

Latent Dimensions of the Economic Impact of Industrial Park Development Projects in Ethiopia: Evidence from Exploratory Factor Analysis and Ordered Probit Models

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Abstract: Industrial Park development has become a strategic policy instrument for accelerating industrialization, attracting investment, creating employment opportunities, and promoting sustainable economic development in Ethiopia. However, empirical evidence on the multidimensional factors shaping the economic impact of industrial park development projects remains limited. This study examines the latent economic, social, political, technological, cultural, and environmental dimensions influencing the economic impact of industrial park development projects in Ethiopia. A mixed-methods research design was employed using survey data collected from employees, managers, administrators, and community representatives across Ethiopian industrial parks. Exploratory Factor Analysis (EFA) with Principal Component Analysis and Varimax rotation was used to identify the underlying latent dimensions, while Ordered Probit and Ordered Logit models were employed to estimate their effects on the indexed economic impact of industrial park development projects. The findings reveal that high community commitment, abundant non-financial resources, tangible government support, and strong social capital significantly enhance the economic impact of industrial park development projects. In contrast, unskilled labour supply, outdated technology, geographic concentration of industrial parks, and weak institutional capacity significantly constrain their economic contribution. The study concludes that maximizing the economic impact of industrial parks requires integrated policy interventions that strengthen institutional support, enhance workforce skills, promote technological upgrading, and encourage more balanced regional distribution of industrial parks. The findings contribute to the literature by providing a multidimensional empirical framework for understanding the determinants of industrial park performance and offer evidence-based policy recommendations for promoting sustainable industrial development in Ethiopia.

Keywords: Industrial Park development; Economic impact; Latent dimensions; Exploratory factor analysis; Ordered Probit; Ordered Logit

1. Introduction

Industrial parks, also referred to as Special Economic Zones (SEZs), Export Processing Zones, and Free Trade Zones, have become an important policy instrument for promoting industrialization, attracting foreign direct investment (FDI), generating employment, expanding exports, and accelerating structural transformation in many developing countries (FIAS, 2008; Farole, 2011). Worldwide, more than 3,000 industrial parks operate across over 135 countries, contributing substantially to employment creation and international trade (World Bank, 2008). Recognizing these developmental benefits, Ethiopia has integrated industrial park development into its industrialization strategy through the Industrial Parks Proclamation of 2014, aiming to improve competitiveness, stimulate private investment, create employment opportunities, and achieve sustainable economic growth.

Despite their strategic importance, empirical evidence on the economic impact of industrial park development remains inconclusive. While numerous studies report positive contributions through increased investment, export growth, employment generation, and industrial upgrading (Chen, 1993; Jayanthakumaran, 2003; Zeng, 2010; Farole, 2011), others argue that the benefits depend on institutional quality, governance, technology, infrastructure, and local economic integration, and may even generate resource misallocation when these conditions are absent (Hamada, 1974; Engman et al., 2007; Madani, 1999). These contrasting findings indicate that the economic performance of industrial parks is determined by multiple interrelated economic, social, political, technological, cultural, and environmental factors rather than by investment incentives alone.

In Ethiopia, industrial parks have expanded rapidly since 2014 as a key component of the country's industrial transformation agenda. However, persistent challenges—including limited technological capability, inadequate

institutional coordination, infrastructure constraints, shortages of skilled labour, and weak integration with domestic markets—continue to affect their overall performance. Existing studies have primarily focused on implementation challenges, policy issues, or individual industrial parks using qualitative case-study approaches, providing limited evidence on the multidimensional determinants of their economic impact (Hailu, 2014; Azmach, 2019; Weldesilassie et al., 2017; Gebreeyesus et al., 2017). Consequently, there is insufficient empirical evidence identifying the latent factors that enhance or constrain the economic contribution of industrial parks at the national level.

To address these gaps, this study employs Exploratory Factor Analysis (EFA) to identify the underlying economic, social, political, technological, cultural, and environmental dimensions influencing industrial park performance and estimates their effects using Ordered Probit and Ordered Logit models. Specifically, the study addresses three research questions: (i) What latent dimensions influence the economic impact of industrial park development projects in Ethiopia? (ii) To what extent do these latent dimensions affect the economic impact of industrial parks? and (iii) Which latent dimensions significantly enhance or constrain the economic impact of industrial park development projects? By providing multidimensional empirical evidence, the study contributes to a better understanding of the determinants of industrial park performance and offers evidence-based policy recommendations for strengthening sustainable industrial development in Ethiopia.

1.1. Research Question of the Study

- What are the underlying latent economic, social, political, technological, cultural, and environmental dimensions that influence the economic impact of industrial park development projects in Ethiopia?
- To what extent do the identified latent dimensions significantly influence the economic impact of industrial park development projects in Ethiopia?
- Which of the identified latent dimensions significantly enhance, and which constrain, the economic impact of industrial park development projects in Ethiopia?

1.2. General Objective

To identify the latent economic, social, political, technological, cultural, and environmental dimensions influencing the economic impact of industrial park development projects and examine their effects on the economic impact of industrial park development projects in Ethiopia.

