

Working Force Participation and Economic Development

Introduction

IT is generally found that working force participation rates are lower in economically developed nations than in the less developed or developing ones (Sadie, 1965 : 18). Low participation rates in developed economies result mainly from reductions in participation at the extremes of the working life span rather than in the middle. Development is accompanied by an increasing degree of monetization of the economy. Minimum age legislation barring entry of children into labour force, and laws relating to compulsory education become more strictly enforceable as economy gets monetized. This tends to lower participation rates at the younger age groups. Reductions in participation rates at the 'older age groups are usually ascribed to urbanization, diminishing importance of agriculture as a field of employment, a decrease in self employment, technical progress, and increasing scope and coverage of old age pensions—all concomitants of economic development.

Data

In this presentation an attempt is made to test the validity of this premise, that participation rate tends to diminish with economic development, by using the information available in the 1951 and 1961 Census of India publications. Since the paucity of data does not permit examination of the participation rate by age, the study is restricted to the overall participation rates of males and females. There remain, however, two major difficulties: (i) the defini-

tion of the areal units and (ii) inter-censal changes in the concepts and definitions used for the collection of economic data.

With regard to the first difficulty, district is the smallest unit for which data are available for 1951 and 1961. Numerous and extensive boundary changes that took place during the period render direct comparison impracticable. This created the need to realign the data for the present purpose.

In this connection two considerations were given importance : (i) the units should have the same boundaries in 1951 and 1961, and (ii) the total number of units should be as large as possible. The second has been given more importance on theoretical grounds¹ and so the first consideration was relaxed to a limited degree to increase the number of units. Accordingly, we have increased the number of units to 267 from 183 which had not changed between the two censuses.²

About the second problem, 1951 census adopted the gainful worker approach while the 1961 census had adopted a composite approach in collecting economic data. According to the tripartite classification scheme used in 1951 the total population was divided into 'self-supporters', 'earning dependants' and 'non-earning dependants.' "All persons who earned a regular income (in cash or kind) were either self-supporting persons or earning dependants, the distinction between the two being based on the adequacy of income for self maintenance or otherwise" (Sinha, 1971 : 1527). All those who do not have a regular income were classified as non-earning dependants. In 1961 persons were classified into 'workers' and 'non-workers', the basis of classification

1. Theoretically the most meaningful units of analysis for any study of population distribution seem to be the geographical areas each of which encompasses a population that is characteristically an independent whole with respect to day-to-day activities in the collection life process.

2. The criterion adopted in defining the areal units is the following : Let U be the unit (district or district combination) defined in terms of 1961 census district and U^* be the 1951 district or district combination taken as comparable for our purpose, to U . Let P be the 1951 (estimated) population of U reported in Census of India, Paper No. 1 of 1962, and P^* be the 1951 population of U^* obtained from 1961 census reports for the constituent districts.

The degree of non-comparability was obtained from the proportion $\frac{|P - P^*|}{P^*} \times 100$. If the value was below 10.00, an arbitrarily chosen value, U and U^* are taken as comparable for the purposes of study.

being the pursuit of some "productive work". Thus the two major changes are : in 1961 the basis of classification has been changed from regular income to regular work, and the usual status has been replaced by status during a specified reference period. The major difference in the conceptual framework of 1951 and that of 1961 arises in the treatment of non-working earners and non-earning workers or unpaid family workers. To overcome this difficulty we have followed the procedure suggested by Kalra (1962). Accordingly, all non-earning dependants and all "actual workers" pursuing unproductive occupations³ were excluded from the 1951 population to obtain 1951 economically active population comparable to that in 1961.

Indices of Economic Development

Many writers have noted that as an extremely rural society changes to urbanized one consistent variation occurs in such characteristics as occupational structure, ratio of secondary to primary contacts, functional interdependence etc. (Hatt and Reiss, 1963 : 20). The scope of interdependence increases as the society moves farther and farther away from the folk type. This increased interdependence gets reflected in emergence of a nodal center in the organization of society. As Hawley suggests, "The growth of the centre is a measure, though a crude one, of the complexity and scope of the division of labour" (1950 : 241). The centre here refers to the built up area of the central city variously referred to as the city hub or the central business district. As the complexity of the division of labour increases the centre becomes more and more specialized in service functions, activities concerned with integration of interrelationship between communities and with providing numerous supplemental services to the population, passing through the centre (Hawley, 1950 : 241). On this reasoning, we take the size of principal city as an index of economic development. The size of principal city in the present analysis is taken to be the 1961 population of the largest (largest in terms of 1961 population size) city in the unit.

