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The Impact of Family Size on Savings and Consumption Expenditure of Industrial Workers: A Cross-Sectional Study

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Abstract: The present study investigated and analysed the impact of family size on monthly savings and consumption expenditure of the industrial workers. The results showed that with increasing household size, savings not only dwindled in absolute terms but also in relative terms as witnessed by decreasing saving to income ratios. Conversely, the consumption to income ratios witnessed an increasing pattern, which is indicative of income being diverted away from savings with every addition to the family size. The MANOVA post hoc analyses revealed that the mean monthly savings of each of the higher family size group (more than 3 members) were observed to be significantly lower than the smallest family group (3 members), which is symptomatic of low propensity towards saving in context of the workers with higher family size. Though, the mean monthly consumption expenditure of family size of 4, 5 and 6 members was observed to be significantly higher than that of the largest family group (7 members), however its consumption income ratio was observed to be greater than that of all the lower family size groups. This is logically plausible as the workers having the largest family size were observed to have the lowest mean monthly income, thereby implying the presence of large number of economically inactive members in this group, which resulted in diversion of a large part of their income towards their consumption expenses. The results of the ANOVA regression analysis confirmed that family size has a significant positive impact on the consumption expenditure of the industrial workers. Further, the reduction of savings due to increased burden of the additional family member corroborated the proposed negative effect of family size on savings of the workers.

Keywords: Consumption Expenditure, Industrial Workers, Family Size, Savings

Introduction

Economic development of any nation is contingent upon the saving potential and consumption pattern of its people. While, the channelization of savings in productive investment avenues leads to increased capital formation, the rise in consumption expenditure leads to higher aggregate demand and elevated economic growth of a country (Dwivedi, 2005). Since, industrial workforce are both potent consumers and prospective savers of an economy, it becomes all the more important to analyse their savings and consumption expenses. Of the multiple factors determining the saving and subsequent consumption pattern of the individual, the family or the household size assumes crucial importance (Browning and Lusardi, 1996; Orbeta, 2006).

Most of the existing studies are of the view that family size affects both the savings and consumption expenses of the individual, but in opposing direction (Rehman *et al.*, 2010). With increase in the size of the household, the income is diverted away from the savings and consequently the saving income ratio of the individual is lowered. However, because of the presence of relatively large number of economically active members, there is a possibility of average savings of large sized families being more than that of the low member family groups. Nevertheless, the empirical findings of majority of studies suggest that family size has a negative effect on savings, as increased number of family members draw down the savings, thereby resulting in reduced propensity to save of an individual (Bendig *et al.*, 2009). Consumption expenditure, on the

other hand is regarded as a positive function of household size as proposed by a number of consumption theories. Every addition to the family size results in incremental burden on the current income levels of the household which leads to the diversion of income towards consumption (Dornbusch *et al.*, 2004) and the gratification of day to day consumption needs of the additional family member results in increased consumption income ratios of the individual. Some researchers are of the view that in absolute terms, the consumption expenses of the large families can be lower than that of the small member families, which may be possible due to the relatively lower income levels of large households in contrast to the smaller ones. However, the effect of family size on consumption expenditure in real terms is assessed through examining the pattern of proportion of income spent on consumption (consumption income ratios) in response to increase in number of members in a family. A number of studies unanimously agree that existence of additional family members in a household result in increased propensity to consume, thereby implying that consumption expenses are positively impacted by the family size (Kelley, 1988).

There exist limited studies which have exclusively studied the effect of family size on both savings and consumption expenses of the industrial workforce. Therefore, in this backdrop, the present study attempts to fill existing research lacunae through in-depth examination of the impact of family size on monthly savings and consumption expenditure of industrial workers through the application of specific econometric tools. It further aims to study the pattern of savings and consumption expenses of workers by simultaneously analyzing and comparing their mean values across different family size groups.

Data Source and Methodology

A multistage random sampling design was adopted to select a sample of 100 industrial workers engaged in steel firms in Indian city of Chandigarh. The first stage of sampling consisted of randomly selecting 10 steel firms out of the list of steel firms procured from PHD Chamber of Commerce and Industry, Chandigarh, India.

