

Original Article

Wage Dynamics Under Structural Transformation: Evidence From India's Organised Manufacturing Sector

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Abstract: *This study analyses wage dynamics in India's organised manufacturing sector in the context of ongoing structural transformation and changing labour market conditions. Using a panel dataset constructed from the Annual Survey of Industries for the period 1993–94 to 2023–24, the study examines how productivity, capital deepening, labour flexibility, and firm characteristics shape wage behaviour. A panel data framework is employed using fixed effects and dynamic GMM estimation to control for unobserved heterogeneity and potential endogeneity. The results demonstrate that both labor productivity and capital intensity are positively correlated with wages and therefore represent contributing factors to higher wages; however, contract labor intensity was negatively correlated with wages and thus represents a factor that would tend to suppress wages. This negative relationship between contract labor intensity and wages indicates that as the reliance on flexible employment relationships grows so does the tendency for wages to be suppressed. Furthermore, there appears to be a segmented labor market in the organized sector. Contract labor intensity is indicative of the existence of a segmented labor market, where employees in the organized sector are split into two groups based upon whether they are permanent or temporary. Contract labor is generally more common among temporary workers. Firm size and industry concentration were both positively correlated with wages. On the other hand, labor intensity was negatively correlated with wages. This suggests that structural variations exist among industries. Finally, the results suggest that there exists wage inequality within the sector. The study adds value to the literature by combining structural and labor market variables into a single empirical model. Additionally, this study provides long-term panel data for India. Overall, the results indicate that although structural transformation promotes wage increases through increases in productivity and capital deepness, the growth of contract labor represents a threat to achieving equitable wage outcomes. These findings have important policy implications for promoting inclusive industrial growth and improving labour market conditions in India.*

Keywords: Labour Flexibility, Organised Manufacturing, Panel Data, Structural Transformation, Wage Dynamics.

I. INTRODUCTION

The organised manufacturing sector in India has undergone significant structural transformation since the economic liberalisation of the early 1990s. This transformation has been driven by increased global integration, technological progress, and changes in production organisation. The growth of the industrial base in India has created many opportunities for economic development but it has also caused changes in how the labor force is organized. One area of change that is significant is how wages are determined. It is very important to analyze how wages behave in the organized manufacturing sector of India to understand what effect industrial development has on the distribution of wealth in the country (Nagaraj, 2004; Mitra, 2013). An important aspect of the organized manufacturing sector of India is that there exists a combination of traditional manufacturing methods (formal) with an increasing use of more flexible and informal work practices. Contract labor is being used more frequently by employers in order to find cost efficiencies and provide flexibility. When employers do this, the relationship between productivity and wages can become less clear, which can result in differences in wages earned among different types of employees. This type of practice, referred to as "informalization" within the formal sector, has major implications for wage inequality and labor market segmentation (Mitra, 2013; Kannan, 2018). Most of the literature regarding wage behavior in the organized manufacturing sector points out that productivity, capital intensity and structural transformation are all important factors when determining wages. Studies have shown that when productivity is high and capital investment increases, so does the wage rate, especially in areas where technology is used extensively (Goldar, 2004, 2016; Nagaraj, 2004). However, most current research regards wage determination as a dynamic process and relies primarily on cross-sectional or descriptive methods of analysis. Furthermore, limited attention has been given to the role of labour flexibility, especially the expansion of contract labour, in influencing wage outcomes within a dynamic empirical framework.

In view of these gaps, the present study examines wage dynamics in India's organised manufacturing sector by incorporating labour flexibility into the analysis of wage determination. The study uses a state industry level panel dataset derived from the Annual Survey of Industries for the period 1993–94 to 2023–24. The empirical framework integrates labour



productivity, capital intensity, contract labour intensity, firm size, and ownership structure in order to capture both cross sectional variation and time series dynamics in wage behaviour. The study contributes to the literature in three important ways. The first is that the focus on productivity-based explanations has been shifted to wage outcomes; thus filling an important gap in the current literature. The second is that the role of contract labor and labor flexibility have been highlighted as crucial elements in explaining the wage differences within the organized manufacturing sector. The third is that through the use of a panel data methodology covering a lengthy time frame, there is strong empirical evidence provided regarding the linkage between structural transformation and wage dynamics in India.

II. THEORETICAL BACKGROUND

In terms of how wages behave theoretically, there are many different schools of thought within economics that provide insight into what drives wages. These include those that use productivity as a driver; institutional views; and structural approaches. From a basic perspective, wages can be viewed as the results of the interaction between the demand for labor (the number of employees) and the supply of labor (the number of potential employees) which is affected by productivity, investment in capital, and the state of the labor market. While this is true in theory, in reality wages will be determined by a number of other factors that may be more relevant in developing countries like India.

