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Impacts of Vocational Education and Training on Employment and Wages in Indian Manufacturing Industries: Variation across Social Groups—Empirical Evidences from the 68th Round NSSO Data

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Abstract *Vocational education and training (VET) is critical in developing skilled manpower resources in a country. However, in India, where various administrative and institutional factors are key in the determination of employment and wages, people from all social groups may not benefit equally, from VET. This study analyses how the impact of VET on employment and wages varies across social groups in the Indian manufacturing sector. The main data source for this study is the Employment and Unemployment Survey in India (10th Schedule) of the 68th National Sample Survey quinquennial round (2011–2012). To tackle the problem of bias in sample selection, this study uses Heckman's Sample Selection Model (1979) with the two-steps estimation technique (Heckit). It reveals that VET significantly enhances participation from all social groups in the manufacturing sector and aggregates wages, but is ineffective in certain manufacturing industries. In certain cases, VET variously impacts wages across workers from different castes and ethnicities.*

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1 INTRODUCTION

Vocational education and training (VET) is crucial to develop skilled manpower and improve industrial productivity. At the individual level, VET offers greater access to labour markets (Arum and Shavit 1995) and generates the ability to earn more (Neuman and Ziderman 1989). The definition adopted by UNESCO and the International Labour Organisation for technical VET is as follows:

> A comprehensive term referring to those aspects of the educational process involving, in addition to general education, the study of technologies, and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. (Badawi 2013, p. 284).

To meet the demand for skilled workers in the economy, India has already started to focus on easing access to technical and vocational education, along with general education (Goel 2009). Interestingly, as part of the inclusive growth strategy, India has been trying to ensure that individuals across society—irrespective of gender, age, race, caste, ethnicity and religion—have equal opportunities in receiving VET; learn skills that employers need and demand and find jobs (Goel 2009).

However, a unique feature of the labour market is that while hiring, employers are often influenced not only by the nature and quality of the workers but also, by their socio-cultural attributes (Papola 2012; Leontaridi 1998; Becker 1957). Particularly in a less developed country like India with an under-developed labour market, wages cannot be determined through perfect interactions between supply and demand. Rather, various administrative and institutional factors become key. Hence, it would not be appropriate to use the demand-supply analysis technique in a competitive market framework to understand how wages and employment are determined in the Indian labour market (Das 2007a).

Various empirical studies report the presence of caste/ethnicity disparities or even discrimination in employment and wages in rural and urban India, where equally qualified people from lower castes are paid lower wages and segregated from upper-caste people into lower-paid jobs (Das and Dutta 2007; Agarwal 2013; Thorat et al. 2009; Madheswaran and Attewell 2007; Banerjee et al. 2009; Chakravarty and Somanathan 2008; Sengupta and Das 2014). Given such discriminatory practices, it will be interesting to investigate whether people from different social groups with equivalent levels of skills developed through similar VET programmes are equally likely to get jobs and receive similar wages. There is, however, a dearth of studies on this issue and the present study intends to help fill the gap. This study will, however, restrict its focus to the manufacturing sector. Employment growth in manufacturing, particularly in the registered sector, has been critical in India since the early 1980s. While manufacturing is treated convention-ally as an engine of growth in Kaldor's (1966) sense, the manufacturing sector in India has failed to contribute to economic growth sufficiently by transforming the workforce from land-based activities to highly productive manufacturing work even during the high growth phase in the second half of the 1980s or the 1990s (Das 2007b). Thus, an in-depth empirical study on different aspects of employment and

wages in manufacturing assumes significance. In this context, an investigation into the role of VET in the determination of employment and wages in the manufacturing sector becomes very important as manufacturing jobs often require certain types of skills and knowledge that cannot be obtained through general education. Hence, the present study aims at answering the following research question:

How do the impacts of VET on employment and wage income vary across social groups in the Indian manufacturing sector?

Given this main research question, the present paper attempts to answer the following sub-questions:

a. How does VET influence participation in the various manufacturing industries?
b. How does caste/ethnicity influence the impact of VET on participation in the various manufacturing industries?
c. How does VET influence wages/salaries in the various manufacturing industries?
d. How does caste/ethnicity influence the impact of VET on wages/salaries in the various manufacturing industries?

2 METHODOLOGY AND DATABASE

2.1 Methodological issues

The neo-classical or human capital version of the theories of labour market simply assumes that individuals can freely select from a wide range of jobs on the basis of their own individual tastes and preferences, capabilities and skills, and consequently, earn rewards based on their human capital endowments (Mincer 1974; Leontaridi 1998). Hence, it may be assumed that VET will positively impact the probability of finding a job and earning better wages, as it enhances skills and improves human capital endowments.

However, workers are differentiated not only on the basis of their age, education, skill and experience, but also, the buyer's perception and prejudices (Becker 1957). According to the Theory of Taste for Discrimination proposed by Becker (1957), employers often pose a taste of discrimination against socially excluded groups, and/or use race/caste as a proxy of unobserved variables of job seekers, and perceive lower productivity to be a feature of minorities in society. Thus, rewards to human capital vary on account of the presence of institutional barriers that prevent all individuals from benefitting equally from education and skills (Leontaridi 1998). Thus, in the presence of discriminatory practices in the labour market, the impact of VET on employment and wages may vary across social groups.

Based on the conventional model of labour supply and human capital theories, the labour force participation can be presented as follows (Mincer 1974):

$$Y = f(X_1 \ldots X_n) \tag{1}$$

where Y represents labour market participation, $Y = 1$ when an individual participates in labour market and $Y = 0$ when an individual does not participate in the labour market. $X_1 \ldots X_n$ presents various socio-economic factors, such as expected wage, age, gender, race, education, skills, marital status, non-labour income, etc.

Since the present study considers only the manufacturing sector of the labour market, it takes into account only participation in the manufacturing sector and various manufacturing industries within this sector.