Specific Objectives

1. To identify the latent economic, social, political, technological, cultural, and environmental dimensions influencing the economic impact of industrial park development projects in Ethiopia.

2. To examine the effect of the identified latent dimensions on the economic impact of industrial park development projects in Ethiopia.
3. To determine which identified latent dimensions significantly enhance and which constrain the economic impact of industrial park development projects in Ethiopia.

2. Methods and Methodology

2.1. Study Area

This study is conducted in the **Federal Democratic Republic of Ethiopia**. The Federal Democratic Republic of Ethiopia comprises of ten Regions, 68 Zones, 770 Woredas and two federal-level City Administrations. This study focused on 68 Zones and 2 federal City Administrations where Industrial Park project experiments have been conducted. According to a report by the Investment Commission, the federal government authorized zones to establish Industrial Parks depending on their geographic location, industrial sectors development and supply of labor market. Currently, the Industrial Parks project is operating in 28 zones and special zones, and 2 city administrations. Thus, these zones, special zones and city administrations are considered as the treated zones and others as controlled zones.

Industrial Parks/Industrial Zone Development Index

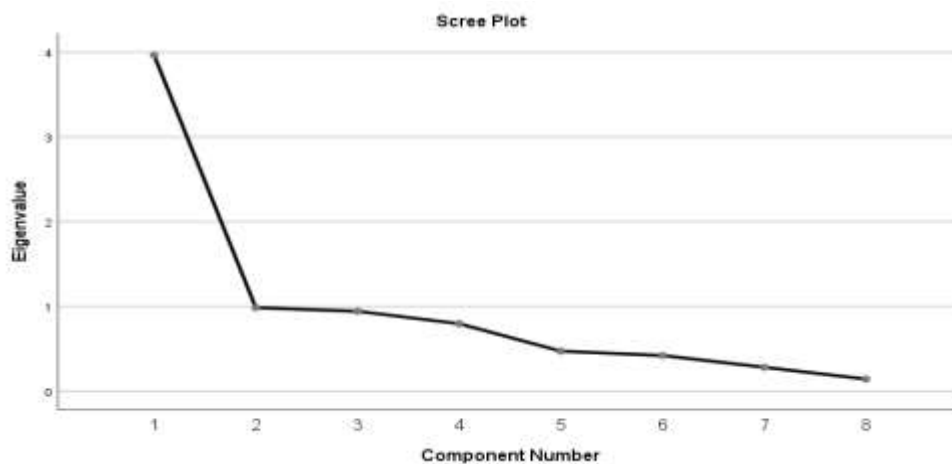
IPdummy = 1, if the zone, special zones or city administration are granted Industrial Park/Special Economic Zone project
IPdummy = 0, Otherwise.

IPdummy = represent industrial park dummy

2.2. Indexed Economic Impact of Industrial Parks Development Projects

To identify the potential factors that affect the economic impact of industrial parks development projects, an indexed economic impact of IP the development project was extracted from 8 different ordered economic questions. By referring to the different theoretical and empirical literature, we designed 8 ordered economic questions that address/evaluate the economic impact of IP development projects from different dimensions (which includes its impact on attracting Foreign Direct Investment (FDI), attracting domestic investors, employment generation, export earning, technological spill over, per capita income, employees' productivity and the living standard of employees). The Kaiser-Meyer-Olkin (KMO) test was conducted to test whether the specified sample was adequate or not. The test result was 0.79 which is above the threshold of 0.5 indicating that the sample was very adequate. The Bartlett's sphericity test, which indicates the existence of at least one correlation in the sample, was conducted to help us to extract the target indexed variable. The Bartlett's sphericity test resulted in 0.000 which shows the existence of at least one correlation in my datasets. Furthermore, the result from the 'Total Variance Explained table' and 'the scree plot' investigation revealed that there was only one factor that could be extracted from the given eight variables.

Figure 1: Factor Analysis: Scree Plot



As shown in the above graph we have only one factor that has an eigenvalue of greater than one. This implies that we can extract only one factor by combining the above eight economic variables. Finally, the reliability test was conducted to check the internal consistency of the identified target variables. Since the internal consistency test (Cronbach's $\alpha = 0.850$) is greater than the threshold value of 0.7, our data set is confirmed as internally consistent. Thus, to get the index value of the economic impact of the Industrial Parks development project, the alternative value of each eight identified variables was summed up and we calculated the average for each question (Hair et al, 2009). Hence, the higher the values of the indexed Economic Impact of Industrial Parks Development Project, the higher the Economic Impact of Industrial Parks Development Projects.

2.3. Sampling procedures and sample size

2.3.1. Sampling procedures

This study was conducted to evaluate the economic impact of Industrial Park development projects in Ethiopia. Currently there are 30 industrial parks in Ethiopia (IPDC, 2019). One hundred twenty thousand, eight hundred forty-six (120,846) workers were hired in all Ethiopian Industrial Parks. A simple random sampling technique has been employed to select targeted employees in each industrial park. The employees were stratified according to sex to ensure proportionate representation of women and men. Employees from each stratum were selected using the purposive sampling technique.

