

Mediating Effect of Advertising Expenditure on Labour Productivity: A Case of Manufacturing Industries in Pakistan

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This paper explores the possibility that the labour productivity enhancing effects often ascribed to capital intensity may partly act through some mediating variable. The paper uses a mediation model to estimate direct and indirect effects of capital intensity on labour productivity in Pakistan's manufacturing industries. The data involve 229 industries at five-digits level of aggregation. The data are taken from Census of Manufacturing Industries for the year 2005-06. Using capital intensity as an independent variable and advertising expenditure as a mediating variable, the paper estimates total, direct, and indirect effects on labour productivity. Approximately 18 percent of total effects on labour productivity are found to be mediated through advertising expenditure. The statistical significance of indirect effects is tested using standard normal tests as well as bootstrap method, and these effects are found to be significant.

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1. INTRODUCTION

In productivity literature capital intensity is often regarded as one of the most important determinants of labour productivity. As pointed out by Arrow, *et al.* (1961), in a linearly homogeneous production function marginal productivity of labour is an increasing function of capital-labour ratio. Usually some other variables like human capital, innovation, trade openness, research and development are included in the model along with capital-labour ratio to analyse determinants of labour productivity [see for example, Velucchi and Viviani (2011); Han, Kauffman, and Nault (2011); Hussain (2009); Apergis, *et al.* (2008)].

All these determinants of labour productivity are important in their own right. However, there is a need to take the analysis one step further, and explore the transmission process through which a determinant may affect labour productivity. An explanatory variable may affect labour productivity directly as well as through some mediating variable. Mediation Model suggested by Baron and Kenny (1986) can be helpful in such a situation. The model gives quantitative estimates of direct and indirect effect of an explanatory variable in a regression equation. A possible missing link in the chain of causation from capital intensity to labour productivity could be advertising expenditure.

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This chain of causation consists of two important relationships. The first one can be established between capital intensity and advertising expenditure. There exist plausible reasons to assume causation from capital intensity to advertising expenditure. First, firms with high capital intensity are usually on higher level of technology adoption. These firms have a forward-looking attitude, and are well aware of modern marketing techniques. Hence they can be expected to spend more on advertising. Second, firms with more capital resources can afford to incur larger advertising expenditures in print and electronic media as well as in other promotional activities. Last, resourceful firms may resort to advertising as a strategy to create barriers for potential entrants, or to drive out existing competitors.¹ These factors induce the firms with high capital to spend more on advertising than those which lack capital resources. The second relationship in this causation chain is established when advertising expenditure, just like other inputs, is included in the value of output.² This fact, along with the assumption of positive marginal product, makes advertising expenditure an important contributor to labour productivity.

This paper attempts to disentangle the underlying mechanism of causation from capital intensity to labour productivity through a mediation model. The paper aims to analyse direct and indirect effects of capital intensity. Advertising expenditure is modeled to play the role of mediating variable. The paper contributes to empirical research on manufacturing industries in Pakistan in three important ways. First, it increases our understanding of labour productivity analysis of manufacturing industries in Pakistan. It provides answer to the question: what might be the contribution made by capital intensity in productivity enhancement, and how advertising plays its role in affecting this contribution. Second, from a policy perspective it is important to know that a significant portion of labour productivity enhancement ascribed to capital intensity, in fact, comes from advertising expenditure. This would be helpful for policy-makers to frame regulatory measures about capital markets as well as about advertising activity. Third, this study will pave the way for further research about the role of advertising, e.g. whether advertising is informative and persuasive, as it is often claimed, or is it being used as a strategy by resourceful firms/groups to stifle competition.

The rest of study is divided as follows: Section 2 presents a review of recent empirical literature about the use of mediating variable as well as analysis of labour productivity. Methodology and data are discussed in Section 3. Section 4 discusses empirical results of the model, and Section 5 concludes the discussion.

2. REVIEW OF LITERATURE

Baron and Kenny's (1986) introduced mediation models in the field of psychology. Gradually their use in economics and other social/managerial sciences became common.³ Some recent empirical studies using mediation models are reviewed below.