Since Equation (1) involves a binary dependent variable, the application of simple linear regression model will not be justified. It is then, necessary to apply some non-linear probability model. The exact model of estimation for the study takes into account a well-defined participation equation as well as a wage equation.

The Mincerian Earning/Wage Equation takes the following form:

$$w_i = X_i'\beta + u_i \tag{2}$$

where, w stands for wage income, X is the vector of independent variables and β is the vector coefficient. Equations (1) and (2) can be estimated separately. However, this kind of estimation may lead to biased estimations due to sample selection errors during wage estimation, since the researcher considers wage information only for the wage labourers in the manufacturing sector. However, the sample will include both, participants and non-participants as wage labourers in the Indian manufacturing sector.

Hence, the present study has looked for sample selection-corrected estimates so that selection bias can be avoided. In this context, the study applies Heckman's Sample Selection Model (1979) with two-step estimation technique (Heckit). This model is important here for two reasons. First, this model incorporates a participation equation that has helped to build the participation model for this study. Second, the selection equation has helped examine the determinants of wages and find out how VET determines these in the Indian manufacturing sector. In both the participation/selection and wage equations, the dummy variable representing the attainment of VET and the interaction dummy variables combining the VET dummy with different social group dummies (Scheduled Castes-SCs, Scheduled Tribes-STs and Other Backward Castes- OBCs with General Castes acting as the reference category) have been incorporated to calculate the impact of VET on participation and wages and the variation in the impact of VET across social groups. In India, SCs, STs and OBCs are the socially backward groups while General Castes category is the socially forward group in terms of social status as well as economic wellbeing. This paper has also investigated the impact of formal VET to find out whether it produces impact different from the non-formal VET. Thus, this paper estimates two sets of regression equations using the Heckit model—one, to investigate the impact of VET (inclusive of VET in any form) on employment and wages in the Indian manufacturing sector, and the other to examine the impact of formal VET.

The exact specifications of participation and wage equations for evaluating the impact of VET (inclusive of VET in any form) are as follows:

$$
\begin{aligned}
\text{Participation} = {} & \alpha_+ \beta_1\,\text{Land Possession} + \beta_2\,\text{Age} + \beta_3\,\text{Age}^2 + \beta_4\,\text{Gender} \\
& + \beta_5\,\text{Marital Status} + \beta_6\,\text{ST} + \beta_7\,\text{SC} + \beta_8\,\text{OBC} \\
& + \beta_9\,\text{Illiterate} + \beta_{10}\,\text{Primary and Below} + \beta_{11}\,\text{Middle} \\
& + \beta_{12}\,\text{Secondary} + \beta_{13}\,\text{Higher Secondary} \\
& + \beta_{14}\,\text{Postgraduate and Above} + \beta_{15}\,\text{VET} + \beta_{16}\,(\text{VET} * \text{ST}) \\
& + \beta_{17}\,(\text{VET} * \text{SC}) + \beta_{18}\,(\text{VET} * \text{OBC}) + v
\end{aligned}
$$

$$(3.1)$$

and

$$
\begin{aligned}
\text{Wage} = {} & \alpha + \beta_1\,\text{Age} + \beta_2\,\text{Age}^2 + \beta_3\,\text{Gender} + \beta_4\,\text{ST} + \beta_5\,\text{SC} \\
& + \beta_6\,\text{OBC} + \beta_7\,\text{Illiterate} + \beta_8\,\text{Primary and Below} \\
& + \beta_9\,\text{Middle} + \beta_{10}\,\text{Secondary} + \beta_{11}\,\text{Higher Secondary} \\
& + \beta_{12}\,\text{Postgraduate and Above} + \beta_{13}\,\text{VET} + \beta_{14}\,(\text{VET} * \text{ST}) \\
& + \beta_{15}\,(\text{VET} * \text{SC}) + \beta_{16}\,(\text{VET} * \text{OBC}) \\
& + \beta_{16}\,\text{Enterprise Type} + \rho\,\sigma_u\lambda + u
\end{aligned}
$$

$$(3.2)$$

The exact specifications of participation and wage equations for evaluating the impact of formal VET are same as Eqs. (3.1) and (3.2) except the case where the researcher has replaced the variable VET with Formal VET. This has been done in the interaction dummy variable terms as well. For example, VET * ST was replaced with Formal VET * ST and so on.

The interpretations of dependent and independent variables in these Equations are as follows:

Participation = 1 if the respondent is a wage earning worker in the manufacturing sector when we consider participation in the manufacturing industry as a whole or in a particular manufacturing industry when we consider participation in a specific manufacturing industry, = 0 otherwise.

Land possession = Amount of land possessed by household

Age = Age of respondent

Age^2 = Square of age of respondent

Gender = 1 if the respondent is male, = 0 otherwise

Marital status = 1 if the respondent is currently married, = 0 otherwise

ST = 1 if the respondent belongs to ST category, = 0 otherwise

SC = 1 if the respondent belongs to SC category, = 0 otherwise

OBC = 1 if the respondent belongs to OBC category, = 0 otherwise

(General Castes category has been considered as the reference category for social group)

Illiterate = 1 if the respondent is illiterate, = 0 otherwise

Primary and below = 1 if the respondent is primary or below primary educated, = 0 otherwise.

