age group would not significantly alter the above explanation. This group actually declined slightly as a share of the population (from 12.93 percent to 12.24 percent). If we assume that this decline would almost exactly offset the effect of the population increase in the participation rate for this group.

The share of the 60 and over group in the total population increased slightly between 1940 and 1960 (from 14.7 percent to 15.7 percent) but this is such a small share of the total population that little of the overall decline in the LFR can be attributed simply to the change in the weight of this group. Since changes in the age distribution of the population can account for only a relatively small share of the fall in the LFR the major causal factor must have been reduced participation rates for most of the primary working age groups. This factor is considered next.

3b. Labor force participation by sex1) Labor force participation by women

The participation of women in the Brazilian labor force has increased during the period under observation, or at least since 1950, as might have been expected in a developing economy. Over the twenty-year period the LFR has declined for the 10-14 age group, which may or may not reflect an increase in the percentage of girls in these ages who attend school, and has risen in all other age groups, no doubt in response to the increased employment opportunities for women in an urbanizing society. (1) These trends are indicated in Table 10.

TABLE 10
PARTICIPATION RATES OF FEMALES IN THE BRAZILIAN LABOR FORCE
1940-1960

AGE	1940	1950	1960
10-14	7.7	8.6	7.1
15-19	17.8	23.5	23.4
20-24	17.5	18.9	22.5
25-34	13.5	12.6	17.8
35-44	10.8	11.0	17.1
45-54	11.1	10.3	15.6
55-64	10.6	8.8	12.6
65 +	8.2	5.5	8.5
TOTAL 10 +	14.0	13.9	16.7
TOTAL POP.	9.9	9.6	11.5

SOURCE: IPEA, "Aspectos Demográficos da População Economicamente Ativa."

While the overall trend of these age-specific participation rates seems reasonable, the direction of change between 1940 and 1950 was in most cases contrary to the trend. Thus the LFR for the 10-14 group rose between 1940 and 1950 and then fell in 1950-60. In the six age groupings for the population 20 and over the LFR's were all higher in 1960 than in 1940 but four of these classes showed

(1) However, as is pointed out later, much of the increase in the female labor force has been in the agricultural sector.

falling LFR's between 1940 and 1950. As a check on the reasonableness of these rates the LFRs in Table 10 were multiplied against the total numbers of women in the corresponding age groups according to the censuses to obtain the implied female labor force in each of the census years. The results of this calculation are compared with the actual census totals for the female labor force in Table 11.

TABLE 11
TOTAL PARTICIPATION OF FEMALES IN THE BRAZILIAN LABOR FORCE

YEAR	ESTIMATED PARTICIPATION (1) (000)	MEASURED PARTICIPATION (2) (000)	PERCENT DEVIATION (3)
1940	1,855	2,042	+ 9.2%
1950	2,410	2,507	+ 3.9
1960	3,984	4,054	+ 1.7

(1) Estimated by applying participation rates from Table 10 to the numbers in age groups from census.

(2) Demographic census.

(3) Measured Participation - Estimated Participation
Measured Participation

This exercise produces reasonably comparable figures for 1950 and 1960 which indicates that at least the age-specific LFR estimates for these years are consistent with the census data for total population and labor force. The deviation is considerably greater in 1940, however, indicating that the estimated age-specific participation rates for that year may be in error. However, the error would seem to lie in the wrong direction. A backward projection of the 1950-60 trend would give lower participation rates in 1940 for all age groups except ages 15-19 and 10-14. Yet the estimated female LFRs for 1940 which would appear to be too high produce a total female labor force which is 9 percent lower than that reported in the demographic census. The estimated LFRs for 1940 are clearly inconsistent and should be revised.