¹ In literature this phenomenon is called "long purse" hypothesis; see for example, Telser (1966).

² The issue of including advertising expenditure as an input is explained in Section 3.

³For reviews of mediation models in psychology and related fields, see Gelfand, *et al.* (2009), Kenny (2008), and Mathieu, DeShon, and Bergh (2008).

Srivastava and Rai (2013) analyse the mediating role of customer satisfaction in determining the relationship between service quality and customer loyalty. The study uses data from a survey of 400 customers of the top three life insurance companies in India. The companies are selected on the basis of their relative shares in the market of life insurance policies in India. Customer loyalty has been used as dependent variable while independent variable is service quality. Customer satisfaction is used as a mediating variable. Sobel's test is used to examine the significance of mediation model. The study finds that customer satisfaction plays a significant role as a mediator in a service quality-customer loyalty relationship.

Newsham, *et al.* (2009) use a mediated regression model linking the physical environment, through environmental satisfaction, to job satisfaction and other related measures. Physical measurement and questionnaire data are used from 95 workstations in Michigan, USA. The study demonstrates a significant link between overall environmental satisfaction and job satisfaction, mediated by satisfaction with management and with compensation.

Banker, Bardhan, and Chen (2008) study the impact of activity-based costing on plant performance by using world-class manufacturing practices as a mediating variable in a sample of 1250 manufacturing plants in U.S. The study finds that world-class manufacturing practices completely mediate the positive impact of activity-based costing.

Kuha and Goldthrope (2007) develop a mediation model to assess the impact of educational attainment on intergenerational social mobility using British survey data. The study proposes a method to estimate direct and indirect effects between a person's father's and his or her own social classes in systems where some of the variables are categorical. Education is used as a mediating variable to decompose the effect on intergenerational social mobility. The data are used for years 1973 and 1992. Analysis is performed separately for men and women with educational qualification used in seven categories, and social status defined in three classes, viz. (i) Salariat and employers, (ii) Intermediate class, and (iii) Working class. The results indicate high variation in the proportions of indirect effect. This proportion is found to be about 80 percent for women (for mobility from salariat to salariat class) to about 12 percent for men (for mobility from working to working class). However the study does not find any systematic or significant change in proportions of indirect effects between the years 1973 and 1992.

Maydeu-Olivares and Lado (2003) analyse the economic performance of insurance industry in the European Union. The study uses a multiple mediator model to separate the effect of market orientation on economic performance. The mediators used are innovation degree, innovation performance, and customer loyalty. The three mediating variables are found to be interrelated. Customer loyalty alone does not mediate the effect of market orientation on economic performance. However, when it is used in combination with innovation degree and innovation performance, it mediates the effects of market orientation on business performance. It is found that these variables completely mediate effects of market orientation on economic performance. Moreover, there is an improvement in predictions of economic performance by 52 percent over what is explained by market orientation alone.

Productivity has been extensively analysed in empirical literature. A number of writers have studied the issues in the area of total factor productivity (TFP) and explored

its determinants, e.g. Cheema (1978), Mahmood and Siddiqui (2000), and Hamid and Pichler (2009). On the other hand some studies focus on labour productivity, a partial measure, for analysis. A few recent papers dealing with determinants of labour productivity are reviewed below.

Velucchi and Viviani (2011) investigate how some firms' characteristics affect the dynamics of the Italian firms' labour productivity in food, textiles and mechanical machinery sectors. The authors estimate a nonlinear production function by quintiles regression approach using firm-level panel data developed by Italian National Institute of Statistics. The study covers the period of 1998-2004. It is found that the relationships between labour productivity and firms' characteristics are not constant across industries and quintiles. Particularly human capital and innovation have a larger impact on fostering labour productivity of less productive firms than that of highly productive firms. Similarly human capital and innovation have a higher impact for exporters than for non-exporters. Such polarisation is also found within sectors. In food sector innovativeness is significant for low and high productivity firms but it is found to be irrelevant for the median firm. Similarly in textiles the effect of innovation grows as productivity grows. The patents are found to be significant in the machinery sector only for median firms and have very little impact on both low and high productivity firms. Internationalisation turns out to be important for low productivity firms in all sectors.

