

HOW DRIVERS AND DETERMINANTS SHAPE REGIONAL WAGE DISPARITIES IN UZBEKISTAN?

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Abstract

This study empirically analyzes the main economic and demographic factors affecting the average wage level in 14 regions of Uzbekistan between 2017 and 2023. The study, based on panel data, uses a fixed effects (FE) regression model that takes into account individual (inter-regional) changes. The main independent variables are productivity, investment volume, education ratio, inflation rate, population, employment rate, and GDP. The results of the analysis show that productivity, investment, and population are the factors that have the strongest impact on wage growth. Education and inflation are not statistically significant in this model. Practical policy recommendations are developed based on the results.

Key words: wage, productivity, panel regression, Uzbekistan, regions

1. Introduction

In recent years, Uzbekistan has implemented economic reforms, liberalized the labor market, increased international investment, and experienced population expansion. In light of these developments, pay levels and regional variations have emerged as a study focus. Wages are not only a direct reflection of the population's level of living, but they also serve as an economic indicator of production efficiency and human capital quality.

By understanding the factors influencing the wage variable, it is feasible to remove regional disparities within the country, assure effective resource allocation, and promote social stability. However, the available scholarly literature on Uzbekistan has mostly focused on this topic at the national level, with insufficient empirical analysis at the regional level.

This study seeks to address this gap by examining the factors influencing salary levels in all areas of Uzbekistan between 2017 and 2023 using panel regression.

2. Literature review

The relationship between wages and productivity in manufacturing industries is complex and multifaceted. While some studies suggest a positive correlation between wages and productivity (Nayak, 2012; Afrooz & Rahim, 2010), others find little evidence of an age-related pay-productivity gap (J.van Ours & Stoeldraijer, 2010). Theoretical models, such as marginal productivity theory and efficiency wage theory, have been used to explain this relationship (Nayak, 2012; Jain, 2019). Empirical studies have shown that factors like gender, age, and education influence both wages and productivity (Afrooz & Rahim, 2010). In the Indian context, a divergence between wage growth and productivity growth has been observed, with efficiency wage theory found to be more appropriate in explaining long-term equilibrium (Jain, 2019). To address this, it is suggested that skill intensity should match capital intensity, potentially increasing workers' bargaining power and encouraging higher production (Jain, 2019).

The relationship between education and wages has been extensively studied across various countries. Research consistently shows a positive correlation between educational attainment and wages, with higher levels of education generally leading to greater wage premiums (Kahyarara, 2013; Enu et al., 2014). However, this relationship is complex and non-linear, with returns to education often increasing at higher educational levels (Kahyarara, 2013). Wage inequality can be influenced by

factors such as gender, sector, and regional differences (Enu et al., 2014; Hakro et al., 2021). The expansion of higher education can have varying effects on wage inequality over time. In Chile, for instance, it contributed to increasing inequality in the 1990s but decreasing inequality in the 2000s, partly due to the decreasing returns to university degrees (Murakami & Nomura, 2020). Policymakers may need to address wage inequality through targeted interventions, such as improving access to education and increasing minimum wages (Hakro et al., 2021).

Recent research explores the complex relationship between wages and inflation across different economies. In Uzbekistan, a positive association between wages and inflation was found, suggesting the need for wage indexation and efficient supply policies (Bakhriddinov, 2024). European studies reveal that while wage growth has historically led to higher inflation, this impact has weakened since 2009, particularly in periods of low inflation expectations and increased competition (Boranova et al., 2019). The COVID-19 pandemic's economic support measures have been linked to increased inflation and wage growth, with a 5 percentage point rise in direct transfers correlating to a 3 percentage point boost in both (Jordà & Nechio, 2022). In Nigeria, food and transportation costs are identified as primary inflation drivers, negatively impacting employee compensation. The study recommends measures such as maximum price legislation and rational wage policies to address these challenges (Adeniyi et al., 2024). These findings highlight the nuanced and context-dependent nature of wage-inflation dynamics.

Research on investment and wages reveals complex relationships across different economic contexts. In India, investment in the formal sector may reduce the formal-informal wage gap under certain conditions, but investment in the informal sector is unlikely to close this gap (Chattopadhyay, 2018). In China, higher minimum wages are associated with increased capital investment, particularly in labor-intensive firms with technological improvement potential (Geng et al., 2020). Firms face a tradeoff between output price and wage uncertainties when making investment decisions, as price shifts positively impact investment while wage shifts have negative effects (Huang, 2013). In Indonesia, recent policy changes aim to improve the investment ecosystem and wage system within the framework of Pancasila industrial relations, as outlined in the Job Creation Law (Banjaransari, 2022). These studies highlight the intricate interplay between investment, wages, and broader economic factors across different national contexts.