In the next stage, 10 industrial workers were selected randomly from each firm and questionnaire interview combination was administered on each one of them so as to achieve higher response rate with regard to their saving and consumption behaviour. The entire process of data collection was carried out during the months of January and February, 2013. In order to analyse the effect of family size on monthly consumption expenditure and savings of the industrial workers, the econometric tools of single-factor MANOVA and ANOVA regression model were used, which are described in detail in the subsequent section.

Single-Factor Multivariate Analysis of Variance (MANOVA)

Single-Factor Multivariate Analysis of Variance (MANOVA) is a statistical technique to analyse the difference between the mean values of multiple dependent variables across different categories (groups) of a single independent variable (Field, 2005). In general, the application of MANOVA is restricted to those situations, where there exists low to moderate level correlation among the dependent variables (correlation value below 0.6). Taking into account these guidelines, the present study utilizes the MANOVA procedure to assess whether the mean monthly savings and mean consumption expenditure of the industrial workers significantly vary across different family size groups or not.

The dependent and independent variables used in the MANOVA procedure are presented in Table 1, which shows that the family size of the industrial workers ranged from a minimum 3 to a maximum of 7 members, with majority of the workers registering the family size of 6 members. The low negative Pearson correlation value (-0.178) between savings and consumption authenticates that both the dependent variable are conceptually connected and are correlated with each other at a lower level. This confirms that the single factor MANOVA procedure was the appropriate statistical tool to simultaneously analyse and compare the two dependent variables (average monthly savings and average consumption expenditure) across different levels of a single independent variable (5 different family size groups).

Table 1. Description of the variables used in the MANOVA procedure

Dependent variable	Independent variable	Sample size
A. monthly savings (Rs.) ^a	Family size 3	12
B. monthly consumption Expenditure (Rs.)	Family size 4	22
	Family size 5	28
	Family size 6	32
	Family size 7	6
	Total = 5 groups	Total = 100 workers
Pearson correlation between savings and consumption expenditure = -0.178		

^aRs. Refers to the national currency of India

ANOVA Regression Analysis

The family size of the workers was treated as a qualitative independent variable having 5 categories (groups) to study its effect on worker's monthly savings and consumption expenditure, both of which are quantitative dependent variables. In such situations, where a quantitative dependent variable is regressed on qualitative independent variables, the Analysis of Variance (ANOVA) regression procedure based on the method of Ordinary Least Squares (OLS) is employed for estimating the parameters of the regression model (Wooldridge, 2013). Since, family size is qualitative in nature having polychotomous categories (5 groups), consequently its quantification was done through the introduction of group of dummy independent variables. As a thumb rule, when a qualitative independent variable has y categories, then $y-1$ dummy variables are introduced in the regression model (Madnani, 2006). Therefore, following this guideline, four dummy variables representing family size were constructed in the following manner:

- FS4 = 1, when worker has a family size of 4 members
 = 0, for otherwise
 FS5 = 1, when worker has a family size of 5 members
 = 0, for otherwise
 FS6 = 1, when worker has a family size of 6 members
 = 0, for otherwise
 FS7 = 1, when worker has a family size of 7 members
 = 0, for otherwise

It is to be noted that no dummy variable was constructed for the family size of 3 members, thereby making it a reference or the benchmark category against which all the group comparisons are made. In the present study, two separate ANOVA regression models were used to study the effect of workers' family size on monthly savings and consumption expenditure using White's standard errors. With the estimation of White's standard errors, the associated hypothesis testing procedure (F-test and t-tests) becomes robust and parameter estimates become asymptotically consistent (Gujarati, 2004).