Middle = 1 if the respondent is middle educated, = 0 otherwise

Secondary = 1 if the respondent is secondary educated, = 0 otherwise

Higher secondary = 1 if the respondent is higher secondary educated, = 0 otherwise

Postgraduate and above = 1 if the respondent is postgraduate or above educated, = 0 otherwise

(Graduate and diploma, i.e. respondent has graduate or diploma level education, is taken as reference category for education level)

VET = 1 if the respondent possesses VET of any form, = 0 otherwise

Formal VET = 1 if the respondent has formal VET, = 0 otherwise

VET * ST = 1 if the respondent belongs to ST category and possesses VET of any form, = 0 otherwise

VET * SC = 1 if the respondent belongs to SC category and possesses VET of any form, = 0 otherwise

VET * OBC = 1 if the respondent belongs to OBC category and possesses VET of any form, = 0 otherwise

Formal VET * ST = 1 if the respondent belongs to ST category and possesses formal VET, = 0 otherwise

Formal VET * SC = 1 if the respondent belongs to SC category and possesses formal VET, = 0 otherwise

Formal VET * OBC = 1 if the respondent belongs to OBC category and possesses formal VET, = 0 otherwise

Enterprise Type = 1 if the respondent is working in government-owned enterprise, = 0 otherwise

λ = inverse Mill's Ratio

2.2 Empirical database

Data, for the creating the empirical base of the study, has been used from the Employment and Unemployment Survey in India (10th Schedule) of the 68th NSS quinquennial round for 2011–2012. The cross-sectional survey is roughly representative of the national, state and the so-called "NSS region" levels (National Sample Survey Office 2012). It gathers information on the demographic characteristics of household members, weekly time disposition and their main and secondary job activities (National Sample Survey Office 2012). The principal job activities are defined for all household members as self-employed, regular salaried worker, casual wage labourer and so on. The usual principal activity status is used to examine a person's employment status.[1]

To investigate the impact of VET on employment and wages in the Indian manufacturing sector, the researcher considers the National Industrial Classification 2008 (NIC-2008) at two-digit level for the manufacturing industry. The National Sample Survey Organisation (NSSO) used this standard (NIC-2008) to collate data on the industrial engagement of people (National Sample Survey Office 2012). The NSSO also offers data on whether individuals surveyed received formal and informal VET.

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[1] This is the activity status on which an individual spent relatively longer time during the preceding 365 days prior to the date of survey.

The two-digit classifications of industries include 24 manufacturing entities. However, among these, the researcher has been able to check the employment and wage structure as well as the impact of VET only for those industries with the highest levels of concentration of workers engaged in manufacturing. Hence, industries engaged in manufacturing food products, textiles, wearing apparel, non-metallic mineral products, and fabricated metal products and absorbing a majority of the workers—more than 5 per cent of the total manufacturing workers—have been considered here for econometric analysis (percentage distribution of total manufacturing workers across different manufacturing industries is given in the appendix). This study considers four social groups—STs, SCs, OBCs and General Castes. In this data set, the sample size covering only the individuals engaged in manufacturing industries—either as wage labourers or non-wage workers—within the age group of 15–59 years is 18,654. However, the size of the entire sample corresponding to the age group of 15–59 years is 288,782. This includes wage labourers or non-wage workers in different industries as well as the non-workers.

3 EMPLOYMENT STRUCTURE IN THE INDIAN MANUFACTURING SECTOR

The study examines the percentage distribution of manufacturing workers in India across different social groups in the manufacturing sector as a whole during 2011–2012.

Figure 1 plots the percentage distribution of all workers in the manufacturing sector across social groups against the percentage distribution of total workers

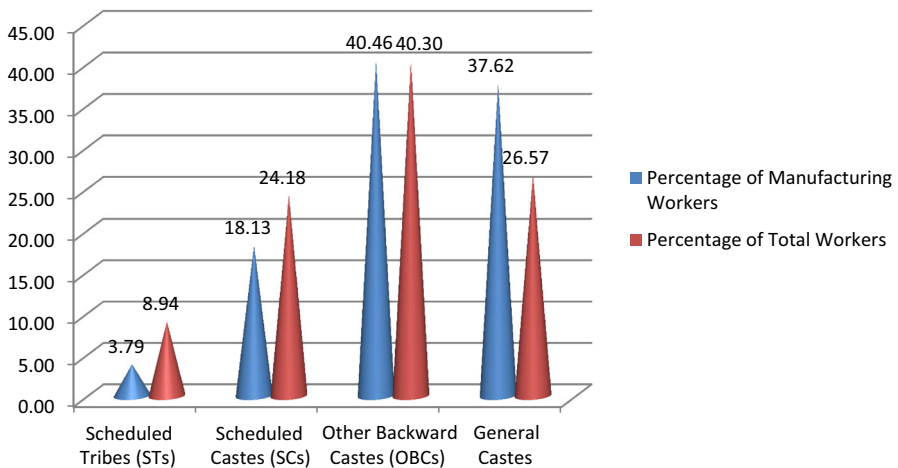**Fig. 1** Distribution of total manufacturing sector workers across different social groups (2011–2012, %). *Note*: Percentage values for workers belonging to different social groups have been calculated using multipliers developed by the NSSO. The multipliers act as weights while determining population estimates using the sample data. *Source*: NSSO 68th Round unit-level data

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across social groups in India. Figure 1 clearly indicates that the Indian manufacturing sector is mainly dominated by the OBC and General Caste workers just like the Indian wage labour market, as a whole. It must be noted that in the labour market—as a whole as well as in the manufacturing sector—the presence of OBCs as wage labourers has been most prominent amongst all the social groups, while the STs have been the least prominent. Moreover, it has been observed that the presence of STs and SCs as wage labourers is far less prominent in the Indian manufacturing sector than in the Indian labour market, as a whole.

Figure 2, on the other hand, reveals that the group of manufacturing sector workers with VET (inclusive of VET in any form) was mainly dominated by the workers from the General Caste (around 56 per cent) followed by OBC workers (around 38 per cent). But, the presence of ST and SC workers with VET (inclusive of VET in any form) was quite low—in fact marginal—for the STs in the Indian manufacturing sector. The findings were more or less similar for workers with formal VET.

Thus, it can be inferred that despite non-General Caste workers having prominent presence in the Indian manufacturing sector, the General Caste workers dominated the group of skilled workers with VET, especially formal VET. It must be noted that people from socially backward classes may either not get enough opportunities to receive VET or face some discriminatory practices when seeking entry into the manufacturing sector despite having VET.