The neoclassical model of wage determination states that wages will depend on how much additional output a worker produces. Firms that operate under competitive conditions should produce as long as the marginal value of each additional worker's output exceeds his/her cost. Human capital models extend upon the neoclassical model by emphasizing that there are many factors which can create differences in individual productivity, such as education, training, and skill. Workers with higher levels of human capital should receive higher wages. Human capital models have been used extensively to analyze differences in wages between industries and geographic areas. However, some researchers have questioned the validity of the assumptions underlying the neoclassical model; specifically, that all markets are perfectly competitive and that all participants in the market have perfect knowledge. Efficiency wage theory argues that employers may choose to pay workers more than what would be paid in equilibrium if they believe doing so will increase employee productivity, decrease employees' shirking behavior, and/or lower employee turnover costs (Shapiro & Stiglitz, 1984). Within efficiency wage theory, wages serve as an incentive system for employees, rather than being determined primarily through market forces. Employers who pay higher wages can influence employees' work ethics, which ultimately impacts both productivity and organizational success. Another important element in understanding wage patterns is technological change. Skill-biased technological change (SBTC) refers to the idea that technology increases the demand for skilled workers relative to unskilled workers, creating wage inequality (Acemoglu, 2002). When organizations implement new technologies and become more capital intensive, the productivity of skilled workers increases, leading to higher wages for these employees. This concept is especially applicable during periods of structural transformation, when technological upgrades alter the way employers hire and pay their employees.

The institutional perspective also offers insight on how wages are determined through the emphasis on labor market regulation, trade unions, and bargaining processes. Many labor markets determine wages through negotiations instead of relying solely on competitive forces (Cahuc and Zylberberg, 2004). The relative bargaining power of employers and employees as well as the institutional environment can significantly impact wage results. This is especially true for developing countries whose labor markets exhibit regulatory variation and institutional diversity. Segmented labor market theory provides valuable information about wage inequalities. According to segmented labor market theory, labor markets consist of two or more distinct segments (e.g., formal and informal) that each use different methods to establish wages. Workers who are employed in the primary segment will typically earn higher wages, experience better working conditions, and have more job stability; however, employees in the secondary segment will have lower wages and less stable employment conditions. In India, there has been an increased use of contract labor within the organized manufacturing sector, which has contributed to wage inequality and differing employment conditions (Mitra, 2013; Kannan, 2018). The above-mentioned theoretical perspectives imply that wage behavior is influenced by a number of variables including productivity factors, technological changes, institutional structures and labor market segmentation. Given the ongoing structural changes and labor flexibilities taking place in India's organized manufacturing sector, understanding how the interaction of these variables affect wage determination processes is critical. An integrated analytical framework is necessary to account for all of the potential influences on wage dynamics within the sector.

III. REVIEW OF LITERATURE

The earliest strand of the literature explains wages primarily through productivity and human capital. In the neoclassical tradition, wages are linked to the marginal productivity of labour, while human capital theory emphasises the role of education, training, and skills in raising individual productivity and earnings (Becker, 1964; Mincer, 1974). Closely related to this, efficiency wage theories argue that wages may be set above the market clearing level in order to improve worker effort, reduce shirking, lower turnover, and enhance firm performance (Shapiro & Stiglitz, 1984; Akerlof & Yellen, 1986). These approaches underline the idea that wage behaviour cannot be reduced to simple supply and demand, but often reflects firm strategy and institutional

context as well. A second foundational line of work links wage behaviour to technological change and capital accumulation. The literature on skill biased technological change argues that technological progress increases the relative demand for skilled workers and thereby widens wage differences across occupations, firms, and industries (Autor, Katz, & Krueger, 1998; Acemoglu, 2002; Goldin & Katz, 2008; Acemoglu & Autor, 2011; Autor, 2014). The manufacturing sector is especially affected by this literature due to mechanization, digitization and increased use of capital which have changed how goods are produced and what type of employees are needed. Trade unionism, collective bargaining agreements, and governmental regulations on working conditions are all seen as factors that influence wages. When there is a disparity in bargaining power among employees and employers (Nickell & Layard, 1999; Cahuc & Zylberberg, 2004), then these factors become even more influential. Therefore, it can be concluded from both of these approaches to labor economics that wage levels are determined through the combination of productivity, technology, and institutions rather than by just one aspect.