2.3.2. Sample Size

To answer the research questions of the study, the authors collected the necessary data using the survey questionnaire. In the study authors calculated the right sample size using the following sample size calculation formulas (Kothari, 2004): Sample Size Calculation:

$$sample\ size = \frac{Distribution\ of\ 50\%}{\left[\frac{margin\ of\ error\ \%}{(confidence\ level\ score)^2} \right]}$$

Finite population correction

$$\begin{aligned} & True\ sample\ size \\ & = \frac{sample\ size \times population}{sample\ size + (population - 1)} \end{aligned}$$

In this formula the confidence level score is the standard deviation value that goes along with the confidence level. In the case of a confidence level of 95%, the confidence level score would be equal to 1.96. Distribution, on the other hand, reflects how skewed the respondents are on a topic. In the survey world, it is almost always safest to stick with 50% distribution. In all Ethiopian Industrial Parks, the total population of the study is 120,846 and the desired confidence level is 95% and the margin of error is 5%:

$$1. \ Sample\ size = \frac{0.5 \times (1-0.5)}{((0.05/1.96)^2)}$$

$$Sample\ Size = \frac{0.25}{((0.02551)^2)}$$

$$Sample\ size = \frac{0.25}{0.00065077}$$

$$Sample\ Size = 384.16$$

$$2. \ True\ Sample =$$

$$384.16 \times 100,000 / 384.16 + 100,000 - 1$$

$$True\ Sample = 38,416,000 / 100,383.16$$

$$True\ Sample = 383$$

Therefore, in order to have a 95% confidence level with a 5% margin of error in the study, researchers would need to survey 383 respondents. Additionally, with the interview and focus group discussions at each industrial park we would purposively select one manager, one employees' representative, one labor union representative, and one representative from the community. To estimate the sample

size from each industrial park in Ethiopia, we used the following formula (Kothari, 2004):

2.3.3. Ordered probit model

To identify the factors that affect the economic impact of industrial parks development projects, we used the ordered response model. In our data set, we measure the micro-economic impact of industrial parks development projects as an ordered response. Thus, we prefer to use ordered response models that recognize the index nature of our dependent variable. After the honored work of Mckelvey and Zovoina (1975), over the last five decades, the ordered probit model has been used as the best estimation techniques for ordered data. Many scholars recommend the ordered probit model over other models including the Ordinary Least Square model (DeCanio 1986, Mason et al. 1995, Boex 2000 and Chan, Miller and Teha 2005).

Let take the following latent regression model

$$y^* = x' \beta + \varepsilon \text{ -----}$$

----- (1)

Where y^* is unobserved indexed economic impact of industrial parks development projects in Ethiopia. What is observable is:

$$\begin{aligned} Y &= 0 \text{ if } y^* \leq -\infty \\ &= 1 \text{ if } 0 < y^* \leq \mu_1 \\ &= 2 \text{ if } \mu_1 < y^* \leq \mu_2 \\ &= 3 \text{ if } \mu_2 < y^* \leq \mu_3 \\ &= 4 \text{ if } \mu_3 < y^* \leq \mu_4 \\ &= 5 \text{ if } \mu_4 < y^* \leq +\infty \text{ -----} \end{aligned}$$

----- (2)

The μ 's are unknown threshold variables that will be measured by the coefficient β . The threshold variables measure the average value for different measured value of Y . Our respondents indicated their magnitude of feeling for the given question depending on some factors that can be observed and measured and other unmeasured and unobserved factors categorized under ε . Let's take the ordinal scale of 1 to 5 range of degree of their feeling which represents 1 strong disagreement, 2 disagreements, 3 neutral, 4 agreements and 5 strong agreements. Thus, respondents choose the alternative that approximately represented their feeling/perception of the given question. In the model ε is assumed as normally distributed with an expected value of zero and variance of unity.

Table 1: Factor Analysis result for Economic Related Variables

Observed Economic Related Factors	Factor Loading				Latent variable (Cronbachs Alpha)
	Factor one	Factor two	Factor three	Factor four	
There is sufficient domestic market in the country	.640				Existence of abundant non-financial factors that promote IP
There is an abundant land area for IP development projects	.735				
There is adequate infrastructure development	.865				

The common Ordered Probit model is summarized in the following probabilities (Mohammad and Clem, 2006):

$$\begin{aligned} \text{prob}(y = 0|x) &= \varphi(-x'\beta) (\mu_0 = 0) \\ \text{prob}(y = 1|x) &= \varphi(\mu_1 - x'\beta) - \varphi(-x'\beta) \\ \text{prob}(y = 2|x) &= \varphi(\mu_2 - x'\beta) - \varphi(\mu_1 - x'\beta) \\ &\dots \\ \text{prob}(y = J|x) &= 1 - \varphi(\mu_J - 1 - x'\beta) \text{ -----} \end{aligned}$$

----- (3)

2.4. Methods of data analysis

Data were analyzed using **SPSS** and **STATA**. Exploratory Factor Analysis (EFA) with Principal Component Analysis (PCA) and Varimax rotation was used to identify latent dimensions, while Ordered Probit and Ordered Logit models were employed to examine their effects on the indexed economic impact of industrial park development projects.