4 WAGE STRUCTURE IN THE INDIAN MANUFACTURING SECTOR

Wage is an important factor of a worker's decision to participate in the labour market or a specific industry or job. However, wages in the manufacturing sector differ across social groups. This paper presents and discusses the wage structure of
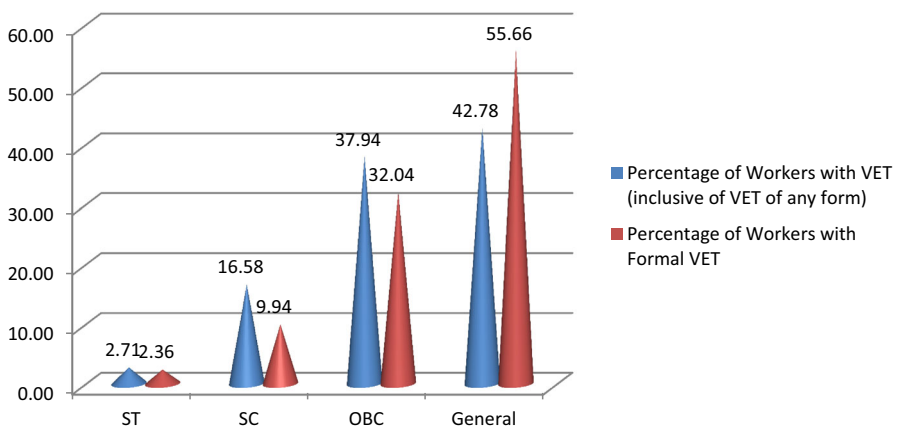

Fig. 2 Distribution of manufacturing sector workers with VET across different social groups: 2011–2012. *Note*: Percentage values for workers belonging to different social groups have been calculated using multipliers developed by the NSSO. *Source:* NSSO 68th Round unit level data

manufacturing workers in general and with VET, separately, for the public sector as well to get some ideas about whether VET has similar impacts on social group-based wage structures in public and private manufacturing sectors of India.

Table 1 reveals the mean wage of General Caste workers to be the highest amongst all the social groups working in the Indian manufacturing sector during 2011–2012. On the other hand, the SC workers in the manufacturing sector received the lowest mean wages. It has been found that amongst the manufacturing sector workers with VET (inclusive of VET in any form), the mean wage was the highest for the workers from the General Castes and the lowest for the SCs. It is interesting to note that the mean wage of the manufacturing workers with formal VET was higher than that of the manufacturing workers with VET (inclusive of VET in any form) in the case of all social groups. Interestingly, ST workers with formal VET were receiving higher wages on average than their counterparts from other social groups. It is also interesting to note that VET, mainly formal VET, generally increased wages on average for all social groups.

Another interesting thing to note here is that, on average, workers in public enterprises received lower wages than those in the private enterprises irrespective of the social groups. This implies that the private manufacturing sector in India paid better wages on average than the government-owned section of the manufacturing industry during 2011–12.

Table 2 presents the mean wage gaps calculated using the classical t test to compare mean values of a variable—wage—of two social groups. Here, the mean wage gaps have been estimated between the ST and the General Caste workers; the SC and General Caste Workers and the OBC and General Caste workers. The mean wage gaps presented in Table 2 reveal that they are all negative, which implies that ST, SC and OBC workers have a lower earning potential than the General Caste workers in the Indian manufacturing sector. Even the ST, SC and OBC manufacturing workers with VET (inclusive of VET in any form) or formal VET have received significantly lower wages than the General Caste workers possessing similar skills during 2011–2012 on most occasions. Nevertheless, the mean wage gaps were lower in magnitude in the public sector on most occasions (Table 2). This

Table 1 Mean wages of manufacturing workers across social groups

Group	Mean Wage of All Workers	Mean Wage of All Workers in Public Sector	Mean Wage of Workers with VET	Mean Wage of Workers with VET in Public Sector	Mean Wage of Workers with Formal VET
All	1,786.40	760.66	1,885.88	853.56	3,633.04
ST	1,323.36	601.94	1,772.09	770.00	5,214.41
SC	1,255.91	826.00	1,307.11	653.20	2,754.22
OBC	1499.99	718.43	1,570.37	879.75	2,527.37
General	2,396.99	1,124.00	2,397.79	1,375.00	4,359.27

Note: There is lack of observations on wage income for workers with formal vocational training working in government enterprises in India in the manufacturing sector

Source: Author's calculation using NSSO 68th Round unit-level data

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Table 2 Mean wage gaps among manufacturing workers across social groups

Group Combination	Mean Wage Gap (All)	Mean Wage Gap (All Public Sector)	Mean Wage Gap of Workers with Vocational Training	Mean Wage Gap of Workers with Vocational Training in Public Sector	Mean Wage Gap of Workers with Formal Vocational Training
ST—General	− 913.52***	− 522.06***	− 476.79**	− 605*	− 134.24
SC—General	− 1108.87***	− 298**	− 973.63**	− 721.8**	− 1626.08**
OBC—General	− 893.06***	− 405.5714***	− 717.08***	− 495.25	− 1791.27***

There is no observation for workers with formal vocational training working in government enterprises in the manufacturing sector in India. Hence, there is no value for mean wage gap for workers with formal vocational training in the public sector

Notes: *** significant at 1% level, ** significant at 5% level, and * significant at 10% level

Source: Author's calculation using NSSO 68th Round unit-level data

could be because of existing affirmative actions implemented for socially backward classes in the public sector, such as reservation policies, anti-discriminatory laws, etc.

It is, however, necessary to mention that the magnitude and the strength of the statistical significance of mean wage gaps appear to be weaker among the manufacturing workers with VET (inclusive of VET in any form) than the manufacturing workers in general (inclusive of all workers with or without VET in any form) when considering the total sector, and the picture is more or less similar when considering only the public sector. Thus, it can be inferred that the mean wage gaps are mostly less intense among workers with VET. Thus, it seems that the acquisition of VET might play a key role in lowering caste/ethnicity-based wage gaps in Indian manufacturing sector. However, formal VET seems to have intensified the wage gap further for OBCs particularly when being compared against that of General Castes.