Despite this inconsistency in the data it can be established that female participation has increased since 1940 in the aggregate and that this increase has applied to all age groups except the youngest. If female participation had remained at the 1940-50 level of approximately 14 percent of the 10 and older population, the overall LFR in 1960 would have been only 31.4 percent instead

of 32.3 percent. Since the rise in the female LFR would, in the absence of other forces, have brought about an increase in the total LFR, we must look for a decline in the male participation rate as the major causal factor behind the overall decline.

11) Labor force participation by men

Male age-specific participation rates are shown in Table 12. When these rates are multiplied against the total numbers in the corresponding age groups as was done for women the results are as shown in Table 13. In the case of the male population the participation rates by specific age groups all would appear to be quite consistent with the total male labor force as reported by the demographic censuses.

TABLE 12
PARTICIPATION RATES OF MALES IN THE BRAZILIAN LABOR FORCE
1940-1960

AGE	1940	1950	1960
10-14	30.2	30.8	23.0
15-19	80.0	80.7	72.4
20-24	93.8	93.8	92.3
25-34	98.2	97.4	97.2
35-44	98.2	97.1	96.9
45-54	97.0	94.8	94.0
55-64	92.6	88.4	83.2
65 +	78.5	66.0	59.1
TOTAL 10 +	83.0	80.8	77.3
TOTAL POP.	58.0	56.4	53.1

SOURCE: IPHA, "Aspectos Demográficos da População Economicamente Ativa."

It is quite evident from the data of Table 12 that there has been a perceptible decline in the male participation rate. The decline in the LFR for males 10 and over of 5.7 percentage points is about 7 percent of the rate for the base year 1940. All of

TABLE 13

TOTAL PARTICIPATION OF MALES IN THE BRAZILIAN LABOR FORCE

YEAR	ESTIMATED PARTICIPATION (1) (000)	MEASURED PARTICIPATION (2) (000)	PERCENT DEVIATION (3)
1940	11,716	11,960	+ 2.0%
1950	14,532	14,610	+ 0.5
1960	18,692	18,597	- 0.5

(1) Estimated by applying participation rates from Table 12 to the numbers in age groups from census.

(2) Demographic census.

(3) Measured Participation - Estimated Participation
Measured Participation

the male age group LFRs declined or remained roughly constant from 1940 to 1960. In the primary working age groups (25-54) the largest declines occurred in the first decade with a levelling off in the second, which could indicate that these rates may not fall much lower in the future. The decline in the rates for the younger age groups accelerated between 1950 and 1960, indicating that these rates may decline even further in the future due to increased schooling.

At this time I do not have information which explains these declines in male LFRs. They could reflect withdrawals from the labor force as urban employment opportunities have failed to grow as rapidly as the urban population. (1) Perhaps as a response to the inability of the urban sector to supply employment there has been a tendency for women to supply their labor in place of men - domestic servants supporting non-working husbands, etc. However, we do not know how unemployment was actually treated in the censuses although, as previously stated, its inclusion in 1960 only would have caused the participation rate to rise in that year relative to 1950 and 1940. Finally, we cannot know how much confidence to place in trends derived from the preliminary 1960 census information.

The various forces which have produced changes in the LFR since 1940 are summarized in Table 14. Another way of expressing this information would be to say that if the male population 10 and

(1) This seems to have been the case in Colombia in recent years, particularly for males in the younger working ages. See R. L. Slighton, "Urban Unemployment in Colombia: Measurement, Characteristics, and Policy Problems," RAND Corp., Memorandum RM-5393, January 1968.

over LFR of 1940 had applied in 1960 with no other changes the overall LFR would have been 34.3 percent, or two percentage points higher than it actually was. The reduced participation of males 10 and over is therefore capable of explaining all of the reduced participation in the total labor force by itself while the effects of increased participation by women (positive) and the increased share of the population in ages 0-9 cancelled each other out.