2.5. Validity, Reliability, and Ethical Considerations

The questionnaire was validated through expert review, pilot testing, and revisions based on feedback to ensure content, construct, internal, and external validity (Kothari, 2004). Reliability was confirmed using Cronbach's alpha ($\alpha = 0.820$), indicating good internal consistency (Kumar, 2011). Ethical standards were maintained through informed consent, voluntary participation, confidentiality, and the use of data exclusively for research purposes.

3. Results and Discussion

3.1. Potential factors that affect Economic Impact of Industrial Parks Development Projects

3.1.1. Factor Analysis/ Principal Components Analyses

Exploratory Factor Analysis (EFA) using Principal Component Analysis (PCA) with Varimax rotation and Kaiser normalization was employed to identify and validate the latent economic, social, political, technological, cultural, and environmental factors influencing the economic impact of industrial park development projects.

Factor Analysis for Economic related Variables

The following tables present the factor analysis result for economic-related variables that affect the economic impact of industrial parks development projects in Ethiopia. The survey includes 16 major economic-related variables that directly affect the economic impact of industrial parks development projects in Ethiopia.

Ethiopia has a stable macroeconomic situation	.797				(Cronbachs 0.895)
There are many domestic stakeholders and investors	.773				
There are attractive investment sites for IP development	.663				
There is a cheaper energy supply in Ethiopia		.665			Existence of tangible government support (Cronbachs 0.869)
There is subsidies for IP enterprise from the government		.811			
There is interest-free credit for IP investors		.782			
There are duty-free import and export opportunities		.871			
Weak implementation of international trade policy			.721		Existence of poor institutional setup (Cronbach's 0.812)
High control of foreign currency in Ethiopia			.802		
The majority of IP enterprises operate with out-dated technology				.688	Existence of out dated technology (Cronbach's 0.812)
There is out dated land management system in Ethiopia				.855	
Most of Ethiopia's technologies are out-dated				.866	

As showed in the above table, we observed 16 economic-related variables categorized into four dimensions according to the result from factor analysis using principal components analyses as extraction methods and Varimax rotation methods with Kaiser Normalization: Existence of abundant non-financial factors that promote IP development, the existence

Factor Analysis for Cultural-related variables

The following table presents the factor analysis result for the cultural-related variables that directly affect the economic impact of industrial parks development projects in Ethiopia.

of tangible government support, the existence of poor institutional set up and existence of unsuitable foundations for industrial parks development project. In all dimensions, the Cronbach's alpha coefficient is also above the required minimum thresholds value (>0.7), which show the internal reliability of the variables under each category.

The data collection instruments identify nine major cultural-related variables that directly affect the economic impact of industrial parks development projects in Ethiopia.

Table 2: Factor Analysis Result for Cultural Related Factors

Observed Cultural Related Factors	Factor Loading		Latent variable (Cronbachs Alpha)
	Factor One	Factor Two	
Ethiopians have a good working culture	.814		Existence of high social commitment for work (Cronbachs 0.923)
Ethiopians are punctual in their work	.923		
Ethiopians are good at team work spirit.	.818		
Ethiopians have a good communication skills	.662		
Ethiopians have a good culture of creativity	.747		
Ethiopians have a good culture of hospitality		.660	Existence of good social capital in Ethiopia (Cronbach's 0.875)
Ethiopians have a good culture of quickly adopting to the situation		.641	
Ethiopians have a good culture of tolerance		.885	
Ethiopian have a good culture of living together		.897	

As showed in the above table, the identified 9 cultural-related variables categorized into two dimensions according to the result from factor analysis using principal components analyses as extraction methods and Varimax rotation methods

with Kaiser Normalization: Existence of high social commitment for work and existence of good social capital. The Cronbach's alpha coefficient is also above the required minimum thresholds value (>0.7) for all dimensions which

shows the internal reliability of the variables under each category.

Factor Analysis for Political related Variables

The following table presents the factor analysis result for the political related variables that affect the economic impact of industrial parks development projects in Ethiopia. We

identified 20 major political related variables that directly affect the economic impact of industrial parks development projects in Ethiopia.