Nevertheless, the existing social group-based wage gaps among skilled manufacturing workers could be due to the gaps in other human capital endowments (general and/or technical education, experience) and/or discrimination against socially backward classes.

To examine the mean wage gaps in the Indian manufacturing sector, in depth, it becomes imperative to study the mean wage gaps in food products, textiles, wearing apparel, non-metallic mineral products and fabricated metal products, to find out how social group-based mean wage gaps vary across different manufacturing industries.

The mean wage gap between the ST and General Caste workers within the group of total manufacturing sector workers was negative in most of the industries but statistically insignificant in many of them (Table 3). Interestingly, the mean wage

Table 3 Mean wage gap between ST and General Caste manufacturing workers in different manufacturing industries

Industry	ST-General (all workers)	ST-General (workers with VET)	ST-General (workers with formal VET)
Food products	− 904.76**	− 1658.17	− 4367.33
Textiles	321.31	755.59	1406.21
Wearing apparel	− 373.62	− 497.54	–
Non-metallic mineral products	− 739.73***	− 1408.09**	− 2982.5
Fabricated metal products	− 964.50*	− 981.72**	–

Notes: *** Significant at 1% level; ** significant at 5% level; and * significant at 10% level

Source: Author's calculation using NSSO 68th Round unit-level data

Table 4 Mean wage gap between SC and General Caste manufacturing workers in different manufacturing industries

Industry	SC-General (all workers)	SC-General (workers with VET)	SC-General (workers with formal VET)
Food products	− 881.91***	− 1437.89**	− 3707.33
Textiles	− 261.38**	− 363.18**	− 1215.46
Wearing apparel	− 309.64**	− 289.89**	− 1092.91
Non-metallic mineral products	− 578.98***	− 1011.50**	− 2282.5
Fabricated metal products	− 997.79***	− 392.04*	− 2380.50*

Notes: *** Significant at 1% level; ** significant at 5% level; and * significant at 10% level

Source: Author's calculation using NSSO 68th Round unit-level data

gap becomes statistically insignificant in most of the cases among workers with VET (inclusive of VET in any form) and formal VET.

On the other hand, Table 4 shows that the mean wage gaps between the SC and General Caste workers in the manufacturing industries under consideration, were mostly negative and statistically significant mainly amongst all manufacturing workers and manufacturing workers with VET (inclusive of VET in any form).

In most of the industries, when being compared with the cases that considered all workers (inclusive of workers with or without VET), the mean wage gaps between the SC and General Caste workers have widened when only workers with VET (inclusive of VET in any form) have been taken into account and the gaps remained statistically significant. One plausible explanation for this finding could be that the acquisition of VET enhanced the wages of the General Caste workers more than those of the SC workers. However, mean wage gaps were statistically insignificant in most of the industries for workers with formal VET, probably because the return to formal VET in terms of wage to SC workers was mostly at par with that of General Caste workers with formal VET.

Table 5 Mean wage gap between OBC and General Caste manufacturing workers in different manufacturing industries

Industry	OBC-General (all workers)	OBC-General (workers with VET)	OBC-General (workers with formal VET)
Food products	− 635.21***	− 1461.02***	− 3133.63*
Textiles	− 283.48***	− 345.29***	− 345.43
Wearing apparel	− 88.79	− 118.68	− 1231.29**
Non-metallic mineral products	− 464.07***	− 1203.39***	− 3244.38***
Fabricated metal products	− 959.54***	− 543.54***	− 2675.46**

Notes: *** Significant at 1% level; ** significant at 5% level; and * significant at 10% level

Source: Author's calculation using NSSO 68th Round unit-level data

Finally, from Table 5, it may be noted that the mean wage gaps between the OBC and General Caste workers, even amongst the group of workers with VET, in various manufacturing industries were negative and statistically significant across the industries under consideration. Interestingly, the magnitude of mean wage gaps between the OBC and General Caste workers was higher and remained statistically significant in these manufacturing industries amongst manufacturing workers with VET (inclusive of VET in any form), even with formal VET, than amongst all manufacturing workers. Thus, it seems that in the manufacturing sector of India, VET increased the wage earning potential of the OBC workers far less than that of the General Caste workers.

Now, to have a more accurate picture of the influence of VET on employment and wages for different social groups in Indian manufacturing industries, regression analysis has been conducted. The next section discusses the results of the Heckit regression estimation.

5 INFLUENCE OF VOCATIONAL EDUCATION ON EMPLOYMENT IN THE INDIAN MANUFACTURING SECTOR

This section examines the influence of VET on employment for the entire manufacturing sector as well as for a few manufacturing industries, those with the highest level of concentration of manufacturing workers.

Based on the results reported in Table 6, we can infer that the direction of influence of the VET (inclusive of VET in any form) dummy (positive and statistically significant) on employment matches the proposition of human capital theories (Becker 1957; Mincer 1974; Schultz 1971) in the case of the entire manufacturing sector—textiles, wearing apparel, and fabricated metal products manufacturing industries—in India. Thus, it can be deduced that VET (inclusive of VET in any form) can enhance the probability of participation as wage labourers in the manufacturing sector—as a whole—as well as in textiles, wearing apparel, and