Research on population and wages reveals complex relationships between demographic factors, education, and economic outcomes. Urban density is associated with higher productivity and wages, particularly for skilled workers, suggesting benefits of agglomeration (Morikawa, 2011). Education level significantly impacts income, with higher education correlating to higher wages (Xie, 2022). However, wage disparities persist across gender, race, and marital status, highlighting ongoing labor market discrimination (Xie, 2022). Demographic shifts, such as increased life expectancy, necessitate higher wages to maintain a productive working population and contribute positively to the economy (Ridho et al., 2019). Despite rising nominal wages, regional and sectoral differences contribute to social inequality, with real wage growth lagging due to inflation (Lytnev et al., 2024). These findings underscore the importance of addressing wage disparities, enhancing labor productivity, and implementing social programs to improve living standards and reduce inequality in the face of demographic and economic changes.

Research on employment rates and wages reveals complex relationships across countries and economic conditions. High unemployment-to-wage employment ratios in poor countries indicate labor market frictions, leading to increased self-employment (Poschke, 2019). Wage compression, contrary to some expectations, is associated with higher employment rates and labor force participation across countries (Barth & Moene, 2012). In the manufacturing sector, productivity growth has differential

effects on employment and wages across industry groups, with implications for labor market flexibility policies (Das & Halder, 2017). The cyclical relationship between wage growth and labor market flows shows that wage inflation positively correlates with both employer-to-employer transitions and the employment rate, suggesting that employer-to-employer transitions serve as a measure of labor demand (Moscarini & Postel-Vinay, 2017). These findings highlight the complex interplay between employment rates, wages, and economic factors across different contexts.

3. Methodology

3.1. Data source and variables

The study examined panel data from Uzbekistan's 14 regions from 2017 to 2023. The statistics were taken from accessible sources maintained by the Republic of Uzbekistan's State Statistics Committee.

Table 1

Description of main variables

Variable	Description	Transformation
wage	Average annual wage (UZS)	ln(wage)
productivity	GDP per worker (UZS)	ln(productivity)
educ_ratio	Higher education graduates per 1,000 workforce (graduate / labor force)	-
inflation	Annual inflation (%)	-
invest	Annual investment volume (bln soums)	ln(invest)
population	Population of the region (thousand people)	ln(population)
employment_rate	Employment rate (%)	-

All unit variables were log-transformed, allowing for the estimate of elasticity coefficients while also balancing measurement discrepancies.

3.2. Model construction

To make analysis the formula was formulated below:

$$\ln(\text{wage}_{it}) = \beta_0 + \beta_1 \ln(\text{productivity}_{it}) + \beta_2 \text{educ_ratio}_{it} + \beta_3 \text{inflation}_{it} + \beta_4 \ln(\text{invest}_{it}) + \beta_5 \ln(\text{population}_{it}) + \beta_6 \text{employment_rate}_{it} + u_{it} + \epsilon_{it}$$

here:

i-region, t-time (year)

u_{it} - constant characteristics for each region

ϵ_{it} -error term

The model used a Fixed Effects (FE) approach. The Hausman test showed that the FE model was superior to the RE model. ($\chi^2(6)=188.00$, $p<0.01$)

4. Results and discussion

The model analysis yields $R^2 = 0.9847$, indicating that it can explain 98% of the observed changes over time. This demonstrates a very high degree of accuracy. $\text{Prob} > F = 0.0000$, implying that the model has overall statistical significance. Furthermore, $\rho = 0.999$ implies that inter-regional differences account for a significant portion of the variation, confirming the importance of individual differences in panel data.

According to this analysis, production efficiency, investment, and population reduction all have a major impact on wages. The statistical relationship between education level and inflation has not been identified.