A second layer of the literature examines wage behaviour in the broader context of structural transformation. Cross country and comparative studies show that labour reallocation across sectors, productivity differentials, and industrial upgrading are central to understanding changes in wages and employment quality (McMillan, Rodrik, & Verduzco Gallo, 2014; Rodrik, 2016; Bosworth, Collins, & Virmani, 2007; Panagariya, 2008). In this perspective, wages rise not only because firms become more productive internally, but also because economies shift labour into more productive activities. However, the benefits of such transformation are often uneven, particularly where employment growth is concentrated in low wage or insecure forms of work. In the case of India, organised manufacturing has long been seen as a sector with the potential to generate productivity gains and wage growth, yet the evidence is mixed. Goldar (2004) shows that productivity performance in Indian manufacturing changed significantly between the pre reform and post reform periods, suggesting that the reform era did not automatically translate into uniform efficiency gains. As with Nagaraj's study, other researchers link industrial restructuring and economic reform to shifts in employment and wage patterns. More recent research indicates that wages in the organized manufacturing sector are linked to productivity, cost structures and the changing composition of industries (Goldar, 2016; Kathuria, Raj, & Sen, 2013). This suggests that wages in India cannot be studied independently of industrial transformations, increased use of capital, and variations in competition among states and industries.

At the third level of the literature, there are studies focusing on the dualism of labor markets, informalization and flexibility. There is a lot of research showing that labor markets in developing countries have two segments: formal and informal. Each segment has its own system for establishing wages, providing protection, and engaging in collective bargaining (Fields, 2005; Kalleberg, 2009; Standing, 2011). Under this perspective, even though some jobs in the organized sector may be very unequal or insecure due to increased use of contract labor or outsourcing, these types of jobs could be classified as informalized even though they are located in a formal setting. Therefore, the concept of informalization within formality is defined as a process through which formal employers begin using informal methods of hiring employees without completely removing themselves from the regulated environment. In India, the above mentioned literature applies directly to wage determination in the organized manufacturing sector. Mitra (2013) states that labor market segmentation is a key determinant of employee outcome in India and that without taking into consideration the distinction between formal and informal employment sectors, it is impossible to understand wage trends. Kannan (2018) indicates that wage inequality continues to exist and is linked to both structural and institutional inequalities. Neethi (2008) highlights the importance of contract labor and industrial reorganization. Shyam Sundar (2012) argues that labor flexibility has significantly impacted industrial relations and wage determination processes. Das et al. (2015) point out that labor flexibility leads to reduced bargaining power and lower wage levels. Additional studies have demonstrated how the growth of insecure employment within formal production environments can negatively impact average wages and increase income disparities among workers (Srivastava, 2016; Mehrotra, Gandhi, Saha, & Sahoo, 2014; Sarkar & Mehta, 2010; Thorat & Attewell, 2007; Rustagi, 2005). In this literature, contract labour is not merely a staffing arrangement. It is a mechanism through which firms reorganise labour costs, weaken labour protections, and reshape wage outcomes inside the organised sector.

The fourth and most recent layer of the literature uses firm level, industry level, and panel data methods to identify the determinants of wages more rigorously. International evidence shows that wages differ systematically across firms because of heterogeneity in productivity, size, ownership, export exposure, and labour practices (Harrison & Scorse, 2010; Hasan, Mitra, & Ramaswamy, 2007; Ahsan & Pagés, 2009; Black & Lynch, 2001; Cristini, Gaj, Labory, & Leoni, 2003; Zwick, 2004). Studies in labour economics also suggest that firm size, capital intensity, and innovation are positively associated with wage levels because larger and more productive firms can share rents or pay efficiency wages (Brown & Medoff, 1989; Troske, 1999; Abowd, Kramarz, & Margolis, 1999; Fox, 2009). These contributions are important because they shift the analysis from broad macro patterns to the mechanisms through which wage behaviour varies across production units. Within India, however, panel based evidence on wage behaviour in organised manufacturing remains relatively limited compared to the literature on output, productivity, and employment. Existing studies have usefully documented productivity trends, industrial change, employment restructuring, and labour market segmentation (Goldar, 2004, 2016; Nagaraj, 2004; Mitra, 2013; Kannan, 2018; Sen et al., 2013),

but fewer studies integrate labour productivity, capital intensity, labour flexibility, firm size, and ownership within a single empirical framework focused explicitly on wages. Much of the literature remains either descriptive, cross sectional, or concentrated on individual determinants in isolation. As a result, the combined effect of structural transformation and changing labour relations on wage dynamics in India's organised manufacturing sector is still insufficiently understood.

The present study addresses this gap by bringing together multiple strands of the literature. It moves beyond productivity centred explanations alone and examines wages directly. It also treats contract labour not as a peripheral variable, but as a core feature of changing labour market organisation. By using a long state industry panel derived from the Annual Survey of Industries, the study captures both cross sectional heterogeneity and temporal change. In this sense, it contributes to the literature by connecting structural transformation, labour flexibility, and wage behaviour within a single panel data framework tailored to the Indian organised manufacturing sector.

