

# Innovations

## Policy Recommendation: Fostering Sustainable Growth through Industrial Park Development in Ethiopia

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### Abstract

*Industrial park development projects are commonly employed by policymakers and decision-makers as a strategic approach to foster economic growth. Within Ethiopia, there are presently 32 industrial parks located across diverse zones and city administrations. This study examines the economic impact of industrial park development in Ethiopia by employing a difference-in-difference (DID) methodology. Specifically, the study distinguishes between treated zones, which encompass zones and city administrations with industrial parks, and controlled zones, which represent areas without industrial parks. The findings of the analysis indicate that the establishment and operation of industrial parks have yielded positive effects on various macro-economic indicators, with the exception of domestic capital formation. Consequently, it is highly recommended that the government devise tailored policies and incentives to encourage domestic investors to engage in Ethiopian industrial parks. Such measures would contribute to further leveraging the economic benefits associated with industrial park development in the country. This study provides valuable insights for policymakers and stakeholders, shedding light on the potential of industrial park initiatives as catalysts for economic growth and suggesting targeted strategies to maximize their impact in Ethiopia.*

**Keywords:** *Difference in Differences (DID), Ethiopian Industrial Parks Development Projects, Economic Impact.*

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## 1. Introduction

### 1.1. Background of the Study

Industrial parks, alternatively referred to as industrial zones or special economic zones, encompass a diverse array of economic concepts, such as free trade zones, export processing zones, and free ports, among others. They manifest in various types and configurations across the globe. The primary objectives of these industrial parks revolve around the production of export-driven goods and the attainment of competitiveness in international markets. As elucidated in a report by the Foreign Investment Advisory Service (FIAS), although industrial parks may assume different appellations and structures, they can be delineated based on the subsequent definitions:

“It is a separately designed business place under the national boundary where the rules of business are different from other places in the country. The government also gives special treatment and support to international and domestic investors that operate inside the industrial parks. Some of these special procedures include flexible investment conditions, easy access to international markets, lower customs, taxes, and regulatory environments, and creating an enabling environment for enterprises that operate inside industrial parks (FIAS, 2008)”.

The establishment and implementation of industrial park development projects are extensively employed as significant strategies for economic advancement by policymakers and decision-makers. A comprehensive report by the World Bank unveiled that there exist over three thousand industrial parks across 135 countries, yielding a staggering 68 million employment opportunities and contributing to trade-related value additions totaling five hundred billion (World Bank, 2008). Despite the existence of numerous economic theories that assert the positive influence of industrial park development projects, there is a dearth of empirical research that critically assesses their economic impact.

Since assuming power in 1991, the government of the Federal Democratic Republic of Ethiopia has devised a range of policies and strategies aimed at achieving sustainable economic development within the country. Among these strategies is the development of industrial parks, which have been designed to contribute significantly to the realization of Ethiopia's sustainable economic development objectives. The Ethiopian Industrial Policy has been formulated with the goal of modernizing the country's industrial sectors to facilitate sustainable economic

development. By promoting the establishment of industries that manufacture diverse products, this policy aligns with Ethiopia's long-term plan to achieve sustainable economic development goals and improve living standards by 2025. The government of Ethiopia has crafted the industrial policy as a means to drive economic, social, and political transformations throughout the country. This policy is intended to contribute to 27 percent of the national economic growth, while concurrently modernizing and globalizing the role of the industrial sectors within Ethiopia. In 2014, the Ethiopian government enacted the Industrial Parks Proclamation, which encompasses five key objectives: 1) managing and overseeing the establishment, construction, and operation of Ethiopian industrial parks; 2) creating a favorable environment for the development of technical and industrial infrastructure; 3) enhancing the participation and involvement of the private sector in the national economy; 4) bolstering the country's competitiveness in the global economy; and 5) generating ample employment opportunities and achieving sustainable economic development goals within the country. Hence, the Ethiopian industrial park development proclamation gives different incentives, as identified below, for both domestic and international investors:

**Property Protection:** The proclamation encourages international investors to operate inside the industrial parks either with their own capital or in cooperation with local investors. A government secures the protection of their capital, assets, and profits.

**Tax and customs subsidies:** The government arranges different tax and customs breaks for enterprises that operate within the Ethiopian Industrial Parks. Furthermore, the government grants income exemptions for at least 5 to 10 years for investors operating within the industrial parks.

**Free Shade provision:** For investors operating within the industrial parks, the government provides free or highly discounted shade for their businesses.