Table 3: Factor Analysis Result for Political Related Variables

Observed Political Related Factors	Factor Loading				Latent variable (Cronbachs Alpha)
	Factor one	Factor two	Factor three	Factor four	
There is high political commitment in Ethiopia	.828				Existence of suitable institutional setup in Ethiopia (Cronbachs 0.925)
Ethiopians' laws support IP development project	.863				
Ethiopia has a clear vision for IP development projects	.811				
There is an effective one stop shopping service inside IP	.798				
There is a government consultancy body inside IP	.848				
Ethiopia investment laws encourage IP development	.794				
There is a special government body inside IP		.698			Existence of visionary leaders that realize the goal of IP development (Cronbachs 0.831)
There is no political intervention inside Ethiopian IP		.864			
There is comfortable management style in IP		.776			
There are eye-catching subsidies in Ethiopia		.586			
There is no sufficient land supply for IP development			.604		Absence of good administration at lower layers of the country (Cronbach's 0.921)
There is a bureaucratic administration system at lower layer of administration in Ethiopia			.736		
There is social unrest around IP			.748		
There is a conflict of interest between the federal and local government.			.692		
There is poor communication between IP and gov't				.699	Existence of poor working environment inside the IP (Cronbach's 0.901)
There is a complex operational system inside IP				.753	
There is an unsuitable international trade policy				.752	
There are complex regulations and procedures				.878	
There is active government intervention in IP				.803	
The protection of copy-right is not strong in Ethiopia				.791	

As showed in the above table, there were 20 observed political-related variables categorized into four dimensions according to the result from factor analysis using principal components analyses as extraction methods and Varimax rotation methods with Kaiser Normalization: Existence of suitable institutional setup in Ethiopia, Existence of visionary leaders that realize the goal of industrial parks, absence of

good administration at the lower layers of the country and existence of poor working environment in the country. The Cronbach's alpha coefficient is also above the required minimum thresholds value (> 0.7) for all dimensions which show the internal reliability of the factors under each category.

Factor Analysis for Environmental Related Factors

The following table presents the factor analysis results for the environmental-related variables that affect the economic impact of industrial parks development projects in Ethiopia.

The survey identifies 9 environmental-related variables that affect the economic impact of industrial parks development projects in Ethiopia.

Table 4: Factor Analysis Result for Environmental related variables

	Factor Loading	
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Observed Environment Related Factors	Factor One	Factor Two	Latent variable (Cronbachs Alpha)
There is convenient accommodation around IP	.534		Existence of sufficient space that promote IP development (Cronbach's 0.838)
There is a large area for disposal of liquid waste	.823		
There is enough place for recycling dry waste inside IP	.874		
There is plenty of space for supply markets around IP	.797		
There is favourable weather condition for IP production		.898	Existence of plenty of nature gifted resource around the parks that promote IP development (Cronbach's 0.871)
There is a long dry/summer season in Ethiopia		.866	
The natural resource around the park enhance the development of IP		.563	
Ethiopian landscape is suitable to promote IP development		.695	
There are plenty of land areas that promote industrial parks development		.522	

As showed in the above table, we observed 9 environment-related variables categorized into two dimensions according to the result from factor analysis using principal components analyses as extraction methods and Varimax rotation methods with Kaiser Normalization: Existence of sufficient space that promote IP development and the existence of nature-gifted

Factor analysis for Social related Variables

The following table presents the factor analysis result for social variables that directly affect the economic impact of industrial parks development projects in Ethiopia. The survey

resources around the parks that promote IP development. The Cronbach's alpha coefficient is also above the required minimum thresholds value (> 0.7) for all dimensions which confirm the existence of internal reliability of the factors under each category.

includes 15 different variables that address social-related variables that affect the economic impact of industrial parks development projects in Ethiopia.

Table 5: Factor Analysis Result for Social Related Variables

Observed Social related factors	Factor Loading			Latent Factor (Cronbachs Alpha)
	Factor One	Factor Two	Factor three	
The working environment inside the IP is not suitable	.838			Inconvenient social interaction among agents participate inside industrial parks (Cronbach's 0.905)
IP workers have low communication skill	.880			
There is no agreement among enterprises operate inside IP	.712			
No partnership between domestic and international investors	.678			
There are highly demotivated IP workers		.661		Unfit human resource supply for IP (Cronbach's 0.842)
The administrative staffs of IP have no relevant experience		.765		
IP workers are not eager for skill and knowledge transfer		.866		
Ethiopia's labour proclamation is not conducive		.816		
English is widely spoken in Ethiopia			.779	Existence of commitment from the community that promote IP development (Cronbach's 0.881)
There are large domestic supply markets in Ethiopia			.814	
There are many easily trained human resources supply in Ethiopia			.764	
There is high demand from the community to have IP project			.753	
There is a high interest from the community to work inside IP			.726	
There are affordable house supplies around IP in Ethiopia			.703	
There are no laws that prohibited inter and intra-regional migration			.668	

As showed in the above table, we observed 15 social-related variables categorized into three dimensions according to the result from factor analysis using principal components

analyses as extraction methods and Varimax rotation methods with Kaiser Normalization: inconvenient social interaction among agents participate inside industrial parks, the existence

of unfitting human resource supply for IP and high commitment from the community that promote IP development. The Cronbach's alpha coefficient is also above

the required minimum thresholds value (>0.7) for all dimensions which show the internal reliability of the variables under each category.

3.1.2. Factors Affecting Economic Impact of Industrial Parks Development Projects in Ethiopia

3.1.2.1. Test of Causality between Potential Observed Factors and Indexed Economic Impact

The following table test the existence of causality between the potential factors that affect economic impact of industrial parks development projects and the indexed economic impact of industrial parks using the Chi-square test. Under the Chi-square test the null hypothesis states that there is no causality

between listed potential factors and indexed economic impact of industrial parks project. The alternative hypothesis claims existence of a significant causality between potential factors and indexed economic impact of Industrial Parks Development Projects.