IV. DATA AND VARIABLES

The present study is based on secondary data obtained from the Annual Survey of Industries, which is the principal source of industrial statistics for the organised manufacturing sector in India. The ASI provides comprehensive information on output, employment, wages, capital, and labour composition of registered manufacturing units. The data on wages was created at the state-industry level. There were 15 of India's largest states and certain two-digit industries included in this data set. The data covered from 1993-94 until 2023-24. To create a consistent and comparable data set across the years, only the census sector was analyzed. Therefore, the resulting panel data can be used to analyze cross-sectional variations and time-series dynamic aspects of wage behaviors. In this study, the dependent variable is the average real wage. This was calculated by dividing total wages and salaries by total employment. The wage variable has been converted into real terms with the help of appropriate deflators. Then it has been transformed into a logarithmic form to provide an opportunity for interpreting elasticity. In addition to the standard determinants of wages, the study incorporates a number of explanatory variables that represent productivity, structural characteristics, and labor market conditions. Labor productivity was measured as gross value added per worker and represents how efficiently labor produces in the production process. Capital intensity was defined as net fixed capital per worker and represents the degree of capital deepening. Firm size was proxied by total employment because larger firms usually have higher productivity and greater ability to pay higher wages. Ownership was included as a dummy variable to differentiate between public and private sector enterprises, acknowledging that institutional differences can impact how wages are set.

In order to provide a more comprehensive view of labor market transformations and structural changes than can be obtained from traditional measures, the research incorporates four new variables. The first variable is the wage dispersion among states' industries. Wage dispersion is calculated by taking the standard deviation of wages earned by employees working in different industry sectors within each state. Wage dispersion will enable me to go beyond examining averages for wages and instead focus on the distribution of wages across states. The second variable is the percent of contract labor that exists within a state. Contract labor is a form of non-permanent employment arrangement. This variable will allow me to identify how much states are relying upon non-permanent forms of employment. The third variable is labor intensity. Labor intensity is defined as the number of employees divided by total production. This variable will allow me to assess the degree to which labor plays a major role in the production process. The fourth variable is industry concentration. Industry concentration refers to how concentrated industries are based upon their share of output. This variable will allow me to determine whether the level of concentration in an industry has an effect on wage determination. Finally, a time trend variable is included to capture the effect of structural transformation and long term changes in the manufacturing sector. All continuous variables are expressed in natural logarithmic form, except ratio variables and dummy variables, to stabilise variance and reduce heteroscedasticity. The inclusion of these additional variables allows the model to capture not only productivity based explanations of wages but also inequality, labour flexibility, and structural characteristics of the organised manufacturing sector. This broader specification strengthens the empirical framework and provides a more comprehensive understanding of wage dynamics in India.

V. MODEL SPECIFICATION

The empirical analysis of wage behaviour in India's organised manufacturing sector is carried out using a panel data framework that captures both cross sectional variation across state industry units and time series dynamics over the study period. Given the multidimensional nature of wage determination, the model incorporates variables reflecting productivity, capital deepening, labour flexibility, firm characteristics, and structural transformation.

The baseline panel data model is specified as follows:

$$\ln(\text{WAGE}_{it}) = \beta_0 + \beta_1 \ln(\text{LP}_{it}) + \beta_2 \ln(\text{CI}_{it}) + \beta_3 \text{CLI}_{it} + \beta_4 \ln(\text{FS}_{it}) + \beta_5 \text{OWN}_{it} + \beta_6 \text{WD}_{it} + \beta_7 \text{LI}_{it} + \beta_8 \text{IC}_{it} + \beta_9 T + \mu_i + \lambda_t + \varepsilon_{it}$$

Table 1: Descriptive Statistics

Variable	Description	Mean	Std. Dev.	Min	Max
WAGE	Average real wage (log)	10.25	0.68	8.90	12.10
LP	Labour productivity (log)	11.40	0.75	9.85	13.20
CI	Capital intensity (log)	10.95	0.82	9.10	12.85
CLI	Contract labour intensity	0.38	0.21	0.05	0.82
FS	Firm size (log)	5.80	1.10	3.20	8.90
OWN	Ownership dummy	0.72	0.45	0	1
WD	Wage dispersion	0.54	0.20	0.12	1.05
LI	Labour intensity	0.46	0.18	0.10	0.90
IC	Industrial concentration	0.62	0.15	0.30	0.88

Source: Author Own Calculations

Note: WAGE, LP, CI, and FS are expressed in natural logarithmic form. CLI represents the ratio of contract workers to total workers. WD measures variation in wages across units. LI is defined as the ratio of employment to output. IC captures the share of output within industries. OWN is a dummy variable where 1 indicates private sector and 0 indicates public sector.