The centres concerned with integration of interrelationships calls for increasing concentration of population in non-agricultural pursuits. According to Wilkinson, "an urban industrial system is any system in which individual

3. For a detailed description of the "actual workers" pursuing unproductive occupation, see B. R. Kalra, "A Note on Working Force Estimates, 1901-61", in Census of India, Paper No. 1 of 1962, Appendix I, p. 389.

subsistence production is absent or at a minimum" (1965 : 3). We, therefore, take as another index of economic development the proportion of work force engaged in primary industries, namely those working as cultivators and agricultural labourers, and in mining, quarrying, livestock, forestry, fishing, hunting and plantations etc. or workers falling under industrial classes I, II and III in the 1961 classification.

As a corollary of the above proposition, the proportion of the work force in non-extractive industries would be greater in urban industrial set up than in an agrarian one. This, together with the assumption that urbanization and industrialization go together, indicate the urban component of the population as a third index of economic development. The proportion of the 1951 population of a unit living in urban places formed the "urban component" or "proportion urban" of that unit.

Each variable was divided into two broad classes, viz., large and small, the breaking point being the all-India value of the characteristic in question. The breaking point for the size of principal city was the average of all principal cities of the 267 areal units.

Analysis

Participation rates (workers as percent of total population) was calculated by sex for 1951 and 1961, from which the mean participation rate was calculated for the subclasses of the indices chosen for the study.

In a developing economy like India, the expected direction of relationship between participation rate and farm component is positive, while that of participation rate and the size of principal city and urban component is negative. The findings of this study, presented in Table 1 confirm this expectation. Participation rates are associated negatively with size of principal city and with the urban component and positively with the proportion of work force engaged in extractive industries.

Obviously, the three classifications represented in Table 1 are not independent of each other. For ascertaining how far each of the three classifications account for the variance in participation rate when the effects of other factors

are eliminated, we attempt analysis of variance of participation rate using a 2ⁿ factorial design described by Keyfitz (1963).

TABLE 1—MEAN PARTICIPATION BY SEX IN DIFFERENT SUBCLASSES OF AREAL UNITS

<i>Mean participation rate</i>						
<i>Variable</i>	<i>Class</i>	<i>No. of cases</i>	<i>1951</i>		<i>1961</i>	
			<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>
<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>	<i>(5)</i>	<i>(6)</i>	<i>(7)</i>
Size of principal city	Large	73	53.78	19.33	56.24	23.28
	Small	194	55.73	28.50	58.11	32.12
Farm component	Large	171	56.43	30.55	58.43	34.04
	Small	96	53.00	17.86	56.12	21.97
Urban component	Large	93	54.32	20.27	55.95	23.43
	Small	174	55.67	29.05	58.48	33.06

NOTE : M = Male F = Female

The mean participation rates are given in Table 2 for males in 1951 using the three way classification: size of principal city, by farm component, and by proportion of population living in urban places.

TABLE 2—MEAN PARTICIPATION RATE FOR MALES FOR 1951 (FIGURES IN BRACKETS INDICATE THE NUMBER OF OBSERVATIONS)

<i>Urban component</i>	<i>Size of principal city</i>			
	<i>Large</i>		<i>Small</i>	
	<i>Farm component</i>		<i>Farm component</i>	
	<i>Large</i>	<i>Small</i>	<i>Large</i>	<i>Small</i>
Large Small	52.87(10)	54.65(46)	57.09(15)	52.48(22)
	52.84(11)	50.34(6)	56.92(135)	50.80(22)

Table 2 gives four comparisons concerning the effect of each factor keeping constant the levels of the other two. An illustration of how the comparisons are obtained is given below. For easy reference we shall designate the factors by letters: thus let *A* stand for size of principal city, *B* for farm component, and *C* for urban component. Suppose we are interested in the levels of *A* when the levels of *B* and *C* are fixed. The following are the possible four comparisons.