Table 2

Results of panel data estimation

ln_wage	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
ln_productivity	.4887374	.0470448	10.39	0.000	.3950785	.5823963
educ_ratio	.1147149	4.359044	0.03	0.979	-8.563475	8.792904
inflation	-.18235	.3920637	-0.47	0.643	-.9628889	.5981889
ln_invest	.0557405	.0209168	2.66	0.009	.0140982	.0973827
ln_population	3.197889	.3587007	8.92	0.000	2.483771	3.912007
employmentrate	.0059682	.0029945	1.99	0.050	6.52e-06	.0119298
_cons	-12.82525	2.623015	-4.89	0.000	-18.04727	-7.603224
sigma_u	1.5000696					
sigma_e	.04725252					
rho	.99900872	(fraction of variance due to u_i)				

F test that all u_i=0: F(13, 78) = 29.64

Prob > F = 0.0000

The findings of the investigation show that labor productivity has a strong beneficial influence on pay levels. The model's estimated coefficient is 0.4887, which suggests that for every 1% improvement in labor productivity, earnings rise by an average of 0.49%. This finding is compatible with neoclassical economic theories, namely the notion of marginal productivity. That is, when the work force's efficiency in production improves, it begins to produce more value, encouraging employers to raise salaries. In Uzbekistan, this indicator is mostly related with technical breakthroughs in production, firm modernization, and enhanced worker professional qualifications. Therefore, a rise in labor productivity is seen as the primary component stabilizing and having a long-term influence. Therefore, an increase in labor productivity is interpreted as the main factor stabilizing and having a long-term impact on wage growth.

The model also discovered that investments had a positive, statistically significant effect on pay levels. The computed coefficient is 0.0557, implying that when the volume of investments grows by 1%, earnings rise by an average of 0.056%. This link demonstrates the importance of investments in stimulating economic growth. When regional investment grows, new businesses launch and old ones expand, increasing worker demand in the labor market. As a result, firms are pushed to raise pay in order to attract skilled candidates. Foreign direct investment (FDI) is particularly concentrated in high-tech industries that require advanced degrees and pay higher wages. As a result, investment is one of the most important structural determinants influencing regional wages.

Population has a big and considerable positive influence on wage levels, according to economic theories of urbanization and agglomeration. In the model, the coefficient for this variable was 3.198, which means that a 1% increase in population raises salaries by around 3.2%. This is a very high elasticity and a significant predictor of higher salaries in places with high population density. The reason for this is because major settlements have a vast market size, well-developed infrastructure, and great consumer demand. Firms produce more, demand more workers, and enhance labor competitiveness when these circumstances exist. Such competition, in turn, raises wages. Thus, in addition to being a direct demographic element, population density also functions as a proxy for the intensity. Thus, in addition to being a direct demographic factor, population density also serves as a proxy for the intensity of economic activity and the degree of regional centralization.

The employment rate has a positive, if modest, influence on salary levels. The model predicts that when the employment rate rises by one percent, salaries rise by an average of 0.006 units. This

element represents the overall stability of the labour market. Increased employment, particularly in formal occupations, drives firms to compete for more competent personnel, resulting in salary increases. However, the employment rate has an indirect effect, such as on labor supply and output volume. As a result, while it has an effect, it is less significant.

The education indicator, which is the percentage of the workforce with higher education to the entire workforce, had no statistically significant influence on the model. The calculated coefficient was tiny, with a p-value of 0.979, implying that this variable's influence on pay levels is unstable or weak. Several economic considerations can account for this condition, including: First, the quality or substance of education may not completely meet the job market's demands. Second, the lack of substantial changes in educational attainment between areas (low variance) may have hampered the separation of its influence in the model. Third, the process of entering the labor market of higher education graduates is likely to be slow and delayed, i.e., they do not directly affect earnings in the year of their graduation. These factors ultimately led to the fact that the education variable was not statistically significant in the model.

In addition, the model found no statistically significant influence of inflation on salaries. Although the predicted coefficient is negative (-0.1824), the effect is not statistically significant ($p = 0.643$). This is due to the intricate link between inflation and salaries in real economic practice. Wages in Uzbekistan are frequently established by the public sector and linked with a lag to inflation. Wages may not be changed promptly in years of strong inflation. Furthermore, even if nominal wages rise, the impact of inflation may be statistically insignificant if they are not transformed into real wages. As a result, this model shows that the direct influence of inflation on pay changes is inaccurate.

5. Conclusion

According to the findings of this study, productivity, investment, and population are the most important elements that positively influence wage levels in Uzbekistan's regions. Education level and inflation are not closely related. Therefore:

Encourage policies aimed at increasing workforce productivity, such as training and technology upgrading.

Prioritize improving the investment climate in low-economic activity regions.

A balanced urbanization approach, including infrastructure and employment development in densely populated areas, may boost wage growth.

6. References

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