Han, Kauffman, and Nault (2011) evaluate the contributions of spending in IT outsourcing on labour productivity. The study uses an economy-wide panel dataset in the United States. The data cover sixty industries for the period 1998 to 2006. The authors estimate determinants of labour productivity using IT outsourcing as a mediating input along with other inputs. The results show that on average, a 1 percent increase in spending on IT outsourcing per labour hour is associated with a 0.024 percent to 0.04 percent increase in labour productivity. Separate equations are estimated for the high-and low-IT intensity industry groups. The results show that the coefficient estimates for IT outsourcing are greater in high-IT intensity industries.

Hussain (2009) analyses the causal ordering between inflation, and productivity of labour and capital in Pakistan's economy. The study uses the data from IMF dataset compiled by the United Nations Statistical Database and World Development Indicators covering the period 1960 to 2007. Vector Autoregressive technique is used in the analysis and results suggest that there exists a unidirectional causality from inflation to labour productivity through capital labour ratio. Bidirectional causality between inflation and capital productivity through capital labour ratio is also found. The paper estimates that on average it takes about 15 months for these causalities to take effect.

Kutan and Yigit (2009) estimate determinants of labour productivity growth in eight new EU member states that joined the Union in 2004, namely, the Czech Republic, Estonia, Hungary, Poland, Latvia, Lithuania, Slovakia and Slovenia. The study uses panel data for the period 1995–2006. Results indicate mixed effects of globalisation. FDI and exports increase productivity growth, while imports reduce it. Education, measured by secondary school enrolment, and domestic investment have significant and positive effect while R&D does not play any significant role. Effect of productivity gap is found to be positive and significant, thus implying labour productivity convergence among European countries.

Most of these studies are mainly concerned with finding determinants of labour productivity, or quantifying the impact of these determinants on labour productivity.

There is a need to explore the causal sequence of the impact of one or more determinants on labour productivity. How much is the direct effect of a determinant on labour productivity and how much of the effect is being transmitted through some mediating variable (e.g. advertising)? Present study aims to answer this question.

3. METHODOLOGY

Use of Advertising Expenditure

At macro level advertising has been found to have positive effect on variables like labour supply, consumption etc. [Fraser and Paton (2003); Jung and Seldon (1995)]. However, at firm or industry level the issue is problematic. Advertising is usually not regarded as an input in traditional production analysis. This may partly be due to the perception that advertising, like other marketing strategies, comes into play *after* production process has been completed. Hence its role in productivity enhancement is not relevant. Another reason may have stemmed from the notion of perfect competition. In the words of Pigou (1924, pp. 173-174), "Under simple competition there is no purpose of advertisement, because ex hypothesis, the market will take, at the market price, as much as any one small seller wants to sell." It is probably due to these reasons that a significant body of literature on advertising focuses on its role in market structure, its influences on demand, prices, preferences, quality etc., and its welfare implications, see for example, Hamilton (1972), Hochman and Luski (1988), Horstmann and Moorthy (2003).

Some writers take a divergent perception of advertising. Telser (1978), argues that promotion and the product are joint outputs in supply; thus making advertising an inextricable component of the product. Ehrlich and Fisher (1982), and Richards and Patterson (1998) explicitly treat promotion expenditure as an input in the production process. At empirical level, however, the issue is less problematic. Firms generally include advertisement expenditures in total cost while determining market price of their product. These expenditures are reported in income accounts just like other inputs' costs.

Theoretical Model

This study follows a simple mediation model suggested by Baron and Kenny (1986). This model consists of three variables; independent variable, dependent variable, and mediating variable represented by X , Y , and M respectively. The model represents a causal sequence; X affects M which may in turn affect Y . In addition X may have direct effect on Y which is not transmitted through M . The size and significance of coefficients of these variables decides the nature of mediation.

This model⁴ can be described by the following three equations:⁵

⁴Although a mediation model is not specifically a production model, Equation (1) can be derived from a linearly homogeneous production function with two inputs, in this case, labour and capital. If we divide the production function by labour and take log of both sides, Y becomes log of labour productivity, and X becomes log of capital-labour ratio. In a similar way, Equation (3) can be derived from a linearly homogeneous production function with three inputs, viz. labour, capital, and advertising expenditure. Here M expresses log of advertising expenditure per unit of labour.