Using the ANOVA framework, the regression equations showing the functional relation between the dependent variable and the set of dummy independent variables is expressed as:

$$S_i = \alpha_0 + \alpha_1 FS4_i + \alpha_2 FS5_i + \alpha_3 FS6_i + \alpha_4 FS7_i + U_i \rightarrow \text{ANOVA Model 1}$$

$$C_i = \beta_0 + \beta_1 FS4_i + \beta_2 FS5_i + \beta_3 FS6_i + \beta_4 FS7_i + U_i \rightarrow \text{ANOVA Model 2}$$

Where:

- S = Monthly savings (Rs.)
 C = Monthly consumption expenditure (Rs.)
 α_0 = intercept term representing estimated monthly savings of workers with family size of 3 members
 β_0 = intercept term representing estimated monthly consumption expenditure of workers with family size of 3 members
 α_i and β_i = i th differential intercept coefficient, $i = 1, 2, 3, 4$

FS4, FS5, FS6 and FS7 are dummy independent variables representing different family size groups and U_i = stochastic error term.

Results

The Descriptive Statistics

The mean values of savings, consumption expenditure and income of the workers along with the ratio of average saving to average income as well as ratio of average consumption expenditure to average income for each of the five family size groups were computed to describe the pattern of savings and consumption expenses of the workers. As shown in Table 2, the average monthly savings were observed to be highest for workers with family size of 3 members (Rs. 1541.67), while it was observed to be lowest (Rs. 316.67) for the workers with household of 7 members, thereby implying that that savings of the worker decrease with rise in family size. With regard to the pattern of consumption, it was observed that as family size increased from 3 to 5 members, the average consumption expenditure rose from Rs. 4791.67 to Rs. 6464.28, respectively. Fulfilling the consumption demands of the additional family members can be cited as the main reason behind this trend. However, as family size increased to 6 and 7 members, the average consumption expenditure of the workers fell from Rs. 5701.56 to Rs. 4600, respectively. This is due to the lower average monthly income levels of workers having family size of 6 and 7 members as compared to the lower member family groups (<than 6 members). Further, the mean values of both monthly savings and consumption expenditure differed sizably across five groups of varying family size. However, whether there existed a significant difference in their mean values across different family size groups was revealed through multivariate tests of MANOVA.

Results of Single-Factor MANOVA Procedure

Box Test and Multivariate F-Test

Wilk's Lambda, Pillai's Trace and Roy's Largest Root are the multivariate F-statistics, which are commonly used to examine whether the five family size groups significantly differ on a linear combination of dependent variables, i.e., savings and consumption expenditure (Leech *et al.*, 2005).

Table 2. Descriptive statistics

Family size	Average income \pm S.D. ^b . (Rs.)	Average saving \pm S.D. (Rs.)	Average consumption \pm S.D. (Rs.)	Saving income ratio	Consumption income ratio
3	6333.330 (246.183)	1541.670 (582.25)	4791.670 (620.056)	0.243	0.757
4	6286.370 (274.808)	900.000 (274.296)	5386.370 (432.375)	0.143	0.857
5	7196.430 (761.812)	732.140 (241.988)	6464.280 (725.317)	0.102	0.898
6	6128.130 (1404.425)	426.560 (221.427)	5701.560 (1298.172)	0.070	0.930
7	4916.670 (240.139)	316.670 (147.196)	4600.000 (352.136)	0.064	0.936

^bS.D. refers to the standard deviation

Table 3. Results of single-factor MANOVA

Box test	Multivariate F-tests			Univariate F-test	Levene's test
	Wilk's lambda	Pillai's trace	Roy's largest root		
8.924**	20.74**	19.206**	35.695**	S = 34.836** C = 11.42**	S = 7.887** C = 16.59**

**denote that test statistic is significant at 1% level

S and C denote monthly savings and monthly consumption expenditure, respectively

However, suitability of these multivariate tests depends upon the fulfilment of the assumption of equality of covariance matrices, which is tested through Box test. The Box test assesses whether or not the covariance among the two dependent variables (savings and consumption) is equal across the five groups of the independent variable (family size groups). If Box test does not come out to be significant and assumption of equality of covariance matrices is fulfilled, then Wilk's Lambda is the most commonly used multivariate F-statistic. On the other hand, when Box test statistic comes out to be significant, then in that case Pillai's Trace and Roy's Largest Root can be used (Mayers, 2013). As shown in Table 3, the Box statistic was observed to be statistically significant ($p < 0.01$), therefore Pillai's Trace and Roy's Largest Root were used to inspect whether the multiple groups of the independent variable significantly differ on a linear combination of dependent variables or not. The significant values of Pillai's Trace and Roy's Largest Root confirmed that there existed significant differences among the 5 family size groups on a linear combination of the two dependent variables (savings and consumption expenditure of the workers).