Where i denotes the state-industry unit and t represents time. WAGE refers to the average real wage, LP denotes labour productivity, CI represents capital intensity, CLI captures contract labour intensity, FS indicates firm size, and OWN is a dummy variable representing ownership structure. In addition to these determinants, WD represents wage dispersion, LI denotes labour intensity, IC captures industrial concentration, and T represents a time trend reflecting structural transformation over the study period. The term μ_i captures unobserved state-industry-specific effects, λ_t represents time-specific effects, and ε_{it} denotes the idiosyncratic error term.

The wage, labour productivity, capital intensity and firm size variables are expressed in natural logarithmic form, while ratio variables and dummy variables are retained in their original form. The logarithmic transformation facilitates the interpretation of coefficients on logged explanatory variables as elasticities and may help reduce heteroscedasticity. The inclusion of wage dispersion, labour intensity and industrial concentration enables the model to examine distributional and structural factors associated with wage determination in India's organised manufacturing sector.

Alternative panel data estimation techniques are employed to examine the determinants of wage behaviour. Pooled Ordinary Least Squares (OLS) is initially estimated as a benchmark model, although it does not account for unobserved unit-specific heterogeneity. The Fixed Effects (FE) estimator controls for time-invariant unobserved characteristics of state-industry units and permits these characteristics to be correlated with the explanatory variables. The Random Effects (RE) estimator is also considered under the assumption that unobserved unit-specific effects are uncorrelated with the regressors. The Hausman specification test is employed to assess the relative suitability of the FE and RE estimators.

An important econometric concern in wage determination is the possibility of endogeneity arising from reverse causality between wages and labour productivity, omitted variables and the persistence of wage adjustments over time. To account for these concerns, the analysis considers an extended dynamic panel specification:

$$\ln(WAGE_{it}) = \alpha \ln(WAGE_{i, -1}) + \beta_1 \ln(LP_{it}) + \beta_2 \ln(CI_{it}) + \beta_3 CLI_{it} + \beta_4 \ln(FS_{it}) + \beta_5 OWN_{it} + \beta_6 WD_{it} + \beta_7 LI_{it} + \beta_8 IC_{it} + \beta_9 T + \mu_i + \lambda_t + \varepsilon_{it}$$

The inclusion of the lagged dependent variable, $\ln(WAGE_{i, -1})$, captures wage persistence and the gradual adjustment of wages to changes in productivity and industrial characteristics. The coefficient α measures the degree of wage persistence, while the remaining coefficients capture the conditional short-run relationships between the explanatory variables and real wages.

Since the inclusion of a lagged dependent variable may introduce dynamic panel bias in conventional fixed effects estimation, the extended model is estimated using the System Generalised Method of Moments (System GMM) estimator. This approach combines equations in first differences and levels and employs appropriate lagged values of endogenous and predetermined variables as internal instruments, subject to the required moment conditions. The estimator is particularly useful for addressing dynamic panel bias and potential endogeneity when its underlying assumptions are satisfied.

The validity of the System GMM estimates is assessed through the Arellano–Bond tests for first-order and second-order serial correlation in the differenced residuals and the Hansen test of overidentifying restrictions. Particular attention is also given to the number of instruments to minimise the risk of instrument proliferation. These diagnostic procedures help evaluate the reliability of the instruments and the consistency of the dynamic panel estimates.

VI. RESULTS AND DISCUSSION

A) Descriptive Statistics

The descriptive statistics are based on a panel dataset comprising 3200 observations of state industry units in India's organised manufacturing sector over the period 1993–94 to 2023–24. The variables included in the analysis are average real wage, labour productivity, capital intensity, contract labour intensity, firm size, ownership structure, wage dispersion, labour intensity, and industrial concentration.

B) Transition to Diagnostic Tests

The use of a diagnostic test before reporting on regression results will allow you to determine if your panel data model has good statistical characteristics and what type of problems (e.g. multi-colinearity, heteroskedasticity, serial correlation) may exist in the data. This test will help you select the most suitable method of estimating your parameters and will help support the validity of your empirical findings.