⁵These equations do not prove causality in statistical sense. Rather, the coefficients in these equations provide estimates of theoretical causal links among the variable. These theoretical links have been discussed above.

$$Y = i_1 + cX + u \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

$$M = i_2 + aX + v \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

$$Y = i_3 + c'X + bM + e \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

Where u , v , and e are random terms satisfying usual OLS assumptions.

Equation (1) establishes direct effect of independent variable on the dependent variable. Equation (2) is used to see how the mediator is affected by the independent variable. Equation (3) shows how mediator affects the dependent variable when direct effect of independent variable is controlled.

As pointed out by Baron and Kenny (1986), the method requires that the coefficients a , b , and c should be statistically significant, and the condition $c' < c$ must hold. Perfect mediation occurs when $c' = 0$. In this case total effect, c , is completely mediated. In general, mediation is not complete, and total effect is said to be partially transmitted through the mediator. Some authors [Collins, Graham, and Flaherty (1998); MacKinnon, Krull, and Lockwood (2000)] argue that significance of c is not necessary for mediation to occur.

The total effect of X on Y , measured by the coefficient c in Equation (1), can be written as combination of direct and indirect effects. If OLS is used to estimate the model, the total effect is the additive sum of the direct and mediated (or indirect) effect [Warner (2012), p. 654]. Symbolically we may state the relationship as:

$$c = c' + ab$$

$$\text{or } ab = c - c'$$

The coefficient 'a' represents the effect of independent variable on mediating variable, and 'b' coefficient represents the effect of mediating variable on dependent variable. The product 'ab' reflects how much a unit change in independent variable affects dependent variable indirectly through mediating variable.

Testing the Significance of Indirect Effects

The tests of significance of indirect effects, 'ab', can be performed in many ways. The most frequently used tests can broadly be grouped in two types; (i) tests based upon the assumption of normality of 'ab', (ii) tests based upon bootstrap technique. These tests will be applied against the null hypothesis of no indirect effects, i.e. $H_0: ab = 0$.

In order to conduct the test under normality assumption, 'ab' is divided by standard error of 'ab' and resulting value is compared with the critical value from the standard normal distribution for a given level of significance. The standard error of the product ab is given by

$$SE_{ab} = \sqrt{(b^2 SE_a^2 + a^2 SE_b^2 + SE_a^2 SE_b^2)} \quad \dots \quad \dots \quad \dots \quad \dots \quad (4)$$

Where SE_{ab} is standard error of the product 'ab', SE_a is standard error of 'a', and SE_b is standard error of 'b'.

Aroian test uses the above expression to conduct the test of significance. Sobel test assuming independence of 'a' and 'b', omits the last term (i.e. the covariance of 'a' and 'b'). The Goodman test subtracts the last term from the first two terms to form an unbiased estimate of the variance of 'ab'. These tests are built on the works of Aroian (1947), Sobel (1982), and Goodman (1960) respectively.

The product of two normal variables is, in general, not normally distributed [see e.g. Aroian (1947); Lomnicki (1967)]. It has been argued that the normal theory approach for testing indirect effects lacks statistical power especially for small samples [MacKinnon, *et al.* (2002)]. It is suggested that minimum sample size of 150 to 200 may be regarded as suitable [Warner (2012), p. 663]. Present study applies these tests on 229 observations. So we can expect that these tests will perform better.