Univariate F-Test and Levene's Test

When the multivariate F-test was found to be significant, the next step in the MANOVA procedure was to examine whether the mean values of the individual dependent variable significantly differed across the groups of the independent variable, which is tested through univariate F-test. As shown in Table 3, the two separate significant univariate F-test values (34.836 and 11.42 with respect to savings and

consumption, respectively) confirmed that the mean values of monthly savings and consumption expenses significantly differed across the 5 family size groups. When univariate F-test statistic was observed to be statistically significant, the next step involved the application of post hoc multiple comparison tests, which was used to identify the specific pairs of family size groups which were significantly different from the others with regard to the mean value of monthly savings and consumption expenditure of the workers.

In general, the application of the post hoc tests depends upon the outcome of the Levene's test, which help examine whether the variances of the dependent variable are equal or not across all the groups of independent variable. When Levene's test does not come out to be significant and assumption of homogeneity of variances is fulfilled, then the post hoc test which is specifically used for equal variances is applied, however when the assumption of homogeneity of variances is not fulfilled, then the post hoc test which is specifically designed to deal with the situation of unequal variances is used (Morgan *et al.*, 2004). Since, the Levene's of test homogeneity of variances was observed to be significant for both savings (7.887) and consumption expenditure (16.59), therefore Dunnett T3 post hoc test, specifically applied in situations of unequal variances was used for multiple comparisons.

Post Hoc Multiple Comparisons

Table 4 shows that the mean monthly savings of lowest family member group (3 members) were observed to be significantly greater than all the other

higher family size groups by approximately Rs. 642, 810, 1115 and 1225, respectively. In a similar fashion, the mean monthly savings of workers with family size of both 4 and 5 members were found to be significantly higher than that of the household size of 6 and 7 members as indicated by the positive mean difference of monthly savings between them ($p < 0.01$). Thus, the mean savings of small member families being significantly more than that of the large member family groups indicate that savings on an average follows a downward trend with increasing family size (Loayza and Shankar, 2000).

As presented in Table 5, the mean monthly consumption expenditure of workers with lowest family size (3 members) was found to be significantly less than that of family size of 5 and 6 members as indicated by the negative mean difference of consumption expenditure between them ($p < 0.01$). Likewise, the mean monthly consumption expenditure of workers with household size of 4 members is significantly lower than that of family size of 5 members by approximately Rs. 1078. However, the mean monthly consumption expenditure of largest family size group (7 members) was observed to be significantly lower than that of the family size of 4, 5 and 6 members by approximately Rs. 786, 1864 and 1102, respectively. This is possibly due to the average monthly income of all the other lower family

size groups being greater than that of the workers with largest family size group (Table 2).

Results of the ANOVA Regression Analysis

Table 6 shows that the intercept term and the differential intercept coefficients of the ANOVA regression model 1, which examine the effect of family size on monthly savings of the industrial workers, were observed to be statistically significant ($p < 0.01$). The value of the intercept term represented the estimated monthly savings of the benchmark group, i.e., workers having family size of 3 members. The negative sign of the significant differential intercept coefficient of each of the higher family size groups (> 3 members) indicated that the monthly savings of these family groups were observed to be significantly lower than the savings of the benchmark group (Rs. 1542). These results are in alignment with the research work of Gonzalez and Ozcan (2008), who reported that with increasing family size, the income is redirected towards the consumption expenses of the additional family member, thereby resulting in significant decline in average savings. The significant intercept term of the ANOVA regression model 2, which corresponds to the estimated monthly consumption expenditure of the workers with family size of 3 members (the benchmark group), was observed to be about Rs. 4792.