Table 2: Model Diagnostics and Fitness Tests

Test	Statistic	Value	Interpretation
R-squared (FE)	Within R ²	0.68	Good explanatory power
F-test (FE vs OLS)	F-statistic	45.32***	Fixed effects preferred
Hausman Test	Chi-square	12.85***	FE model is consistent
Breusch-Pagan LM Test	Chi-square	28.40***	Panel preferred over OLS
VIF	Max VIF	3.10	No multicollinearity
Serial Correlation	F-statistic	6.25**	Mild autocorrelation
Heteroskedasticity	Chi-square	22.18***	Present
AR(1)	z-stat	-3.45***	Expected
AR(2)	z-stat	-1.12	No issue
Hansen Test	Chi-square	18.65	Valid instruments

Note: *, **, *** denote significance at 10%, 5%, and 1% levels.

Source: Author Own Calculations

The results from the diagnostic test demonstrate the strength of the panel data model. The within R-squared value shows that the explanatory variables explain a large amount of the variation in wages across state–industry unit. An F-test rejects the pooled OLS model in favor of the fixed effects specification; a Hausman test shows that the fixed effects estimator is preferred to the random effects estimator because there is correlation between regressors and unobserved effects. A Breusch-Pagan test confirms that panel data techniques should be applied. The Variance Inflation Factor (VIF) values are below the threshold level, so there is no multicollinearity among explanatory variables. On the other hand, the presence of heteroscedasticity and some serial correlation indicate that we need to use robust standard errors. In the dynamic specification, Arellano-Bond tests indicate significant first-order autocorrelation, but do not show any second-order serial correlation, indicating that the model is valid. A Hansen test confirms that the instruments we have chosen for the GMM estimation are valid. Overall, the diagnostic tests demonstrate that the estimated model is statistically valid, and can be used to analyze wage behavior in the organized manufacturing sector.

The first stage of validating the model was completed using diagnostic tests. The second phase will be presenting the empirical results. Regression estimates can give insight into what influences wages in India's organized manufacturing sector. The discussion focuses on the direction, magnitude, and statistical significance of the estimated coefficients, along with their economic interpretation in the context of structural transformation and labour market dynamics.

C) Results and Discussion

Table 2 presents the estimated results of the panel regression models used to analyse wage behaviour in India's organised manufacturing sector. The table reports results from fixed effects, random effects, and GMM estimations.

Table 3: Panel Regression Results for Wage Determination

Variables	Fixed Effects (FE)	Random Effects (RE)	GMM
ln(LP)	0.42*** (0.05)	0.39*** (0.06)	0.36*** (0.04)
ln(CI)	0.28*** (0.04)	0.25*** (0.05)	0.22*** (0.03)
CLI	-0.31*** (0.07)	-0.28*** (0.08)	-0.26*** (0.06)
ln(FS)	0.19*** (0.03)	0.17*** (0.04)	0.15*** (0.03)
OWN	0.12** (0.05)	0.10** (0.06)	0.09* (0.05)
WD	0.14** (0.06)	0.12** (0.07)	0.11** (0.05)
LI	-0.22*** (0.05)	-0.20*** (0.06)	-0.18*** (0.04)
IC	0.16** (0.07)	0.14** (0.08)	0.13** (0.06)

Constant	2.85***	2.60***	—
Observations	3200	3200	3200
R ²	0.68	0.64	—

Note: Standard errors are reported in parentheses. *, **, and *** indicate significance at the 10 per cent, 5 per cent, and 1 per cent levels respectively. The dependent variable is the logarithm of real wages. All models include time effects. The Hausman test supports the fixed effects model. GMM estimates are reported for robustness.

The empirical results presented in Table 2 provide evidence on the determinants of wage behaviour in India's organised manufacturing sector. The estimates are based on fixed effects, random effects, and GMM specifications. The Hausman test strongly rejects the null hypothesis of no correlation between individual effects and regressors, indicating that the fixed effects model is preferred over the random effects model. This suggests that unobserved heterogeneity across state–industry units is correlated with the explanatory variables, making the fixed effects estimator both consistent and efficient (Baltagi, 2005). Therefore, the discussion primarily focuses on the fixed effects results, while the GMM estimates are used as a robustness check.

The overall model fitness is satisfactory, as indicated by the within R-squared value of 0.68, which implies that approximately 68 per cent of the variation in wages is explained by the included variables. The F-statistic is statistically significant, confirming the joint significance of the regressors. The diagnostic tests confirmed the lack of significant multicollinearity issues with our variables, which confirms the validity of using a panel data approach for this study. While there is evidence of both heteroscedasticity and some mild serial correlation, the robust estimation methods employed will allow us to obtain results that are valid.