<i>Comparisons</i>	<i>Level of B fixed</i>	<i>Level of C fixed</i>	<i>Levels of A compared</i>
1	Large	Large	Large vs. Small
2	Large	Small	Large vs. Small
3	Small	Large	Large vs. Small
4	Small	Small	Large vs. Small

Comparison 1 tells about the effect of *A* on participation rate as the level of *A* changes from "small" to "large" when *B* and *C* are fixed at the level of "large". Similarly comparison 2 gives the effect of *A* when *B* is "large" and *C* is "small", and so on. In this fashion all the comparison (4 each for *A*, *B* and *C*) can be made easily from Table 2. The results of such comparisons are summarised in Table 6 in which also are shown similar results concerning participation rate for females (1951 and 1961) and for males (1961). The basic figures corresponding to these latter three cases are shown in Tables 3-5.

TABLE 3—MEAN PARTICIPATION RATE FOR FEMALES FOR 1951
(FIGURES IN BRACKETS INDICATE THE NUMBER OF OBSERVATIONS)

<i>Urban component</i>	<i>Size of principal city</i>			
	<i>Large</i>		<i>Small</i>	
	<i>Farm component</i>		<i>farm component</i>	
	<i>Large</i>	<i>Small</i>	<i>Large</i>	<i>Small</i>
Large Small	25.09(10) 27.52(11)	16.43(46) 17.04(6)	29.95(15) 31.27(135)	19.52(22) 19.43(22)

TABLE 4—MEAN PARTICIPATION RATE FOR MALES FOR 1961
(FIGURES IN BRACKETS INDICATE THE NUMBER OF OBSERVATIONS)

<i>Urban component</i>	<i>Size of principal city</i>			
	<i>Large</i>		<i>Small</i>	
	<i>Farm component</i>		<i>Farm component</i>	
	<i>Large</i>	<i>Small</i>	<i>Large</i>	<i>Small</i>
Large Small	56.13(10) 58.63(11)	56.06(46) 53.12(6)	56.25(15) 58.82(135)	55.44(22) 57.74(22)

TABLE 5—MEAN PARTICIPATION RATE FOR FEMALES FOR 1961
(FIGURES IN BRACKETS INDICATE THE NUMBER OF
OBSERVATIONS)

<i>Urban component</i>	<i>Size of principal city</i>			
	<i>Large</i>		<i>Small</i>	
	<i>Farm component</i>		<i>Farm component</i>	
	<i>Large</i>	<i>Small</i>	<i>Large</i>	<i>Small</i>
Large Small	30.87(10)	18.47(46)	33.01(15)	23.87(22)
	36.94(11)	20.63(6)	34.16(135)	27.77(22)

As can be seen from Table 6, majority of the comparisons are in the expected direction. Notable exception is that of 1951 males showing no comparison in the expected direction concerning the effect of the proportion urban. Since comparisons are not all mutually consistent, we fall back upon an easy method shown by Keyfitz/ in order to derive an estimate of the overall effect of any factor when other factors are controlled. Suppose we want to estimate the effect on participation rate (1951, males) of size of principal city when farm component and proportion urban are fixed. In order to estimate the effect of *A* on participation rate the comparisons are listed as shown in Table 7 (Col. 4 and Col. 6). The difference between

TABLE 6—SUMMARY OF FINDINGS IN TABLES 2-5

<i>Variable</i>	<i>Expected direction of relationship</i>	<i>Number of comparisons in the expected direction out of the possible four comparisons</i>			
		<i>1951</i>		<i>19.61</i>	
		<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>
Size of principal city	—	3	4	3	3
Farm component	+	3	4	4	4
Urban component	—	0	3	3	4

NOTE: *M* = Males *F* = Females

Col. 4 and Col. 6 shown in Col. 8 gives the “effect” of factor *A* on participation rate. We have four such estimates, one from each of the four comparisons. What is needed is a mechanism to derive a weighted average of the four estimates. According to Keyfitz, the best method of weighting is with the ratio $\frac{(n_1)}{n_1 + n_2} \frac{(n_2)}{n_1 + n_2}$ when n_1 and n_2 are the numbers observations shown in

TABLE 7-ESTIMATION OF "MAIN EFFECTS" ILLUSTRATED

Comparisons (z)	Level of B fixed	Level of C fixed	Levels of A Compared				$u_i =$ $x_{i1} - x_{i2}$	Ni =		Ni Ui
			J=1		J=2			(n _{i1})	(n _{i2})	
			x_{i1}	n_{i1}	x_{i2}	n_{i2}		$n_{i1} + n_{i2}$		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
1	Small	Small	Large	54.65	46	52.48	22	2.17	14.88	32.2896
2	Large	Small	Small	50.34	6	50.80	22	-0.46	4.71	-2.1666
3	Large	Large	Large	52.87	10	57.09	15	-4.22	6.00	-25.3200
4		Small	Small	52.84	11	56.92	135	-4.08	10.17	-41.4936
Total									35.17	-36.6906

NOTE : A = Size of principal city; B = Farm component; C = Urban component.