TABLE 10

FACTORS CONTRIBUTING TO CHANGE IN BRAZILIAN LABOR FORCE PARTICIPATION RATE 1940-1960

SOURCE	CHANGE IN LFR IN PERCENTAGE POINTS
Increase in 0-9 age group	- 0.4
Increase in female LFR	+ 0.9
Decrease in male LFR	- 2.0
Total (error due to rounding)	- 1.5

4 - Projection of Labor Force to 1970

We can obtain various estimates of the labor force in 1970 depending on the assumptions we make about the changing age distribution and about the participation rates for men and women 10 and over. For example, we can assume⁽¹⁾ that the 0-9 share of the population will fall from 31.1 percent in 1960 to 30.4 percent in 1970 and that the participation rates for men and women over 10 will remain at their 1960 levels. This results in an overall LFR

(1) This assumption is taken from the IPHA demographic sector projection of the population for 1970. See "Projeção da População Brasileira até 1980 por sexo e grupos quinquenais de idade." This projected decline in the birth rate seems unreasonably optimistic in light of past experience. Also the projected decline in the death rate (to 9.9 per thousand in 1965-70) seems extreme. If the same 1960-70 population growth were obtained with higher birth and death rates the share of the 0-9 population in 1970 would be larger than projected and the LFR therefore slightly smaller. However, the 1970 labor force estimates would not be substantially affected by these marginal adjustments in birth and death rates.

of 32.5 percent and a total labor force of 30.350 million. Other labor force estimates can be obtained from the following assumptions (in each case the above assumption about the share of the 0-9 population is held):

Male participation continues to decline at 1950-60 trend rate, female participation continues to rise at 1950-60 trend rate: 1970 LFR = 32.6 percent, 1970 labor force = 30.420 million.

Male participation remains at 1960 level, female participation continues to rise at 1950-60 trend rate: 1970 LFR = 33.7 percent, 1970 labor force = 31.490 million.

Each of these projections shows the LFR rising above the 1960 level, i.e., the labor force growing at a slightly higher rate than the population between 1960 and 1970. The rate of labor force growth would be between 2.97 and 3.35 percent per annum compared with a population growth rate estimated to be 2.89 percent. Assumption three, which gives the largest estimated labor force for 1970, is perhaps the most realistic since the female LFR has been shown to be quite low and there is good reason to expect it to rise with development, while there is no basis for expecting the male 10 and over LFR to fall further.

In summary, the projections show a total labor force which lies approximately between 30.5 and 31.5 million and which is approximately 20 percent female and 80 percent male. If the implied rates of growth of the labor force were constant over the decade the 1967 labor force would have been between 27.8 and 28.5 million. The growth of the labor force between 1967 and 1970 would be between 2.550 and 2.975 millions.

5 - Labor force participation by sectors of the economy

The distribution of the PEA by sex and by major sectors of the economy is shown in Table 15. As can be seen, Brazil still has the majority of its PEA in agriculture, (1) but the economy is transforming from agriculture to non-agriculture. This is more clearly brought out in Table 16 where the figures from Table 15 are presented as percentages of the total PEA for each year. Agriculture has declined steadily as a share of the PEA over the period 1940-60 although the population employed in agriculture grew, in

TABLE 15

DISTRIBUTION OF THE ECONOMICALLY ACTIVE POPULATION OF BRAZIL BY SEX AND BY SECTOR OF ACTIVITY IN 1940, 1950, AND 1960 (In Thousands)

SECTOR	1940 (4)			1950			1960		
	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE
Primary (1)	8,968	8,415	553	10,254	9,496	758	12,163	10,946	1,217
Secondary (2)	1,414	1,117	297	2,347	1,955	392	2,963	2,452	511
Tertiary (3)	3,620	2,428	1,192	4,516	3,159	1,357	7,525	5,119	2,325
TOTAL	14,002	11,960	2,042	17,117	14,610	2,507	22,651	18,597	4,054

SOURCE: Censo Demográfico of 1940, 1950; Censo Demográfico Preliminar, 1960

- (1) Includes agriculture, forestry, fishing and vegetable extraction
- (2) Includes mining, manufacturing, construction and production and distribution of gas and electricity
- (3) Includes commerce, transportation and communication, finance, services, professions and government
- (4) The data in the 1940 census are regrouped to conform to the definitions employed in 1950 and 1960. The adjustments are described in "Aspectos Demográficos da População Economicamente Ativa", p.5.