Another alternative to the normal theory approach is the bootstrap procedure to test the statistical significance of direct and indirect effects. Bootstrap method, introduced by Efron (1979), allows estimation of the sampling distribution of statistics using resampling methods. Bootstrap method⁶ will also be used to estimate and test the significance of direct and indirect effects. The standard deviation of the distribution of bootstrapped 'ab' provides an estimate of the standard error, which could be used in the usual way to construct confidence intervals. Bootstrap technique will be used to compute percentile confidence intervals, and bias-corrected confidence intervals. In the percentile confidence intervals bootstrap estimates are sorted in ascending order and interval limits are chosen corresponding to $(\alpha/2) \times 100^{\text{th}}$ and $(1-\alpha/2) \times 100^{\text{th}}$ percentile values for a particular α level of significance. In bias-corrected bootstrap confidence intervals the end points of the intervals are adjusted depending upon whether the proportion of bootstrapped values of indirect effects is less than those estimated from the original data.⁷

The null hypothesis of no indirect effects will be tested using these two types of confidence interval. The hypothesis will be rejected if the confidence interval does not contain zero value.

Data and Variables

This study uses data from Census of Manufacturing Industries (CMI), 2005-06.⁸ The census is published by Statistics Division, Federal Bureau of Statistics Islamabad. The industries are classified according to Pakistan Standard Industrial Classification (PSIC). CMI provides data at four different levels of aggregation, viz. from two- to five-digits level of aggregation. Data on 230 industries are provided at five-digits level. One of these industrial groups, "lead, zinc, tin and their alloys" is reported to have negative capital assets. This sector is excluded from the analysis. So, the study uses data of 229 industrial groups at five-digits level of aggregation.

The theoretical model given in Equations (1), (2), and (3) is estimated with labour productivity (output per labour) as dependent variable. Capital intensity measured by capital-labour ratio is used as independent variable, and advertising expenditure (per labour) as the mediating variable. The definitions for output, capital, labour, and advertising expenditure as reported in CMI are given below:

⁶For detail on the procedure see, for example, Shrout and Bolger (2002).

⁷For detail on these three types of confidence intervals, see Hayes (2013), p. 111.

⁸This is the latest CMI dataset presently available.

Output is defined as the contribution of the establishments (in thousand rupees) in each industrial group to the Gross Domestic Product of the economy.

Capital measures value of fixed assets (in thousand rupees) of the industrial group at the end of the year.

Labour consists of average daily persons employed in the industrial group including employees, working proprietors and unpaid family workers.

Advertising expenditures is defined as advertising cost (in thousand rupees) during the year.

Labour Productivity is output in thousand rupees per labour.

All variables are used in regressions in logarithmic form. Ordinary Least Square technique is used to estimate the equations. Summary statistics, graphs, and variance-covariance matrix of the variables in level form are given in Appendix. STATA 12 computer package is used for estimation and testing the regression coefficients. Add-on command “sgmediation” is used to perform tests of significance of indirect effects.⁹

In addition to advertising expenditure other variables like levels of education of workers and managerial staff, work environment, and expenditures on research and development can also play mediating role. Presently CMI data do not include these variables. A more detailed mediating model can be used when such data become available.

4. RESULTS

The estimated results of mediation model outlined in previous section are as follows. The capital intensity or capital-labour ratio is found to play significant role in determination of labour productivity. In terms of our mediation model ‘c’ is significant (Table 1).

Table 1

Results for Productivity Regressed on Capital Intensity

Labour Productivity	Coef.	Std. Err.	t	P > t
Capital Intensity	0.57	0.05	10.36	0.00
Const.	2.91	0.35	8.32	0.00

Similarly, causal link from capital-labour ratio to advertising is also statistically significant, or in terms of the mediation model ‘a’ is significant (Table 2). The result substantiates the hypothesis that capital intensity is a significant predictor of advertising expenditure.

⁹This computer programme is available at the website of IDRE, Institute for Digital Research and Education, UCLA: <http://www.ats.ucla.edu/stat/stata/faq/sgmediation.htm>

Table 2

Results for Advertising Expenditure Regressed on Capital Intensity

	Coef.	Std. Err.	t	P > t
Number of Obs. = 229				
F Statistic = 22.32				
Adj R-Squared = 0.08				
Capital Intensity	0.58	0.12	4.72	0.00
Const.	-2.39	0.78	-3.08	0.00

The next step of mediation model requires that when dependent variable is regressed on independent variable as well as mediating variable, both explanatory variables should turn out to be significant. Moreover, the size of coefficient of independent variable (capital intensity in our case) should decrease. Table 3 confirms that this condition is also fulfilled. When labour productivity variable is regressed on capital intensity as well as advertisement, both explanatory variables turn out to be statistically significant, and the size of the coefficient of capital intensity decreases from approximately 0.57 (Table 3) to approximately 0.46 (Table 5). From this we can conclude that advertisement does indeed play a mediation role in productivity determination.