Table 6 Impact of VET on employment in Indian manufacturing sector

Variables	All	Food products	Textiles	Wearing apparel	Non-metallic mineral products	Fabricated metal products
Land possession	− 0.0002***	− 0.0001***	− 0.0003***	− 0.0005***	− 0.0001***	− 0.0007***
Age	0.07***	0.06***	0.05***	0.07***	0.02**	0.06***
Age square	− 0.0009***	− 0.0007***	− 0.0007***	− 0.001***	− 0.0004***	− 0.0008***
Marital status	− 0.10***	− 0.06*	− 0.10***	− 0.16***	0.12**	− 0.11**
Sex	0.79***	0.60***	0.50***	0.29***	0.72***	0.89***
ST	− 0.34***	− 0.46***	− 0.25***	− 0.30***	0.02	− 0.12
SC	− 0.02	− 0.04	− 0.15***	− 0.18**	0.30***	0.04
OBC	0.02*	0.03	− 0.01	0.06	0.14***	0.12**
Not literate	0.05**	0.09**	0.30***	0.17**	0.63***	0.1
Primary and below primary education	0.10***	0.14***	0.42***	0.46***	0.37***	0.14**
Middle education	0.04**	0.15***	0.29***	0.34***	0.18**	0.13**
Secondary education	− 0.03	− 0.02	0.20***	0.26***	0.05	0.06
Higher secondary education	− 0.16***	0.02	0.04	0.05	− 0.07	− 0.07
Postgraduate and above	− 0.12***	− 0.09	− 0.11	− 0.14	− 0.2	− 0.40**
VET (inclusive of VET in any form)	0.51***	0.03	0.46***	0.61***	− 0.08	0.42***
VET (inclusive of VET in any form) * ST	0.01	0.32**	− 0.02	− 0.08	0.14	− 0.02
VET (inclusive of VET in any form) * SC	0.01	0.11	− 0.04	0.13	− 0.01	− 0.01
VET (inclusive of VET in any form) * OBC	− 0.11***	− 0.02	− 0.05	− 0.1	0.03	0.01
Constant	− 3.48***	− 4.09***	− 3.86***	− 4.15***	− 3.87***	− 4.57***

Note1: *** Significant at 1% level; ** significant at 5% level; and * significant at 10% level

Note2: In Table 6, the marginal effects of the explanatory variables on the binary dependent variable have not been reported as the paper is studying only the direction of impacts, rather than their magnitude

Source: Author's calculation using NSSO 68th Round unit-level data

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fabricated metal products manufacturing industries in India. However, in industries that manufacture food products and non-metallic mineral products, the possession of VET does not help wage labourers to significantly increase their probability of participation, probably because skilled workers are not required here.

The results (Table 6) further indicate that the impact of VET (inclusive of VET in any form) on employment in the manufacturing sector as a whole is significantly lower for OBC workers than the General Caste workers (coefficients corresponding to VET (inclusive of VET in any form) * OBC are negative and significant). On the contrary, the degree of impact on employment for ST workers is found to be significantly higher than that for General Caste workers in food products manufacturing (coefficients corresponding to VET (inclusive of VET in any form) * ST is positive and significant). However, in the rest of the cases, the coefficient terms of interaction dummies are statistically insignificant, implying no significant difference in the impact of VET on participation across social groups.

With respect to the impact of the control variables, we find that land possession, age, sex, social group and general education levels significantly influence wage labourers' participation in the Indian manufacturing industry.

Table 7 shows the impact of formal VET on the probability of entering the manufacturing sector. The result (positive and significant coefficient) indicates that formal VET increases the probability of participation as wage labourers in the manufacturing sector as a whole and in the textile manufacturing industries. However, for the rest of the chosen manufacturing industries, formal VET cannot significantly increase the probability of participation as wage labourers, probably because jobs in these industries do not require formal VET. Moreover, the degree of influence of formal VET on employment in the manufacturing sector is not found to be significantly different for the General Caste, SC, ST, and OBC workers in the manufacturing sector as a whole (coefficients corresponding to interaction dummy variables are statistically insignificant for manufacturing sector as a whole). In case of the control variables—land possession, age, sex, social group and general education levels exert significant influence as well.

6 INFLUENCE OF VOCATIONAL EDUCATION ON WAGE INCOME IN THE INDIAN MANUFACTURING SECTOR

This section investigates the influence of VET on wages for the entire manufacturing sector as well as in the selected manufacturing industries.

The regression results presented in Table 8 reveal that VET (inclusive of VET in any form) statistically significantly increases the wages of workers in the entire manufacturing sector as well as in the non-metallic mineral products manufacturing industry at the individual industry level, since the corresponding coefficients of the VET dummy are positive and significant.

However, in industries that manufacture food products, textiles, wearing apparel and fabricated metal products, the possession of VET does not significantly help increase the wage income of manufacturing workers. Thus, the impact of VET on wages varies across manufacturing industries.

Table 7 Impact of formal VET on employment in Indian manufacturing sector

Variables	All	Food products	Textiles	Wearing apparel	Non-metallic mineral products	Fabricated metal products
Land possession	− 0.0002***	− 0.0002***	− 0.0003***	− 0.0005***	− 0.0001***	− 0.0008***
Age	0.08***	0.06***	0.06***	0.08***	0.02***	0.07***
Age square	− 0.001***	− 0.0007***	− 0.0008***	− 0.001***	− 0.0004***	− 0.001***
Marital status	− 0.10***	− 0.06	− 0.10***	− 0.17***	0.12**	− 0.13**
Sex	0.82***	0.61***	0.54***	0.36***	0.72***	0.94***
ST	− 0.37***	− 0.41***	− 0.31***	− 0.37***	0.04	− 0.16***
SC	0.01**	0.02	− 0.16***	− 0.14***	0.30***	0.03
OBC	0	0.03	− 0.02	0	0.14***	0.13***
Not literate	0.03*	0.10**	0.27***	0.14**	0.62***	0.04
Primary and below primary education	0.11***	0.14***	0.41***	0.45***	0.36***	0.12**
Middle education	0.05**	0.15***	0.28***	0.33***	0.18***	0.12**
Secondary education	− 0.03**	0	0.19***	0.24***	0.04	0.03
Higher secondary education	− 0.17***	0.02	0.02	0.03	− 0.07	− 0.09
Postgraduate and above	− 0.15***	− 0.1	− 0.13	− 0.17	− 0.19	− 0.42**
Formal VET	0.29***	0.12	0.17**	0.13	− 0.09	0.03
Formal VET * ST	0.18	0.04	0.59**	–	0.15	–
Formal VET * SC	− 0.13	− 0.35	− 0.16	0.36*	− 0.36	0.05
Formal VET * OBC	− 0.09	− 0.21	− 0.13	0.23	0.07	− 0.1
Constant	− 3.53***	− 4.10***	− 3.89***	− 4.22***	− 3.86***	− 4.64***