(1) The word agriculture will be substituted here for the words "primary sector" since less than 4 percent of those economically active in the primary sector are engaged in other activities such as fishing, lumbering, and vegetable extractive industries.

absolute numbers, by some 3.2 million workers. It is interesting, in this connection, to compare this pattern of change for Brazil with that of the United States exactly 100 years before. In the United States the primary sector's share of the PEA declined from 63.5 percent in 1840 to 53.2 percent in 1860, levels almost identical to those of Brazil in 1940 and 1960. (1)

TABLE 16
PERCENTAGE DISTRIBUTION OF THE ECONOMICALLY ACTIVE
POPULATION OF BRAZIL BY SEX AND BY SECTOR
OF ACTIVITY IN 1940, 1950, AND 1960

SECTOR	1940			1950			1960		
	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE
Primary	64.1	70.4	27.1	59.9	65.0	30.2	53.7	58.9	30.0
Secondary	10.1	9.3	14.5	13.7	13.4	15.6	13.1	13.2	12.6
Tertiary	25.8	20.3	58.4	26.4	21.6	54.1	33.2	27.9	57.4

The transformation of the structure of the Brazilian labor force between these dates did not exactly fit the Colin Clark thesis relating to the initial development of primary activities followed in time by expansion of the secondary sector and later by the rise in the relative importance of the tertiary sector since the expansion of the tertiary

(1) While the share of the population in the United States which was engaged in agriculture was declining rapidly in the first half of the 19th century the rate of decline slowed after 1860 so that the primary sector still employed 51.5 percent of the labor force in 1880. This may appear surprising since the 1860-1880 period was one of rapid industrialization in the United States. It is not my intention to argue that Brazil will continue to follow this pattern over the next 20 years or more, but such could be the case since many people are arguing that the only solution to the employment problem in Brazil lies in the absorption of more of the labor force in agriculture, principally through the opening of new lands (exactly as was done in the United States in 1860-1880.)

sector in this period far exceeded that of the secondary. (1) It is

(1) The applicability of the Clark thesis has been questioned on at least two grounds. First, it has been argued that while a very low income country may have no secondary sector it does have a sizeable tertiary sector. It is incorrect to say that almost of the active population is entirely engaged in agriculture because these economies have a large number of traders, domestic and personal servants, religious and government officials, etc. Economic development of such a society does result in a transfer of the labor force from agriculture to industry and, subsequently, the rise of a wide range of new services for which the income elasticity of demand is high - the services of teachers, beauticians, airline stewardesses, etc. At the same time, however, the traditional services associated with low income are declining in importance. Thus it is incorrect to maintain that the tertiary sector grows from a negligible base and also that the final stage of development is an across-the-board expansion of the tertiary sector. A second criticism stresses the simultaneous development of the secondary and tertiary sectors, emphasizing services as intermediate goods rather than as final consumption goods. The tertiary sector grows concurrently with the secondary because industrialization creates a demand for transportation and communications, financial institutions, wholesale and retail trade, etc. It has been further argued that in the modern world industrialization itself will absorb little labor directly because the developing nations, for a variety of reasons, are adopting the capital-intensive technology of the developed nations; therefore the developing nations must look to the tertiary sector to absorb the labor being released from agriculture. Each of these arguments has validity but each must be further qualified. In the first place, the labor force statistics of most pre-industrial countries today (and those of the developed economies for 150 years ago) are seldom accurate enough to permit careful measurement of the changing sectoral distribution of the labor force over a long time span so that these broad trends can only be estimated at best. Second, the division of labor is less distinct in lower-income economies and thus it is difficult to assign each member of the labor force to a specific sector. For instance, while it may be true that, for a given pre-industrial economy, some 40 percent, say, of total work effort is devoted to tertiary activities and 60 percent to primary activities, this does not mean that 60 percent of the workers are exclusively farmers while the remaining 40 percent are exclusively traders, shopkeepers, and servants. Perhaps 90 percent of the labor force is engaged in agriculture as the principal activity but many of these same people devote a part of their time to the transport of goods, trading, moneylending, etc. For this reason a division of the labor force which assigns each worker to the sector of his principal activity only will not reflect the true sectoral distribution of labor. Third, it has been argued that the simultaneous expansion of the secondary and tertiary sectors in the presently developing economies, the latter usually at a much higher rate in terms of employment, is not simply the outcome of a derived demand relationship wherein each new industrial job creates a demand for two or three new service employees as Galenson has hypothesized. Instead the observed expansion of tertiary employment is in some part a spill-over effect. The rising urban population consists of people who are pushed out of agriculture rather than pulled to the cities by the promise of industrial jobs and when this population cannot find industrial employment it spills over into the tertiary sector, crowding the streets with more and more vendors, shoe-shine boys, etc. This movement represents merely a transfer of disguised unemployment or underemployment from agriculture to the service sector - transformation without development.