Table 6: Test of causality between potential observed factors and indexed economic impact of Industrial Parks Development Projects

Potential factors that affect the economic Impact of Industrial Parks Development	Indexed Economic Impact of Industrial Park Projects	
	Number of observation	Chi-square tests
Indexed Economic factors	299	(108.4)***
The existence of abundant non-financial factors that promote IP	299	(176.7)***
The existence of tangible government support	305	(174.3)***
The existence of poor institutional setup	306	(134.5)***
The existence of out dated technology	310	(34.9)***
Indexed Cultural factors	305	(129.5)***
The existence of high social commitment for work	305	(157.6)***
The existence of good social capital in Ethiopia	307	(228.5)***
Indexed Political Factors	309	(151.6)***
The existence of suitable institutional setup in Ethiopia	309	(259.7)***
The existence of visionary leaders that realize the goal of IP development	310	(141.9)***
Absence of good administration at lower layers of the country	309	(54.7)***
The existence of poor working environment inside the IP	305	(95.4)***
Indexed Environment factors	307	(156.3)***
The existence of sufficient space that promote IP development	310	(95.88)***
The existence of plenty of nature gifted resource around the parks that promote IP development	307	(217.9)***
Indexed Social factors	310	(147.2)***
Inconvenient social interaction among agents participate inside industrial parks	311	(52.6)***
Unfit human resource supply for IP	311	(88.5)***
The existence of commitment from the community that promote IP development	301	(172.4)***
Index technological factors	302	(155.2)***
Source authors' estimation ***, **, * one, five and ten percent significance level, respectively		

As shown in the above table, all observed potential factors have a strong and statistically significant causality with

indexed economic impact of Industrial Parks Development Projects in Ethiopia. We rejected the null hypothesis and

concluded that listed potential factors have a strong and statistically significant causality with indexed economic impact of Industrial Parks Development Project. Once the existence of the causality between the dependent and independent is confirmed, in the following table authors examined the potential factors that diminish or optimize the economic impact of Industrial Parks Development Project. Authors assessed different potential factors that diminish or optimize the economic impact of Industrial Parks

Development Projects. The table presents the major latent factors categorized under economic, social, cultural, political, and technological and environmental variables that affect the economic impact of Industrial Parks Development Projects in Ethiopia. Those identified variables include variables that either optimize or diminish the economic impact of Industrial Parks Development Projects in Ethiopia. These major observed variables are reduced to latent variables using the factor analysis techniques.

Table 7: Potential factors that affect Economic Impact of Industrial Parks Development Projects in Ethiopia

Indexed Latent Factors	Indexed Economic Impact of Industrial Parks Development Projects					
	Model One		Model Two		Model Three	
	OProbit	Ologit	Oprobit	Ologit	Oprobit	OLogit
High community commitment	.071 (.018)***	.138 (.041)***	.071 (.022)***	.148 (.050)***	.072 (.024)***	.161 (.060)***
The existence of Abundant non-financial resource	.0322 (.019)*	.073 (.034)**	.065 (.025)***	.123 (.051)**	.063 (.034)*	.141 (.067)**
Tangible gov't support	.172 (.099)*	.312 (.191)	.371 (.110)***	.713 (.245)***	.377 (.183)**	.828 (.428)**
Good social Capital in Ethiopia	.036 (.036)	.108 (.067)*	.105 (.046)**	.272 (.099)***	.099 (.045)**	.247 (.103)**
Unskilled labour supply	-.057 (.116)	-.030 (.232)	-.265 (.134)**	-.299 (.201)	-.271 (.135)**	-.341 (.207)*
Geographic disadvantage	-.091 (.094)	-.112 (.177)	-.234 (.142)*	-.519 (.275)*	-.252 (.147)*	-.578 (.286)**
Out-dated technology operate	-.2427 (.096)**	-.382 (.175)**	-.156 (.112)	-.136 (.240)	-.438 (.214)**	-.815 (.506)
Poor administration at lower layers	-.153 (.109)	-.129 (.219)	-.001 (.146)***	.266 (.254)	.065 (.193)	.385 (.369)
Basic Information of respondents	No	No	Controlled	Controlled	Controlled	Controlled
Indexed average factors values	No	No	No	No	Controlled	Controlled
Source authors' estimation ***, **, * one, five and ten percent significance level, respectively						

The above table shows the factors that affect the economic impact of Industrial Parks Development Projects in Ethiopia. Accordingly, the existence of high community commitment, availability of abundant non-financial resource which promote the development and expansion of Industrial Parks Development Projects, the existence of eye-catching and tangible government support, the existence of good social Capital in Ethiopia have a positive and statistically significant

3.1.3. Potential Factors that Optimize Economic Impact of Industrial Parks Development in Ethiopia

The following table presents the potential factors that optimize the economic impact of industrial parks development projects in Ethiopia. The potential factors that optimize the economic impact of industrial parks development project were collected by reviewing different

impact on the indexed economic impact of Industrial Parks Development Projects in Ethiopia. On the other hand, unskilled labour supply, out-dated technology is operating in Ethiopia and geographic location disadvantage of Ethiopia Industrial Parks which shows the concentration of Industrial Parks only in urban areas significantly decrease economic impact of industrial parks development projects in Ethiopia.

factors which includes Economic factors, Social factors, Political factors, cultural factors, technological factors and environment factors. The following table revealed the effect of identified potential factors on indexed economic impact of industrial parks development projects.