*Note*1: *** Significant at 1% level; ** significant at 5% level; and * significant at 10% level

*Note*2: In Table 7, the marginal effects of the explanatory variables on the binary dependent variable have not been reported as the paper is studying only the direction of impacts, rather than their magnitude

Source: Author's calculation using NSSO 68th Round unit-level data

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Table 8 Impact of VET on wage income in Indian manufacturing sector

Variables	All	Food products	Textiles	Wearing apparel	Non-metallic mineral products	Fabricated metal products
Age	0.04***	0.02	0.03**	0.05***	0.03**	0.02
Age square	− 0.0002***	− 0.0001***	− 0.0001***	− 0.0005***	− 0.0003***	− 0.0001***
Sex	0.51***	0.54***	0.51***	0.39***	0.36**	0.57**
ST	− 0.08***	− 0.01	0.25**	0.15	− 0.25**	0.2
SC	− 0.09**	− 0.12*	− 0.02	0.01	0.05	− 0.18*
OBC	− 0.10***	− 0.01	− 0.16***	0.13*	0.01	− 0.15*
Not literate	− 1.06***	− 1.00***	− 0.95***	− 0.95***	− 0.80***	− 0.80***
Primary and below primary education	− 0.96***	− 0.95***	− 0.89***	− 0.73***	− 0.81***	− 0.74***
Middle education	− 0.84***	− 0.88***	− 0.73***	− 0.65**	− 0.78***	− 0.63***
Secondary Education	− 0.71***	− 0.70***	− 0.61***	− 0.61***	− 0.78***	− 0.48***
Higher secondary education	− 0.55***	− 0.43***	− 0.54***	− 0.50***	− 0.64***	− 0.44***
Postgraduate and above	0.49***	0.12	0.55***	0.82***	0.09	1.34***
VET (inclusive of VET in any form)	0.06***	0.13	− 0.02	0.06	0.27**	− 0.1
VET (inclusive of VET in any form) * ST	− 0.08	− 0.39	0.06	− 0.80**	− 0.29	− 0.47
VET (inclusive of VET in any form) * SC	− 0.08*	− 0.04	0.08	− 0.11	− 0.07	0.06
VET (inclusive of VET in any form) * OBC	− 0.07**	− 0.21*	0.1	− 0.20*	− 0.37**	− 0.06
Enterprise type	− 0.27***	− 0.22	− 0.11	− 0.46*	− 0.15	− 1.56**
Constant	6.45**	− 7.16***	6.23***	5.89***	6.53***	7.19***

Note: *** Significant at 1% level; ** significant at 5% level; and * significant at 10% level

Source: Author's calculation using NSSO 68th Round unit-level data

Table 8 further shows that the impact of VET (inclusive of VET in any form) on wages is significantly less for OBC workers than for General Caste workers (coefficient of VET (inclusive of VET in any form) * OBC is negative and significant) in the manufacturing sector as a whole and within the food products, wearing apparel and non-metallic mineral products manufacturing industries at the individual industry levels. In the manufacturing industry as a whole, VET (inclusive of VET in any form) also produces a significantly lower impact on wages for SC workers than the General Caste workers. Similarly, VET (inclusive of VET in any form) produces a differing influence on the wages of ST and General Caste workers (coefficient of VET (inclusive of VET in any form) * ST is negative and significant) in industries that manufacture wearing apparel. Thus, in the Indian manufacturing sector, possession of VET does not always benefit the socially backward classes in terms of generating higher wage earning potential at par with the General Castes.

With respect to the impact of the control variables, the results (Table 8) indicate that age, sex, social group and general education levels significantly influence wages in the Indian manufacturing sector.

Table 9 shows the impact of formal VET on wages in the Indian manufacturing sector. The results presented here suggest that formal VET increases the wages of the manufacturing workers in the manufacturing sector as a whole and in some of the chosen manufacturing industries, as the coefficients of formal VET are positive and significant across these. Interestingly, on comparing the findings about VET coefficients in Tables 8 and 9, it may be inferred that the level of impact on wages is higher in the case of formal VET (around 28 per cent) than in the case of VET (inclusive of VET of any form) (around 6 per cent) in the manufacturing sector, as a whole. Thus, it can be inferred that the potential for increasing wage incomes is much higher for formal VET than the non-formal VET.

Table 9 also reveals that the impact of the formal VET on wage income is not always uniform across social groups. For example, the impact of formal VET on wages in the manufacturing sector is significantly lower for OBC workers than for General Caste workers in the case of the manufacturing sector as a whole. Similarly, for industries that manufacture food products and non-metallic mineral products, the results suggest that the impact of formal VET on ST and OBC workers, respectively, is significantly lower than that on General Caste workers. In the case of control variables—age, sex, social group, general education levels and enterprise types—the findings from Table 9 are similar to those observed in Table 8.