clear from Table 15 that the tertiary sector experienced the greatest absolute growth during the period from 1940 to 1960, 3.9 million compared with 3.2 million in agriculture and only 1.5 million in secondary. The rate of growth of the secondary sector was the highest for the entire period, but only .03 higher than tertiary. Rates of growth of the PEA by sector are shown in Table 17. The reversal in the positions of the secondary and tertiary sectors is clearly shown here; in the 1940's industry's labor force grew at a high rate while the PEA in the service sector grew at about the overall rate. In the 1950-60 decade, a period when the rate of growth of total industrial output was higher than in 1940-50, the industrial labor force grew at less than 2.5 percent while the PEA in services grew at over 5 percent. Secondary employment actually declined as a

TABLE 17

ANNUAL AVERAGE GROWTH RATES OF THE ECONOMICALLY ACTIVE
POPULATION OF BRAZIL BY SECTOR OF ACTIVITY

SECTOR	1940-50	1950-60	1940-60
Primary	1.36	1.72	1.53
Secondary	5.19	2.35	3.76
Tertiary	2.23	5.23	3.73
TOTAL	2.07	2.79	2.47

share of the total labor force between 1950 and 1960. It could be argued that this rapid growth of the service sector since 1950 was due in part to the afore-mentioned transfer of underemployment from agriculture to the cities. The urban population was growing at a high rate between 1950 and 1960 (5.5 percent per year if the census definition based on municipios is used, 4.4 percent if only the population in towns of 2,000 and over is considered as urban) and neither industry nor "useful" tertiary activities could absorb this influx so the balance had to be absorbed in low-productivity services.

The distribution of employment by sex in Tables 15 and 16 indicates an interesting trend. While the share of the male PEA in agriculture declined more or less in accordance with the decline in the total agricultural PEA, the share of the female labor force in primary activities seems to have risen, at least between 1940 and 1950. The female share of the total labor force was increasing from 14.6 percent to 17.9 percent between 1940 and 1950; at the same time the

female share of the agricultural PEA rose from 6.2 percent to 10.0 percent and the female share of the other sectors was falling. This could be due to an error in the estimation of the directly remunerated share of the female labor force in agriculture in 1940; however this total would have had to be understated by almost 100,000 if the same percent of the female PEA had actually been in agriculture in 1940 as was the case in 1950 and 1960. If we avoid this question by looking only at the changes in the female labor force since 1950 we still find that the share of the total in agriculture was unchanged, that the share in industry fell by three percentage points, and that the share in services rose by three. It does not appear that the female labor force has been shifting away from primary activities as rapidly as have males. This could be a function of the direction of the industrialization process since 1950 - the more rapid rate of growth of heavy industries than of the traditional industries such as textiles and food processing which offer more employment opportunities for women, of a declining rate of growth of demand for domestic servants, or of changes in products and production processes in agriculture.