Table 4. Post Hoc analysis of mean monthly savings across family size groups

Dependent variable	Family size (I)	Family size (J)	Mean difference (Rs.) (I-J)	Standard error	p-value
Mean monthly saving (Rs.)	Family size 3	Family size 4	641.667*	177.964	0.027
		Family size 5	809.524**	174.191	0.005
		Family size 6	1115.104**	172.579	0.000
		Family size 7	1225.00**	178.500	0.000
	Family size 4	Family size 5	167.857	74.238	0.244
		Family size 6	473.438**	70.371	0.000
		Family size 7	583.333**	83.851	0.000
	Family size 5	Family size 6	305.580**	60.196	0.000
		Family size 7	415.476**	75.515	0.001
	Family size 6	Family size 7	109.896	71.716	0.729

** and* denote that the mean difference is statistically significant at 1 and 5 per cent level

Table 5. Post Hoc analysis of mean monthly consumption expenditure across family size groups

Dependent variable	Family size (I)	Family size (J)	Mean difference (Rs.) (I-J)	Standard error	p-value
Mean monthly Consumption Expenditure (Rs.)	Family size 3	Family size 4	-594.697	201.337	0.078
		Family size 5	-1672.619**	225.450	0.000
		Family size 6	-909.896*	288.952	0.030
		Family size 7	191.667	229.577	0.990
	Family size 4	Family size 5	-1077.922**	165.186	0.000
		Family size 6	-315.199	244.850	0.882
		Family size 7	786.364**	170.776	0.009
	Family size 5	Family size 6	762.723	265.034	0.056
		Family size 7	1864.286**	198.634	0.000
	Family size 6	Family size 7	1101.563**	268.553	0.003

Table 6. Estimates of the ANOVA regression

Dependent variable	Dummy independent variables	Estimated coefficients	White's robust standard errors	Robust t-ratios	p-value
Monthly saving (Rs.) (ANOVA model 1)	Intercept (Constant)	1541.667 (α_0)	165.106	9.337**	0.000
	Family Size 4 (FS4)	-641.667 (α_1)	175.204	-3.662**	0.000
	Family Size 5 (FS5)	-809.524 (α_2)	171.414	-4.723**	0.000
	Family Size 6 (FS6)	-1115.104 (α_3)	169.772	-6.569**	0.000
	Family Size 7 (FS7)	-1225 (α_4)	174.435	-7.023**	0.000
R² = 0.5946; Adjusted R² = 0.5775; Robust F- statistic (4, 95) = 27.85**					
Monthly consumption Expenditure (Rs.) (ANOVA model 2)	Intercept (Constant)	4791.667 (β_0)	175.827	27.252**	0.000
	Family Size 4 (FS4)	594.697 (β_1)	198.628	2.994**	0.004
	Family Size 5 (FS5)	1672.619 (β_2)	223.576	7.481**	0.000
	Family Size 6 (FS6)	909.896 (β_3)	288.764	3.151**	0.002
	Family Size 7 (FS7)	-191.667 (β_4)	221.458	-0.865	0.389
R² = 0.3247; Adjusted R² = 0.2963; Robust F- statistic (4, 95) = 27.09**					

Note: ** denote that the t-statistic is statistically significant at 1 per cent level

Further, the significant positive values of differential intercept coefficients of family size of 4, 5 and 6 implied that the monthly consumption expenditure of these groups was higher than that of the benchmark group, which thereby indicated that family size had significant positive effect on monthly consumption expenditure of the workers. Interestingly, the consumption expenditure of 7 member family group was found to be lower than that of the reference group, however due to the statistically non-significant value of its differential intercept coefficient (-191.667), it was affirmed that largest size family group did not have any significant impact on consumption expenditure of the workers.

Discussion

The descriptive statistics of the present study showed that with increasing household size, savings not only dwindled in absolute terms, but also in relative terms as witnessed by decreasing saving income ratios (Table 2). This observation is in line with the a-priori expectation of the present study, that on an average, the savings of the workers decrease with rise in the family size (Rehman *et al.*, 2011). Though, in absolute terms, the average monthly consumption expenditure decreased for the workers having more than 5 family members, nevertheless the consumption income ratios showed an increasing trend with growing family size, thereby implying that on an average, the propensity to consume of the workers increases with rise in the number of family members in a household (Obayelu, 2012). The MANOVA post hoc analyses revealed that with an exception of highest family member group (7 members), the mean monthly consumption expenses of all the other higher family size groups were found to be significantly more than that of the smallest family group (3 members), whose mean monthly savings were observed to be significantly higher than all the other large member family groups.