Table 8: Potential Factors that Optimize Economic Impact of Industrial Parks Development in Ethiopia

	Indexed Economic Impact of Industrial Parks Development Projects					
Potential factors that optimize Economic impact	Model One		Model Two		Model Three	
	Ordered Probit	Ordered Logit	Ordered Probit	Ordered Logit	Ordered Probit	Ordered Logit
Availability of Market/Demand for IP product	.3033441 (.090714)***	.5441965 (.1594336)***	.2606919 (.0987771)***	.4872425 (.2086355)***	.2131636 (.0977653)**	.3366345 (.2074456)*
Attractive investment site	.2701863 (.0830283)***	.5269996 (.1663822)***	.2417376 (.0904651)***	.4920937 (.1872795)***	.1628492 (.1036758)*	.3780194 (.2103712)*
Absence of rules and regulation that restrict intra-regional migration	.1698249 (.0629916)***	.3652106 (.10791)***	.1301107 (.0620586)**	.2801187 (.1154083)**	-.0094299 (.0860046)	-.1017568 (.1753712)
High interest of community to work inside the IP	.1956955 (.0748545)***	.2981994 (.1340209)**	.168049 (.1030793)*	.2542473 (.1993147)	.135155 (.1375127)	-.0331124 (.3160245)
Subsidies provided by government for IP enterprise	.0824625 (.1070181)	.2497445 (.1917174)	.2726739 (.1354177)**	.6493404 (.2531959)**	.0800192 (.1549565)	.2881113 (.2918497)
The culture of hospitality of Ethiopians	.0319231 (.0739281)	.1181022 (.139429)	.1593097 (.092108)*	.3455999 (.1975599)*	.2076382 (.1101163)**	.4589587 (.243045)**
Availability of technology intensive domestic investors	.1212281 (.0706633)*	.2269893 (.1397768)*	.065625 (.1128633)	.128655 (.2318511)	.0547377 (.1340813)	-.037222 (.3033442)
Easily Familiarity of Ethiopians employees with new technology	.0225409 (.0946208)	.0807953 (.1835249)	.233952 (.132975)*	.6005197 (.2805416)**	.3706255 (.1473546)**	.7622778 (.3116669)**
Existence of special government Institution that administer and manage IP	.0908791 (.0831079)	.1787043 (.1546622)	.0677508 (.1142189)	.0584511 (.2194705)	.243257 (.1134101)**	.343145 (.2150488)*
Existence of laws that promote enterprise operate inside IP	.0035702 (.1181828)	.0713293 (.2001726)	.1233821 (.1817642)	.5115778 (.3322809)	.3400838 (.1967996)*	.9344367 (.4114703)**
Indexed Factors value	No	No	No	No	Controlled	Controlled
Basic Information of respondents	No	No	Controlled	Controlled	Controlled	Controlled
Source: field survey (2020) ***, **, * one, five and ten percent significance level, respectively						

As showed in the above table the identified potential factors that optimize the economic impact of industrial parks development project have positive impact and the majority of them are statistically also significant. In the first model the basic information of respondents and the indexed factors value are not controlled. In second model the basic information of respondents are controlled but the indexed factors value is not controlled. In the third model both the basic information respondents and the indexed factors

value are controlled. I run the first and second model to check to consistence / robustness of the model. According to the result from the third model Availability of Market/Demand for IP product, Attractive investment site, the culture of hospitality of Ethiopians, Easily Familiarity of Ethiopians employees with new technology, Existence of special government Institution that administer and manage IP and Existence of laws that promote enterprise operate inside IP have positive and statistically significant effect on indexed

value of Economic Impact of Industrial Parks development projects. Thus, these potential factors optimize the economic impact of industrial parks development projects in Ethiopia.

3.1.4. Potential Factors that Diminish Economic Impact of Industrial Parks Development projects in Ethiopia

The following table presents the potential factors that diminish the indexed economic impact of industrial parks development projects in Ethiopia. These potential factors that diminish the economic impact of industrial parks development projects was designed by reviewing different factors which includes economic factors, social factors, cultural factors, political factors, environmental factors and technological factors. The following table reports their impact by analyzing using ordered probit and ordered logit model.