It would be useful to examine this sectoral transformation of the Brazilian labor force in greater detail, principally by analyzing the different rates of growth of employment of the various sub-sectors of the economy. I will make only one such comparison here for illustrative purposes - an analysis of the changes in the sub-sectors of the secondary and tertiary sectors between 1950 and 1960. Data on rates of growth of output and labor force for the six principal sub-sectors are shown in Table 18. (These six groups accounted for

TABLE 18

EMPLOYMENT AND OUTPUT OF PRINCIPAL NON-AGRICULTURAL SECTORS
OF THE BRAZILIAN ECONOMY 1950-1960

SECTOR	EMPLOYMENT 1950 (000)	EMPLOYMENT 1960 (000)	RATE OF GROWTH OF EMPLOYMENT 1950-60	RATE OF GROWTH OF REAL OUTPUT 1950-60
Industry	1,608	2,006	2.24	9.21
Construction	585	785	2.98	6.57
Trans. & Comm.	697	1,089	4.57	7.34
Commerce	958	1,520	4.72	6.52
Services	1,673	2,732	5.03	3.06
Government	512	1,579	11.92	2.41

SOURCE: Censos Demográficos and Revista Brasileira de Economia, Mar. 1951.

88 percent of the total labor force in the secondary and tertiary sectors in 1960.) According to these data the labor force outside agriculture, which means essentially the urban labor force, grew by 3.6 million persons between 1950 and 1960, or at an average annual rate of slightly over 4.3 percent. This rate is approximately equal to the lower rate of growth of the urban population for this period referred to earlier. Of this increase some .6 million were absorbed in the secondary sector, almost entirely by manufacturing and civil construction since mining employment, a small fraction of the total, fell during the period, and the remaining 3.0 million were absorbed in tertiary activities. Of this increase in the tertiary labor force more than 2.1 million or 70 percent were absorbed by government or in the provision of personal services.

It could be argued that the Brazilian economy was able to absorb the growth in urban population only by an uneconomic expansion in underemployment in services and by the addition of unneeded functionaries to the government payrolls. It can be seen that rates of growth of employment exceeded the rate of growth of real output in both the government and services sub-sectors and that the implied rates of growth of labor productivity were therefore negative in these sub-sectors. This differential is particularly striking in the case of government; according to these figures employment grew at almost 12 percent per year over the decade and labor productivity declined at an average rate of 8.5 percent per year. In services labor productivity fell by about two percent per year. For the six employment categories shown in Table 18 the rates of growth of employment and real product have an almost perfect inverse relationship - highest rates of growth of product associated with lowest rates of growth of employment and vice-versa. If these rates of growth are ranked from one to six the coefficient of rank correlation which is derived has the value of $-.943$ which is significant at the 99 percent level of confidence. There is no reason for expecting the direct opposite of this result, that is a perfect positive correlation between output and employment growth rates, since the relationship between the rates for different sectors depends on the different sectoral rates of change of capital-labor ratios and different rates of growth of labor productivity due to factors other than capital deepening. However, there would seem to be justification for expecting the correlation not to be so strongly negative; a sector growing at 9 percent should be absorbing labor at a higher rate than one growing at 3 percent.