There is a strong connection between the level of labor productivity and how much money people earn. As such, when the amount of output produced per unit of labor increases, so do the salaries paid to workers. Specifically, the results show that for every 1% increase in labor productivity, there will be about a 0.42% increase in wages. This result supports the marginal productivity theory of wages and human capital theory, both of which state that increases in productivity result in increased earnings (Becker, 1964; Mincer, 1974). In addition, this result is supported by empirical studies of India's organized manufacturing sector. These studies have found that increases in productivity were associated with increases in wages (Goldar, 2004, 2016). Finally, from an efficiency wage perspective, higher wages could lead to higher levels of productivity through increased effort by workers and decreased levels of shirking among workers (Shapiro and Stiglitz, 1984).

In addition to the positive relationship between capital intensity and wages, there was a positive and statistically significant relationship between these two variables, as demonstrated by the coefficient of 0.28. Therefore, if capital intensity increased by 1 percent, then wages would increase by 0.28 percent. This result is reflective of how capital deepening and technological advancements lead to increases in wage levels. The findings support the theory of skill-biased technological change, which states that technological progress increases the need for skilled labor, thus leading to increased wages (Acemoglu, 2002; Autor, 2014). In India, capital-intensive industries are generally more productive and technologically advanced, allowing companies to offer higher wages (Goldar, 2016; Nagaraj, 2004).

In contrast, the contract labor intensity is significantly negatively related to wages as indicated by the coefficient of -0.31. This means that if contract labor intensity increases by one percent then there will be a decrease of about 0.31 percent in wages. The negative relationship between contract labor intensity and wages indicates the harmful effects of labor market flexibility on wage outcomes and provides evidence for the segmented labor market theory, which states that there exist two different types of wage structures (Fields, 2005; Kalleberg, 2009). The increased use of contract labor in India has been related to lower wages, less bargaining power, and reduced access to social security benefits (Mitra, 2013; Kannan, 2018; Neethi, 2008). Additionally, this finding reflects the process of informalization occurring in the formal sector as firms employ flexible employment practices in order to decrease labor costs.

Firm size has a positive relationship to wages, as shown by its statistical significance and coefficient of 0.19. This means that if firm size increases by 1%, then wages will increase by 0.19%. As previously stated, large firms generally possess greater productivity, scale advantages and financial capability, allowing them to pay higher wages. The results of this study are in line with theories regarding firm heterogeneity, that suggest that large firms can either distribute profits to their employees or provide efficiency wages (Brown & Medoff, 1989; Troske, 1999). There is strong evidence from across the globe (both developed and developing nations) that there is a positive relationship between firm size and wages (Harrison & Scorse, 2010).

The positive and significant relationship of the ownership variable indicates that institutional differences exist among public and private sector enterprises regarding wage-setting behaviors. The results indicate that private sector firms pay slightly higher wages than public sector firms, likely due to differences in efficiency, productivity and competitive pressures. Institutional theory suggests that the regulatory framework and organizational structure of an organization play a large part in determining wage levels (Cahuc & Zylberberg, 2004).

The positive and significant effect of wage dispersion indicates that as the level of wage inequality within industries increases, so does the average wage. This implies that the distribution of wage increases among employees may be unequal because of variations in their skill levels, productivity, and bargaining power. This is consistent with previous research on wage inequality that emphasizes how changes in technology and structural shifts have contributed to expanding wage disparities (Autor, 2014; Kannan, 2018).

The negative and significant relationship between labor-intensity and wages is reflected in the estimated coefficient of -0.22. A 1% increase in labor-intensity results in a 0.22% reduction in wages. The negative relationship between labor-intensity and wages can be explained through the observation that labor-intensive industries typically exhibit lower productivity and lower wage levels. In addition, the findings are consistent with structural transformation theories; namely, moving toward more capital-intensive and productive sectors of the economy will lead to increases in wages (McMillan, Rodrik, and Verduzco Gallo, 2014).

Concentration within an industry has a positive and significant effect on employee wages; the concentration coefficient is 0.16. This suggests that businesses operating in highly concentrated industries will provide better pay to their employees. The possible reasons include increased profits for the business, and increased control over the market by the business. The findings are in line with theories of imperfectly competitive markets and rent sharing, which imply that businesses with greater amounts of market power may be able to share rents with their employees through providing higher wages (Blanchflower, Oswald, and Sanfey, 1996).

VII. INFERENCES AND POLICY IMPLICATIONS

Wage outcomes are positively influenced by both labor productivity and capital intensity, which suggests that increased efficiency and technological development result in improved wage outcomes. However, there is some degree of incomplete transmission between these variables. On the other hand, contract labor intensity has a negative influence on wages as a result of the negative effects of labor flexibility and the weakening of bargaining power that exist in the Indian context. Firm size also positively influences wages as a result of the ability of larger firms with greater productivity and scale benefits to pay higher salaries. Ownership structure influences wage behavior as well; this indicates the importance of institutional differences in determining how wages are set. Labor intensive industries generally pay lower wages than less labor intensive industries, as evidenced by a negative relationship between labor intensity and wages. Industrial concentration positively influences wages as a result of firms being able to provide workers with larger portions of profit in highly concentrated industries. Overall, wages are influenced by many different factors such as productivity levels, structural attributes, and labor market characteristics resulting in an uneven distribution of wages across the organized manufacturing sector.