7 SUMMARY AND CONCLUSIONS

This study has been restricted only to the manufacturing sector of India to find out the influence of VET on employment and wage, and how these vary across social groups. The findings with respect to the first research question clearly show that VET (inclusive of VET of any form) and formal VET significantly enhance participation in the Indian manufacturing sector. However, the impact on the probability of participation of wage labourers varies across industries in the case of VET (inclusive of VET of any form) as well as formal VET to some extent, due to

Table 9 Impact of formal VET on wage income in the Indian manufacturing sector

Variables	All	Food products	Textiles	Wearing apparel	Non-metallic mineral products	Fabricated metal products
Age	0.04***	0.02	0.03**	0.06***	0.03**	0.02
Age square	− 0.0003***	− 0.0001***	− 0.0001***	− 0.0006***	− 0.0004***	− 0.0001***
Sex	0.52***	0.54***	0.50***	0.38***	0.35***	0.52**
ST	− 0.10***	− 0.02	0.27**	− 0.14**	− 0.27***	0.08
SC	− 0.11***	− 0.11*	0.01	− 0.07	− 0.06	− 0.15**
OBC	− 0.11***	0.04	− 0.12**	0.05	− 0.04	− 0.17***
Not literate	− 1.03***	− 0.99***	− 0.94***	− 0.89***	− 0.81***	− 0.78***
Primary and below primary education	− 0.94***	− 0.94***	− 0.87***	− 0.68***	− 0.80***	− 0.70***
Middle education	− 0.82***	− 0.87***	− 0.61***	− 0.41**	− 0.78***	− 0.61***
Secondary education	− 0.69***	− 0.71***	− 0.60***	− 0.57***	− 0.78***	− 0.46***
Higher secondary education	− 0.54***	− 0.42***	− 0.53***	− 0.47***	− 0.62***	− 0.43***
Postgraduate and above	0.50***	0.1	0.54**	0.87***	0.12	1.09***
Formal VET	0.28***	0.33**	0.14	0.11	0.46	0.52**
Formal VET * ST	− 0.02	− 1.10***	0.02	–	− 0.74	–
Formal VET * SC	− 0.09	− 0.52	0.09	0.14	0.19	− 0.15
Formal VET * OBC	− 0.32***	− 0.17	− 0.14	− 0.1	− 0.78**	− 0.24
Enterprise type	− 0.27***	− 0.23	− 0.12	− 0.38	− 0.14	− 1.53**
Constant	6.43**	7.23***	6.24***	5.69***	6.57***	7.20***

Note: *** Significant at 1% level; ** significant at 5% level; and * significant at 10% level

Source: Author's calculation using NSSO 68th Round unit-level data

differences in the levels of requirement of skilled workers in these manufacturing industries.

Moreover, the empirical analysis presented in this paper also suggests that VET (inclusive of VET in any form) increases wage labourers' participation in the Indian manufacturing sector to a similar extent across social groups, except the OBC. Skilled OBC workers may be concentrated more in industries other than manufacturing, or may be discriminated against more than other socially disadvantaged groups, such as the SCs and STs. Interestingly, formal VET, more or less, similarly enhances the participation of wage labourers in the manufacturing sector as a whole, amongst all the social groups. Even at the individual industry level, the impact of VET or formal VET on participation in manufacturing industries, seems similar. In Indian manufacturing industries, there are more skilled workers with VET from the General Castes than from the non-General Castes. So, it may be inferred that the provision for VET helps people augment their skills and enhances their opportunities to enter the manufacturing sector as wage labourers. In India, the socially backward classes have historically been confined to farming or indigenous low-income and low productive industrial activities; VET has been found to help them participate in the manufacturing sector as wage labourers. Hence, the government is advised to put more effort to offer them VET to facilitate their entry in the manufacturing sector of the labour market.

As far as the impact of VET on wage/salary earning is concerned, both VET (inclusive of VET of any form) and formal VET appear to be capable of significantly increasing the aggregate wages of manufacturing sector workers. However, at the individual industry level, both VET and formal VET are found ineffective in certain industries. This may be why non-General Caste workers dominate many of these industries (such as those that manufacture food products, wearing apparel, textiles and fabricated metal products) and why their wages increase insignificantly compared to the rise of the General caste workers' on many occasions. This makes the average increase in wage in these industries, insignificant. Interestingly, the impact of formal VET has been more intense than VET in general, on wages in the Indian manufacturing sector during 2011–2012.

However, in certain cases, the impact of VET (inclusive of VET of any form) as well as formal VET varies across workers of different castes or ethnicities. For example, during 2011–2012, the impact of VET on the manufacturing sector wages was significantly lower for OBC workers than the General Caste workers in the manufacturing sector as a whole as well as in non-metallic mineral products manufacturing. Some other cases of differing influence on wage for workers of different castes and ethnicities have also been noted for both VET (inclusive of VET of any form) and formal VET during 2011–2012.

Skills developed through VET are not sufficient to eliminate caste/ethnicity-based wage inequalities in the Indian manufacturing sector. While VET definitely helps to improve wages across all social groups in the Indian manufacturing sector on most occasions, a worker with VET from a socially marginalised group, mainly the SCs or OBCs, is not guaranteed a wage similar to that of a General Caste worker with VET, even in the public sector, where they are entitled to the benefits of affirmative action, such as reservation policies. This occurs because they lack other

human capital endowments, such as general education, or because employers exercise discriminatory practices. This remains an area that policymakers need to think about and address properly. In future research endeavours, it is important to figure out the extent to which caste/ethnicity-based discrimination contributes to wage inequality in the Indian manufacturing sector among workers with VET.

APPENDIX

Distribution of total manufacturing workers across different manufacturing industries (2011–2012, %)

Industry	Percentage of workers (%)
Food products	10.05
Beverages	1.12
Tobacco products	1.21
Textiles	13.94
Wearing apparel	9.57
Leather and related products	3.54
Wood and products of wood	3.24
Paper and paper products	1.28
Printing	1.47
Coke and refined petroleum products	0.50
Chemicals and chemical products	3.04
Pharmaceuticals,	2.84
Rubber and plastics products	3.53
Non-metallic mineral products	11.68
Basic metals	4.68
Fabricated metal products	6.36
Computer, electronic, and optical products	1.49
Electrical equipment	3.16
Machinery and equipment	3.04
Motor vehicles	3.11
Transport equipment	1.80
Furniture	2.74
Other manufacturing	5.31
Repair and installation of machinery and equipment	1.28

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