The reader may at this point be wondering how output in the government sector could be growing at only 2.4 percent during a decade when employment was growing at 11.9 percent. In the conventional national income accounting approach the output of the government is measured as the cost of the government services supplied since there is no market valuation of these services; i.e., the value of government output is equal to the value of wages and salaries paid by the government. Government output measured according to this definition could rise at a lower rate than government employment only if the real wages and salaries of the government employees were falling, in this case by 8.5 percent per year. Fortunately or unfortunately, the answer to this dilemma is a simple one. The Fundação Getúlio Vargas, in developing its indices of real product, uses for the government sector the rate of growth of total government employment from 1940 to 1950 according to the demographic censuses - a rate of 2.4 percent. This rate of growth has been used for the government real product series for every year from 1947 to 1966. For services an arbitrary rate of growth of 3.0 percent for the growth of real product has been adopted for the same span of years.⁽¹⁾ For this reason we cannot derive any firm conclusions from the above comparison of real product growth and labor force growth for these sectors.⁽²⁾

(1) See Revista Brasileira de Economia, March 1962, pp. 36-7.

(2) It is distressing to note that these arbitrary rates of growth have been continued without modifications since 1960 with no adjustment made to take account of the fact that it is now known that government and service employment grew much more rapidly in 1950-60 than in 1940-50. These arbitrary rates of growth of real product used for these sectors obviously have an effect on the rate of growth of total real product. The real product index is calculated as a geometric average of the sectoral indices using as weights the relative percentages of the sectors in net internal product in current cruzeiros for each year. (See Ibid., p. 37.) The weight of the government sector was generally between 7 and 8 percent between 1950 and 1960 and that of services around 15 percent. If the total product index is recalculated using a rate of growth of government product of 11.9 percent instead of 2.4 percent for the 1950-60 period the recalculated index value of total product in 1960 is 197.3 instead of 184.0 (1949 = 100) and the average rate of growth of the economy for 1949-60 rises from 5.7 percent per year to 6.4 percent.

The derivation of such an employment series from two benchmark estimates of total labor force (assuming once again that the 1950 census reported total labor force - if it did not this entire analysis becomes meaningless) would be valid only if 1950 and 1960 were both years of full employment equilibrium. However, the weaker assumption could be held that the unemployment rate was the same in 1950 and 1960; then the greater absolute growth in the "employment" series than in the labor force series in any given year would represent a reduction in the unemployment rate from the previous year and vice-versa. If neither of these assumptions can be maintained it could still be argued that years when the employment series lagged behind the labor force series were probably years when the absolute level of unemployment increased and years when the gap narrowed or became positive were years when the absolute level of unemployment fell. For example, the employment series fell behind the labor force series by about 300,000 in 1953 when real gross product grew by only 3.2 percent, and again by 300,000 in 1956 when real product growth was 1.9 percent.⁽¹⁾ The Table also shows aggregate employment rising above the trend value of total supply in years of high growth such as 1955 (6.8 percent) and 1959 (7.3 percent).

This aggregate employment series can be extrapolated forward from 1960 in the same manner in which it was interpolated for 1950-60, that is by relating the rates of growth of the sectoral employment series to the sectoral real product indices. In Table 20 the total employment series which was calculated in this manner is compared with two labor force series, one a projection of the 1960 labor force at an annual rate of growth of 2.97 percent and the other a projection at 3.35 percent.⁽²⁾ For each of the sectors the same employment/output relationship was hypothesized as was derived from the 1950 and 1960 benchmark data. The values of the elasticity coefficient are: agriculture = 0.39; industry = 0.26; services = 1.12. The use of the three sectoral real product indices is a compromise between a single functional relationship for total labor force and total real product on the one hand and a greater number of functions for

(1) The employment series did not actually lag behind the labor force series by 400,000 in 1951 as Table 19 seems to indicate. For 1951 and all subsequent years I have given the implied labor force for the month of September, the month in which the 1960 census was taken, so that the implied growth in the labor force between 1950 and 1951 is for the 14 month period of July 1950 to September 1951. The implied labor force for July 1950 would have been 17,595,000 which means that the gap was on the order of 300,000. The problem of the non-concurrence of the 1950 and 1960 census dates is not recognized in the Plano Trienal employment series.

(2) See section 4 for the derivation of these rates of growth.