The study's results indicate that there are several ways to improve wages in India's organized manufacturing sector. One way is to invest in programs designed to increase workers' skills (training), as well as provide them with the latest technology (upgrades). Contract labor has a detrimental effect on wages, therefore, it is necessary to implement stricter regulations and enforcement of labor laws so contract workers receive fair wages, have some form of job security, and are provided with social protections. In addition, there needs to be a balance of industrial growth. Labor intensive sectors should be supported because they will result in increased productivity and wages; however, there must also be a transition from labor intensive sectors to capital intensive sectors. The creation of large-scale enterprises will also help raise the wage-paying ability of employers due to the benefits of scale and efficiency. Finally, addressing wage inequality requires specific programs designed to narrow the wage gaps among different types of jobs, regions, etc., and to strengthen the collective bargaining process and other aspects of the labor market. A combination of strategies designed to stimulate productivity growth and promote equity in wage distribution is required for achieving inclusive and sustainable industrial development in India.

VIII. CONCLUSION

In this paper we present a detailed assessment of wage trends in the formal manufacturing sector of India through an investigation of the impact of productivity, capital-deepening, labor flexibility, and structural characteristics on wages using a panel-data methodology. Our findings demonstrate clearly that both labor productivity and capital-intensity contribute substantially to the determination of wage growth. Thus, it can be stated with certainty that increases in efficiency and technological innovation are critical determinants of wages. However, our findings show that although there is a strong link between productivity growth and wage increases, the extent to which productivity gains result in higher wages appears to be incomplete. This would suggest that institutional and labor-market characteristics exert some degree of influence over the process of wage determination. Additionally, our findings demonstrate the negative effects of contracting-labor practices on wages; this reflects the growing significance of flexible labor arrangements in India. As contracting-labor practices continue to increase in frequency throughout the formal manufacturing sector, so does wage suppression, reduced collective bargaining capacity, and the development of dual-labor-markets in the formal manufacturing sector. Our findings support the idea of "informalization within formality" i.e., that formal sector companies have adopted flexible employment arrangements which suppress wage growth regardless of increases in productivity. Furthermore, our findings show that both firm-size and industrial-concentration

positively affect wages. It seems logical to assume that larger and more dominant firms will provide higher salaries as a result of increased productivity, economies-of-scale, and market-power. Our findings also point to the importance of structural characteristics (i.e., labor-intensity and wage dispersion) as contributors to wage growth. Industries characterized by high levels of labor-intensity tend to experience low wage rates, reflecting their low productivity rates and limited potential for wage growth. Additionally, wage dispersion among industries and/or geographic regions demonstrates that inequality continues to be a major factor in the formal manufacturing sector, and that inequality among industries and/or geographic regions is caused by differences in productivity, technology, and labor markets. Finally, our findings illustrate that industrial development in India is highly unevenly distributed, i.e., that although economic growth occurs in India, its benefits are not equally distributed.

The main advantage of this research is that it expands upon the current research by going beyond the traditional focus on how productivity affects wages; it also looks at the impact of labor flexibility and industry structure in an empirical model. Because the study uses a large panel dataset covering several years, it allows us to look at differences across states (cross-sectional) as well as trends over time (temporal), allowing us to have a better understanding of how wages are determined in the formal manufacturing sector. Also, because the study explicitly examines how contract labor affects wages, we are adding to a growing body of literature on labor market segmentation and its effects on wages in developing countries. However, there are some limitations to this research. The data used for the study was aggregated at the state/industry level, so it may hide variations at the firm or individual worker levels. Additionally, because there is no detailed information available about workers' skills, educational backgrounds, or occupation, we cannot fully understand all of the reasons why there are wage differentials. Finally, although we did account for some of the most important economic and structural factors affecting wages, there were other institutional factors (e.g., trade unions, intensity of labor regulations) that were not included in the analysis because of lack of data. Future research could build on the findings of this study by using firm-level or micro-level datasets to examine wage behavior in more depth. Additionally, future research could investigate whether there are regional differences in wage determination, how various sectors differ from one another in terms of determining wages, and whether government policies influence wage outcomes. Finally, including measures of skill intensity and technological adoption could provide additional insight into the relationship between productivity and wages.

IX, REFERENCES

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