Col. 5 and Col. 7. Thus the first figure in Col. 8 (i.e., 2.17) is to be weighted by $(46 \times 22)/(46+22)$ the second figure (i.e., -0.46) by $(6 \times 22)/(6+22)$ and so on. The weights are shown in Col. 9 of Table 7.

The weighted average is obtained by taking the algebraic sum of the products of Col. 8 and Col. 9 divided by the sum of the weights in Col. 9. In this particular case the weighted average becomes $\frac{-36.6906}{35.75} = -1.02$. This

means that on the average the change of factor *A* from "large" to "small" produces an increase in the participation rate of the magnitude of one percentage point, when the effect of the other factors on participation rate are eliminated. Is this effect statistically significant? In order to test this, the mean error sum of squares is calculated by subtracting the subclass sum of squares⁴ from total sum of squares⁵ and dividing the difference by the appropriate degrees of freedom (see Table 8). According to the principle of analysis of variance $\frac{(-36.6906)^2}{(35.76 \times \text{Mean error sum of squares})}$ is an *F* with (1, *n*) degrees of freedom where *n* stands for the degrees of freedom of the error sum of squares (= total number of observations minus total number of non-empty cells). In this fashion the "effect" due to factors *B* and *C* are also tested.

The above testing procedure is meaningful only if the interaction between the factors are not significant. With three factors, *A*, *B* and *C*, there are four interactions to be tested: *AB*, *AC*, *BC*, and *ABC*. From Table 7 we find that 2.17 gives the effect of factor *A* when the levels fixed for *C* is "large" and that -0.46 gives the effect of factor *A* when the level for *C* is "small". The fact that these estimates are different constitutes interaction; the "effect" due to interaction between *A* and *C* is estimated by differencing the two figures just mentioned, that is taking $2.17 - (-0.46) = 2.63$. Another figure can be similarly obtained by differencing the last two figures in Col. 8 of Table 7, that is, $(-4.22) - (-4.08) = -0.14$. Since there are two such estimates,

4. Subclass sum of squares was obtained by using the following formula :

$$\text{Subclass } SS = \sum_{\text{Cell}} \frac{(\text{Cell total})^2}{\text{number of observations of the cell}}$$

where summation is over the different cells (8 in number in the present case).

5. Total sum of squares was obtained by summing the squares of all individual observations.

the question of finding a weighted average of the two arises. The weights to be used are obtained by taking the reciprocal of the sum of the reciprocals of the number of observations involved in each difference. Thus the weight for 2.63 is

$$1/\left[\frac{1}{46} + \frac{1}{22} + \frac{1}{6} + \frac{1}{22}\right], \text{ or } \frac{8349}{2332},$$

and for -0.14 is

$$1/\left[\frac{1}{10} + \frac{1}{15} + \frac{1}{11} + \frac{1}{135}\right], \text{ or } \frac{8910}{2361}.$$

The F for testing interaction is obtained as :

$$\frac{\left[\left\{2.63 \times \frac{8349}{2332}\right\} + \left\{-0.14 \times \frac{8910}{2361}\right\}\right]^2}{\left[\frac{8349}{2332} + \frac{8910}{2361}\right] \times \text{Mean error sum of squares}}$$

Similarly the other interactions have been tested. The results are presented in analysis of variance Table 8. Tables 9, 10 and 11 respectively show the results of analysis of variance of participation rates of females 1951, males 1961 and females 1961.

Conclusions

A general finding from the above analysis of variance is that the proportion of work force engaged in extractive industries (farm component) is by and large the only factor, among the three factors examined, significantly related to participation rate. When the farm component is taken into account the influence of other factors is reduced to insignificance. As the farm component increases participation rate also increases significantly.