As described in the previous section, size of mediation or indirect effect is also given by the product 'ab', which is the product of the coefficient of independent variable in Equation (II) and the coefficient of mediation variable in Equation (III). The estimate of this product turns out to be approximately 0.10. This amount approximately equals the reduction in the estimate of the coefficient of capital intensity due to inclusion of advertisement in the model (Tables 1 and 3).

Table 3

Results for Productivity Regressed on Capital Intensity and Advertisement

	Coef.	t	P > t
Number of Obs. = 229			
F Statistic = 85.27			
Adj R-Squared = 0.42			
Labour Productivity			
Capital Intensity	0.46	8.80	0.00
Advertising Expenditure	0.18	6.57	0.00
Const.	3.34	10.19	0.00

Tests of significance of indirect effects are performed under the assumption of normality of 'ab' as well as using the bootstrap technique. The three tests based upon the assumption of normality of the product 'ab' are Sobel Test, Aroian Test, and Goodman Test. These tests give very similar results (Table 4). The results indicate that the null hypothesis of no indirect effect can be rejected at less than 0.001 level of significance. Table 4 also reports proportion of total effect that is mediated, and ratio of indirect to direct effect. After rounding, approximately 18 percent of total effect of capital intensity on labour productivity is mediated through advertisement. The ratio of indirect to direct effect is approximately 0.22 percent. These numbers indicate relative strength of the effect of mediating variable.

Table 4

Tests of Significance for Indirect Effects (Tests Based upon Assumption of Normality)

	Coeff	z	P > z
Sobel	0.10	3.83	0.00
Aroian	0.10	3.80	0.00
Goodman	0.10	3.86	0.00
Proportion of Total Effect that is Mediated	=0.18		
Ratio of Indirect to Direct Effect	=0.22		

Significance of direct and indirect effects is also tested by using bootstrapped estimates. Bootstrap technique is applied with 5000 replications. The percentile confidence intervals sort the bootstrap estimates in ascending order and choose the interval limits corresponding to $(\alpha/2) \times 100^{\text{th}}$ and $(1-\alpha/2) \times 100^{\text{th}}$ percentile values for a particular α level of significance. On the other hand bias-corrected bootstrap confidence intervals adjust the end points of the intervals depending upon whether the proportion of bootstrapped values of indirect effects is less than those estimated from the original data. Estimates of these two types of interval are reported in Table 5. None of confidence intervals contain zero, which implies significance of direct and indirect effects. Hence the null hypothesis of zero mediation effects is rejected. These results confirm the results from Aroian test, Sobel test and Goodman test. So we can conclude that advertising expenditure does play a significant role as a mediation variable.

Table 5

Test of Significance for Indirect Effect (Test Based upon Bootstrap Method)

No. of Obs	229				
Replications	5000				
	Observed Coeff.	Bootstrap Std. Err.	[95% Confidence Interval]		
Indirect Effect	0.10	0.02	0.06	0.16	(P)*
			0.06	0.16	(BC)**
Direct Effect	0.46	0.06	0.35	0.59	(P)*
			0.35	0.58	(BC)**

*Percentile confidence interval.

**Bias-corrected confidence interval.

SUMMARY AND CONCLUSIONS

This paper uses a simple mediation model to determine direct and indirect effects of capital intensity on labour productivity in manufacturing industries of Pakistan. A simple mediation model is estimated using per labour advertising costs as mediating variable, and capital intensity as independent variable. The results show that indirect effect of capital intensity on labour productivity constitutes approximately 18 percent of total effect. The statistical significance of the indirect effect is tested through standard normal tests as well as through bootstrap methods, and results are found to be statistically significant.