TABLE 20

ESTIMATED LABOR FORCE AND EMPLOYMENT1960 - 1966

YEAR	LABOR FORCE (000)		EMPLOYMENT (000)
	GROWTH 2.97%	GROWTH 3.35%	
1960	22,651	22,651	22,600
1961	23,324	23,410	23,500
1962	24,016	24,194	24,300
1963	24,730	25,001	24,700
1964	25,464	25,839	25,100
1965	26,221	26,705	26,100
1966	27,000	27,600	26,500

many more sub-sectors on the other. The aggregate employment/output relationship is unsatisfactory because it overlooks the fact that the year to year rates of growth for the sectors can differ widely from one another while the sectoral elasticities of employment to output are quite different. In other words it makes considerable difference from the employment standpoint whether 5 percent growth in the economy was the result of 8 percent growth in industry and 2 percent in agriculture or vice-versa. More detailed analysis is not possible because of the very fragmentary nature of the output and employment data for many sub-sectors. Such data are available only for manufacturing for years other than 1950 and 1960, and here the output and employment series for individual industries do not always show consistent year to year movements. It has already been mentioned that the arbitrary nature of some of the real product indices for the tertiary sub-sectors does not permit meaningful comparisons of output and employment for these activities. Admittedly, the aggregation of these tertiary indices into a single index for the sector is not certain to improve matters, but it can be hoped that at least some of the biases operate in opposite directions.

Table 20 shows employment growing faster than the labor force in 1961 and 1962 (i.e., the unemployment rate falling), then employment increasing by only half as much as the labor force in 1963 and 1964 - 400,000 vs. 7-800,000 in each of these two years. According

to the table employment recovered in 1965, increasing by one million in that year, but the gap widened again in 1966 when employment increased by only 400,000 jobs.

These results themselves provide a basis for introducing a fundamental criticism of this approach to measuring total employment. We should question seriously whether the relationships between output and employment which have been hypothesized for each sector have relevance for the year to year employment changes in the primary and tertiary sectors. In agriculture, where total output is in part a function of climatic conditions and where a majority of the employed population consists of members of family units that live on the land, it would seem unlikely that annual changes in employment bear a fixed relationship to annual changes in total product. If total agricultural output rises by an amount significantly greater than the trend rate in any given year this is likely to be due largely to favorable weather and it does not imply that there has been a correspondingly greater than average increase in agricultural employment in that same year. Also, when there is a poor harvest this may cause some acceleration in the rate of rural to urban migration but it would be unrealistic to assume that a decline in the production index always produces an actual decline in agricultural employment. Similarly, much has been made in this paper of the point that the tertiary sector in Brazil functions in part as a residual from the employment standpoint; it absorbs automatically any surplus of urban labor force growth over urban secondary employment growth. Given this role of the tertiary sector and given the fact that the tertiary production index has considerably less empirical relevance than those for agriculture and industry it is doubtful that the tertiary employment series has much meaning.

These points can be illustrated by referring back to the numbers in Table 20. From these data it would appear that 1965 was a year of strong recovery in employment, yet this was actually a recession year when gross product grew by less than 4 percent and industrial production fell by 4.7 percent. The explanation is that agricultural production rose by 13.8 percent and, according to equation (1), agricultural employment should have risen by 5.4 percent. Since the agricultural labor force is four times as large as the industrial the net effect which was produced was a large increase in total employment. It seems more likely that agriculture did not really reabsorb a part of the urban population in that year and that the

total amount of unemployment in the economy rose rather than fell. Table 20 shows 1966 to have been a year of low employment growth for exactly the opposite reason; the growth of industrial output of almost 12 percent is outweighed in the function by the 2 percent decline in agricultural output. The results are not quite so unreasonable for 1961 and 1962 since these were years of higher than average growth for all three sectors of the economy. In conclusion, it is clear that the development of an aggregate employment function must await the availability of better information about both rural and urban unemployment and underemployment and also the creation of more meaningful indices of real product for the tertiary sector.