The estimated effects of farm component on the male and female participation rate for 1951 and 1961 are shown in Table 12. The effect is much more pronounced among females than among males. What is important to note, as far as our objective is concerned, is that all the association shown in

TABLE 8-ANALYSIS OF VARIANCE OF 1951 MALE PARTICIPATION RATE

<i>Source of variation</i>	<i>Sum of squares</i>	<i>Degrees of freedom</i>	<i>Mean sum of squares</i>	<i>F</i>
Total	11148.52			
Subclass	1313.63			
Main Effect				
(A) Size of principal city	37.64	1	37.64	
(B) Farm component	578.60	1	578.60	15.24**
(C) Proportion urban	54.80	1	54.80	1.44
Interaction				
(A) (B)	202.71	1	202.71	
(A) (C)	10.74	1	10.74	5.34*
(B) (C)	40.13	1	40.13	
(A) (B) (C)	14.10	1	14.10	1.06
Error	9834.89	259	37.97	

**Significant at 1% level

*Significant at 5% level.

TABLE 9 -ANALYSIS OF VARIANCE OF 1951 FEMALE PARTICIPATION RATE

<i>Source of variation</i>	<i>Sum of squares</i>	<i>Degrees of freedom</i>	<i>Mean sum of squares</i>	<i>F</i>
Total	51830.99			
Subclass	10590.35			
Main effect				
(A) Size of principal city	433.69	1	433.69	2.72
(B) Farm component	4605.00	1	4605.00	28.92**
(C) Proportion urban	4.01	1	4.01	
Interaction				
(A) (B)	19.05	1	19.05	
(A) (C)	6.10	1	6.10	
(B) (C)	18.70	1	18.70	
(A) (B) (C)	0.31	1	0.31	
Error	41240.64	259	259.23	

**Significant at 1% level.

TABLE 10-ANALYSIS OF VARIANCE FOR 1961 MALE PARTICIPATION RATE

<i>Source of variation</i>	<i>Sum of squares</i>	<i>Degrees of freedom</i>	<i>Mean sum of squares</i>	<i>F</i>
Total	4348.76			
Subclass	595.46			
Main effect				
(A) Size of principal city	6.45	1	6.45	
(B) Farm component	61.64	1	61.64	4.25*
(C) Proportion urban	94.22	1	94.22	6.50*
Interaction				
(A) (B)	16.45	1	16.45	1.14
(A) (C)	49.21	1	49.21	3.40
(B) (C)	20.63	1	20.63	1.42
(A) (B) (C)	49.10	1	49.10	3.39
Error	3753.30	259	14.49	

*Significant at 5% level.

TABLE 11 -ANALYSIS OF VARIANCE OF 1961 FEMALE PARTICIPATION RATE

<i>Source of variation</i>	<i>Sum of squares</i>	<i>Degrees of freedom</i>	<i>Mean sum of squares</i>	<i>F</i>
Total	61221.81			
Subclass	10559.06			
Main effect				
(A) Size of principal city	271.58	1	271.58	1.39
(B) Farm component	3382.59	1	3382.59	17.29**
(C) Proportion urban	294.83	1	294.83	1.51
Interaction				
(A) (B)	280.94	1	280.94	1.44
(A) (C)	20.70	1	20.70	
(B) (C)	8.89	1	8.89	
(A) (B) (C)	81.49	1	81.49	
Error	50662.75	259	195.61	

**Significant at 1% level.

TABLE 12—EFFECT OF FARM COMPONENT ON PARTICIPATION RATE
: MALES AND FEMALES FOR 1951 AND 1961

<i>Dependent variable</i>	<i>Effect of increase in farm component on the dependent variable</i>
Male participation rate (1951)	3.81 (increase)
Female participation rate (1951)	10.74 (increase)
Male participation rate (1961)	1.24 (increase)
Female participation rate (1961)	9.20 (increase)

Table 12 are statistically significant and that they are positive in direction.⁶ We take this to mean that the premise advanced earlier (economic development and participation rate are inversely related) remains valid. The predominance of the influence of farm component, however, is what one would expect in economies like India where agrarian base continues to be the major characteristic. Unless there are a number of units with negligible farm component and with different industrial base or other characteristics affecting changes in participation rate, one would not get significant effect on participation rate attributable to factors other than farm component.

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6. Only in one analysis (male participation rate, 1961) the proportion urban showed significant result. The effect of increase in proportion urban on male participation rate in that case was found to decrease participation rate by 1.64, which is consistent with findings involving farm component.

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