The mediating role of advertising costs indicates some subtle aspects of the relationship between capital and labour productivity. Traditional analysis suggests that capital intensive industries are technologically more advanced, hence their modern equipment and innovative ways of production make labour more productive. This argument may be partly true, but as our analysis suggests a significant portion of this causal chain is, in fact, transmitted through advertising. Policy-makers and regulatory bodies should keep these facts in view while making policies or taking regulatory measures about advertising activity and capital markets.

The study highlights the need for further research to clarify the role of advertising; whether advertising is being used as promotion tool or as a strategy to create entry barriers. When advertising is for promotion and information, it acts like an input, and promotion and the product are joint outputs in supply. So it can be regarded as a contributor to value added. Hence advertising may be productive if it is informative and/or persuasive, but it could be counterproductive if it happens to adversely affect competitive structure of the market.

The study also highlights the need for further improvements in CMI data. Presently CMI data do not include variables like levels of education of workers and managerial staff, and expenditures on research and development. These and other such type of variables may also play a similar mediating role. CMI data set should be extended to include these variables. If more variables could be included in a multi-mediation model, it will further refine direct and indirect effects, and provide better analyses of labour productivity.

APPENDIX

Fig. 1. Labour Productivity (Thousand Rupees)

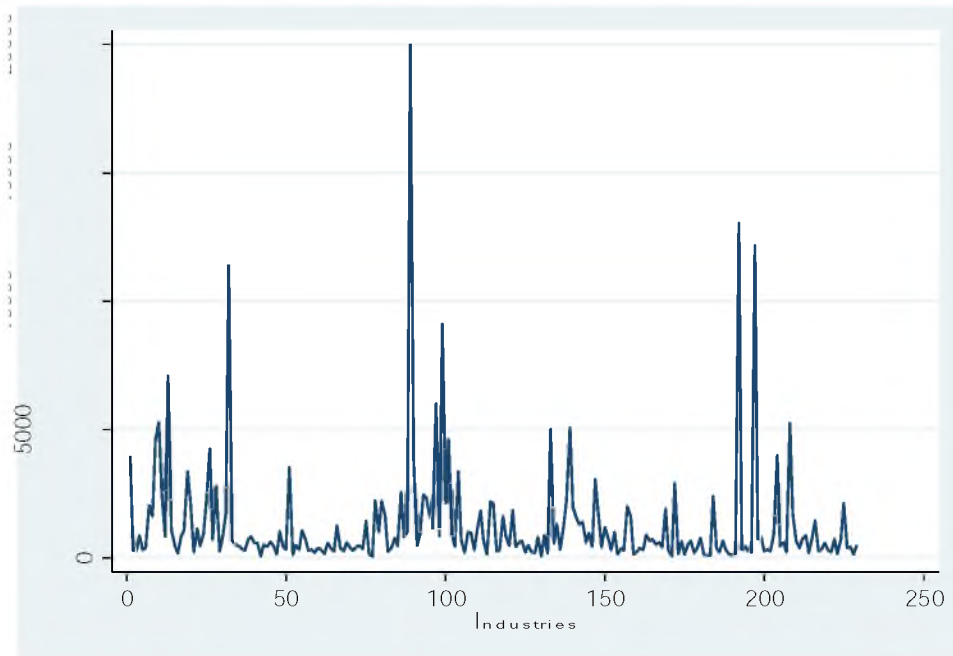
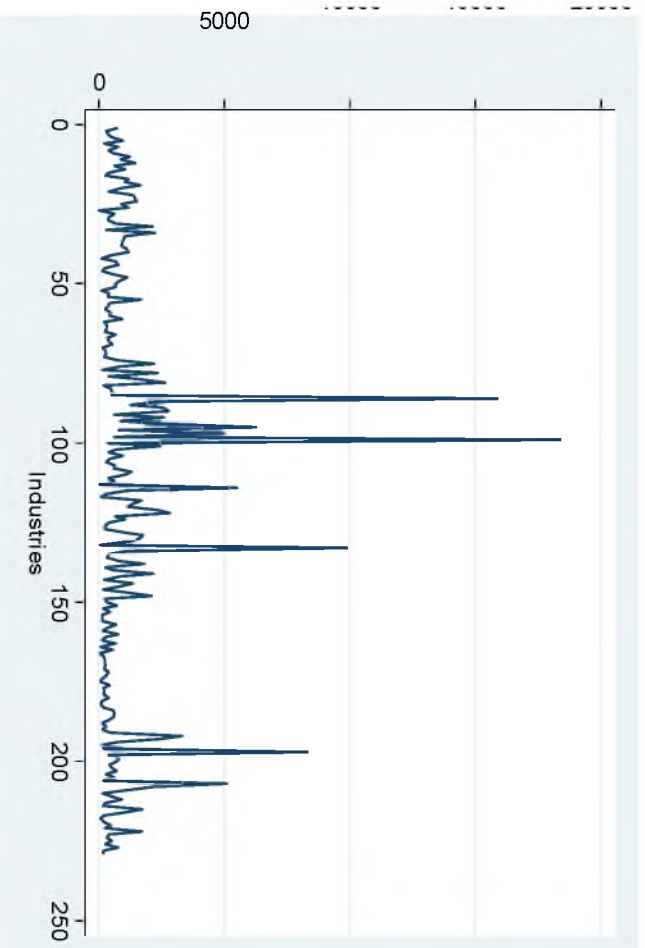
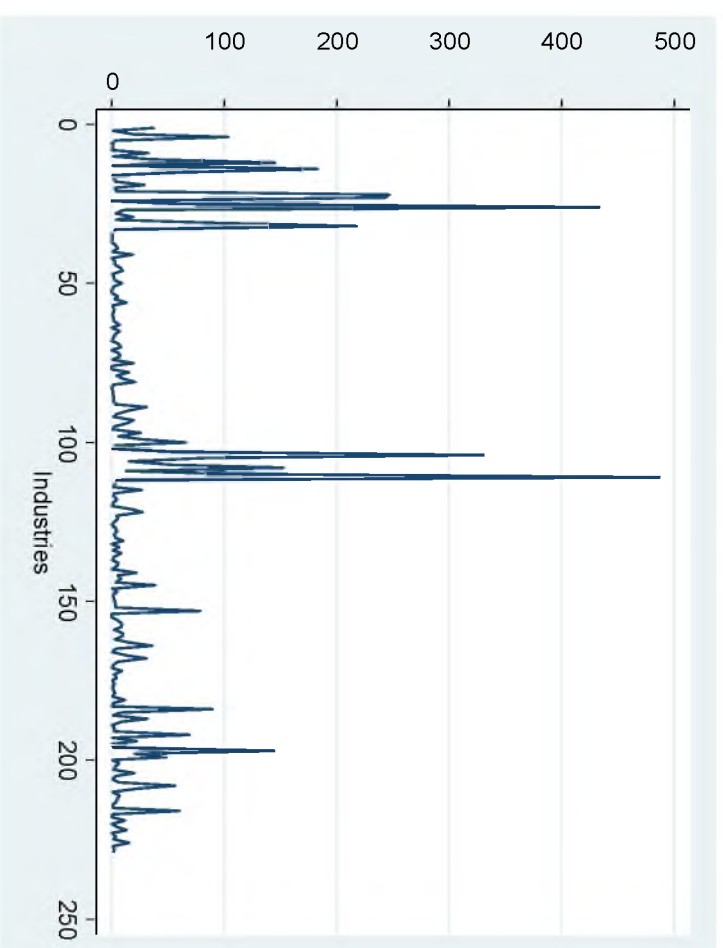


Fig. 2. Capital Intensity**Fig. 3. Advertising Expenditure (Thousand Rupees)**

Appendix Table 1

Summary Statistics of the Variables

Variables	Obs	Mean*	Std. Dev.
Labour Productivity	229	1279.40	2198.22
Capital Intensity	229	1026.88	1930.94
Advertising Expenditure (per Labour)	229	64426.24	208519.20

* Labour productivity and advertising expenditures per labour are in thousand rupees.

Appendix Table 2

Correlation Matrix

	Labour Productivity	Capital Intensity	Advertising Expenditure
Labour Productivity	1		
Capital Intensity	0.44	1	
Advertising Expenditure	0.26	0.06	1

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