The regression results revealed that when compared with the benchmark group (lowest member family

group), the family size of 7 members was observed to have the maximum negative impact on monthly savings of the workers, thereby resulting in reduction of savings by about Rs 1225, which was then followed by family size of 6, 5 and 4 members which lowered the workers' monthly savings by approximately Rs. 1115, 810 and 642, respectively (Table 6). With respect to the results of ANOVA regression model 2, the family having 5 members was observed to have highest positive effect on consumption expenditure of the workers, which resulted in additional monthly consumption expenses of Rs. 1673 when compared with the expenses of the benchmark group. In a similar manner, the consumption expenditure of family having 4 and 6 members was observed to be significantly higher than that of the lowest member family group by approximately Rs. 595 and 910, respectively. This observation validated the positive effect of family size of the workers on their consumption expenses.

The value of adjusted R² with respect to the two ANOVA regression models indicate that about 58 and 30% of the variation in monthly savings and monthly consumption expenditure were respectively explained by the family size of the industrial workers. Further, the robust F-test values (27.85 and 27.09), which reveal information about the overall significance of the regression model (Hair *et al.*, 2010), were observed to be statistically significant with respect to both the regression models. The significant F-statistic confirms that the negative impact of family size on savings and positive impact on consumption expenditure was statistically reliable and was not due to the spurious result of data set oddities.

Conclusion

The primary objective of the present study was to examine the impact of family size on savings and consumption expenditure of the industrial workers. Additionally, it also aimed to study the pattern of

average savings and consumption expenses across different groups with varying family size. The findings revealed that the saving income ratios of the workers followed a decreasing trend with the rise in the size of the family and the mean monthly savings of the large family size groups (>3 members) were observed to be significantly lower than the smallest family group, which is indicative of declining propensity to save of the workers. Conversely, the consumption income ratios witnessed a rising pattern with increase in family size, which is understandably due to the reason that part of the income that is not saved is spent on satisfying the consumption needs of the additional family member. Though, the mean monthly consumption expenditure of family size of 4, 5 and 6 members was observed to be significantly higher than that of the largest family group (7 members), however its consumption income ratio was observed to be greater than that of all the lower family size groups. This is logically plausible as the workers having the highest family size were observed to have the lowest mean monthly income, thereby implying the presence of large number of economically inactive members in this group, which resulted in diversion of a large part of their income towards their consumption expenses. The results of the regression analysis confirmed that family size has a significant positive impact on the consumption expenditure of the industrial workers. Further, the reduction of savings due to increased burden of the additional family member on monthly income validated the proposed negative effect of family size on savings of the workers.

The present study addresses the existing research lacunae by exclusively examining the impact of family size on monthly savings and consumption expenditure of industrial workers through the application of specialized econometric techniques. The present study also facilitates furtherance of knowledge to policy makers by providing in-depth understanding of the direction (positive/negative) and magnitude (more/less) of mean differences between savings and consumption expenses of the lower family size groups vis a vis large family groups of the industrial workforce. The future studies could further extend the present cross-sectional research by providing a longitudinal analysis of the impact of family size on savings and consumption so as to assess whether or not the direction and the magnitude of specific effects changes over time. It is further suggested that a detailed examination of the interaction effects of family size with other additional factors, such as income levels of family members; number of economically inactive members (dependents), their age, gender, marital status, etc. should be kept into consideration by future research investigations.

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Author's Contribution

Tanvi Kiran: Analysed the empirical data, which included the application of appropriate econometric techniques to the cross-sectional primary data. The author also contributed to the writing of the research manuscript.

Shivam Dhawan: Collected the primary data, conducted the review of literature and contributed to data processing and digitalization.

Conflict of Interest

There is no conflict of interest among the authors.

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