Table 9: Potential Factors that Diminish Economic IP Development projects in Ethiopia

Indexed Economic Impact of Industrial Parks Development Project						
Potential Factors that Diminish Economic Impact of Industrial Parks Development Projects	Model One		Model Two		Model Three	
	Ordered Probit	Ordered Logit	Ordered Probit	Ordered Logit	Ordered Probit	Ordered Logit
Ethiopian IP built around big city/zones in the country	-.1819421 (.0653473)** *	-.320928 (.1636632)* **	-.1749336 (.0660791)** *	-.349291 (.1162306)***	-.2472907 (.1565673)*	-.3917185 (.1273696)* **
Absence of sufficient infrastructure	-.021046 (.0096696)**	-.0436776 (.0153541)* **	-.0282593 (.0118162)**	-.0576395 (.0199387)***	-.090463 (.0185988)* **	-.1414435 (.0314373)* **
Poor working environment	-.1293971 (.0647818)**	-.2455682 (.1070903)* *	-.1259039 (.0652978)**	-.2807103 (.1182417)**	-.1917362 (.0861695)* *	-.3170812 (.1671015)* *
Inaccessible media and telecommunication service	-.1692224 (.0867061)**	-.320928 (.1636632)* *	-.1465731 (.0859035)*	-.267046 (.1639053)*	-.2286931 (.108832)**	-.4246043 (.2093071)* *
Unstable political environment	-.0974483 (.08982)	-.0974483 (.078354)	-.1492857 (.0780383)**	-.2807369 (.1477535)**	.1243682 (.1148255)	-.1372394 (.2286927)
Outdate and backward technology operated in Ethiopia	-.0181685 (.059164)	-.1687387 (.1136902)	-.0241272 (.0615384)	-.1001861 (.1078142)	-.2964145 (.0782429)* **	-.4866813 (.144099)** *
Absence of reliable power supply in Ethiopia	-.1043891 (.0831273)	-.15782 (.202834)	-.0889605 (.0921109)	-.1007939 (.1740651)	-.2827641 (.1117724)* *	-.4242217 (.2097038)* *
Complex taxing system	-.0843841 (.0859544)	-.1377489 (.1547328)	-.2082651 (.1671035)	-.0376885 (.0932631)	-.1949749 (.1012652)* *	-.353006 (.2145278)*
Basic information of Respondents	No	No	Controlled	Controlled	Controlled	Controlled
Index factors Value	No	No	No	No	Controlled	Controlled
Source: Field Survey (2020) ***, **, * one, five and ten percent significance level, respectively						

The above table revealed the potential factors that diminish the indexed economic impact of industrial parks development projects in Ethiopia. The first model examine these potential factors without information of respondents and indexed value of factors that affect controlling for basic information of respondents and the indexed economic impact of industrial parks development projects are potential factors value that diminish the economic impact of industrial parks development projects. Whereas the second model analyze by negatively affect the economic impact of industrial parks controlling the basic information of respondents but without development projects. Out of controlled potential factors Ethiopian

Industrial Parks built around the big cities, lack of sufficient and telecommunication service significantly diminish the economic infrastructure, poor working environment and the inaccessible media impact of industrial parks development projects in Ethiopia.

Conclusion and Recommendation

Conclusion

This study examined the latent economic, social, political, technological, cultural, and environmental dimensions influencing the economic impact of industrial park development projects in Ethiopia. Using Exploratory Factor Analysis (EFA), the study reduced a large number of observed variables into a set of reliable latent dimensions, while Ordered Probit and Ordered Logit regression models were employed to estimate their effects on the indexed economic impact of industrial parks. The findings demonstrate that the economic impact of industrial parks is shaped by multiple interrelated dimensions rather than by isolated factors. Specifically, high community commitment, abundant non-financial resources, tangible government support, and strong social capital significantly enhance the economic impact of industrial park development projects. Conversely, unskilled labour supply, outdated technology, geographic concentration of industrial parks, and weak institutional capacity constrain their contribution to sustainable economic development.

The findings underscore that maximizing the economic impact of industrial park development projects requires a comprehensive policy approach that simultaneously strengthens enabling conditions and addresses structural constraints. Enhancing human capital development, promoting technology upgrading and innovation, expanding industrial parks beyond major urban centres, improving institutional effectiveness, and reinforcing government

support mechanisms are essential for increasing the developmental contribution of industrial parks. These findings provide empirical evidence to support policymakers in designing integrated strategies that improve the competitiveness, inclusiveness, and long-term sustainability of industrial park development in Ethiopia. They also contribute to the growing literature on industrial park development by providing a multidimensional empirical framework for understanding the determinants of economic impact in developing-country contexts.

Recommendations

Based on the findings, policymakers should strengthen government support, improve institutional efficiency, and expand investments in workforce development to enhance the economic impact of industrial park development projects in Ethiopia. Particular attention should be given to improving workers' skills, promoting technology upgrading, and strengthening collaboration among government institutions, industries, and higher education institutions.

The government should also promote a more balanced geographic distribution of industrial parks by expanding investments beyond major urban centers and improving supporting infrastructure in emerging regions. Furthermore, policies that strengthen community participation, social capital, and an enabling business environment should be prioritized to maximize the long-term economic contribution and sustainability of industrial park development projects.

4. References

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