## 1.2. Statement of the problem

Existing empirical research has provided varied and inconclusive findings regarding the economic impact of industrial park development projects. A substantial body of scholars has identified a positive and statistically significant influence stemming from such projects. These researchers advocate for the establishment of industrial parks as a preferred strategy for achieving sustainable economic development, urging policymakers and decision-makers in both developing and advanced nations to consider their implementation. The positive impact of industrial park development projects has been demonstrated through their ability to attract foreign direct investment, generate employment opportunities, and

stimulate export levels (Chen, 1993; Jayanthakumaran, 2003; Monge-Gonzalez et al., 2005; Warr, 1989; Zeng, 2010; Fuller and Romer, 2012; Hamada, 1974; Madani, 1999; World Bank, 1992; Kaplinsky, 1993; Johansson and Nilsson, 1997; Farole, 2011; FIAS, 2008; Balasubramanyam, 1988; Willmore, 1995). These scholars have underscored the role of industrial park development projects in realizing sustainable economic development goals and facilitating macroeconomic reforms within nations. They have highlighted the success of industrial park development projects in East Asia's "tiger economies" as exemplars of industrial sector reform and upgrade. The extensive expansion of industrial sector development projects in China, for instance, has resulted in increased foreign direct investment inflows and the growth of export-oriented manufacturing sectors, while simultaneously driving structural and economic reforms in the country. Further research by Alder et al. (2013), Jenkins et al. (1998), Miyagiwa (1986), and Wang (2013) has indicated that industrial park development enhances social welfare by attracting foreign direct investment and fostering diversification within export sectors.

Contrasting perspectives on the economic impact of industrial park development projects have been put forth by various researchers. Engman et al. (2007) found that the impact is insignificant and can lead to distortions in resource allocation. Similarly, Hamada (1974) and Madani (1999) concluded that the effects of industrial park development are contingent upon specific conditions and are limited to a short-term horizon. Chen (1995), Hamada (1974), Hamilton and Svensson (1982), and Wong (1986) argued that the implementation of industrial park development projects can diminish overall well-being. Kaplinsky (1993) posited that such projects can "enclave" the national investment direction of a nation. Ayres (1994) revealed that industrial park development projects tend to concentrate investment in the most promising sectors while disregarding other potential areas within the country. Humphrey (2000) highlighted that the most influential factor determining the impact of industrial park development projects is the advantage of optimal location, enabling investors to access demand and supply markets easily, recruit workers conveniently, and benefit from tax incentives, customs subsidies, and other forms of financial and non-financial support for international market penetration. On the other hand, haphazard and unnecessary establishment and construction of industrial parks can result in socio-economic waste, including vacant industrial park facilities, increased traffic congestion, noise and air pollution in urban areas, and ill-suited and redundant construction. Henriksen (1982) emphasized that proper planning is crucial to optimizing the economic impact of industrial park development projects,

as unplanned initiatives lead to prolonged construction phases and wasteful capital investment. Furthermore, he identified several factors that undermine the economic impact of industrial park development projects, including limited government capacity for infrastructure development, the absence of streamlined services, and a lack of integration with the local economy. Scholars have also identified various factors contributing to the insignificant economic impact of industrial park development, such as challenges related to stakeholder identification, the absence of clear policy and legal frameworks, the lack of social and environmental impact assessments, labor force shortages, and the absence of industry-university linkages (Hamada, 1974; Hamilton & Svensson, 1982; Wong, 1986).

The initial Growth and Transformation Plan of Ethiopia prioritized the promotion of micro and small enterprises as a strategic approach to expand the industrial sector's contribution to the national economy. In 2014, the Ethiopian Industrial Parks Development Corporation was established with the mandate to design, construct, and manage industrial park development projects across the country. To lay the groundwork for these projects, the Industrial Parks Development Corporation assessed the performance of the textile and leather manufacturing sectors that same year. The evaluation revealed that Ethiopia had not achieved the desired growth in textile and leather exports due to the absence of mechanized industrial parks equipped with essential institutions such as utilities, banks, customs, and transportation links.

Given the novelty of industrial park development projects in Ethiopia, there has been limited research conducted to evaluate their economic impact. Existing studies have primarily focused on examining the implementation status, challenges, and prospects of these projects (Hailu, 2014; Gebreeyesu, 2009; Mbreat, 2017; Azmach, 2019; Weldesilassie, 2017; and Gebreeyesus et al., 2017). Consequently, this study aims to address these gaps by assessing the economic impact of industrial park development projects on Ethiopia's overall economic development.

### **1.3. Research Question of the Study**

What is the economic impact of Industrial Parks Development Projects in Ethiopia?

## **2. Methods and Methodology**

### **2.1. Identification strategy**

In 2008, the Ethiopian government formulated the Industrial Parks Development Strategy and initiated the construction of the initial set of Industrial Parks, known as the Eastern Industrial Park. Building upon the economic contributions observed from the first generation of Industrial Parks Development in Ethiopia, the federal government, through the Ethiopia Industrial Parks Development Corporation, has expanded the Industrial Park/Special Economic Zone initiative to various zones, special zones, and city administrations across the country since 2014. Consequently, there exists both temporal and geographical diversity, providing an opportunity to assess the economic impact of Industrial Park/Special Economic Zone Development Projects in Ethiopia.

### **2.2. Study Area/ Geographic Setting of the Study**

This study is conducted within the context of the Federal Democratic Republic of Ethiopia, which encompasses ten Regions, 68 Zones, 770 Woredas, and two federal-level City Administrations. The focus of this study is on the 68 Zones and 2 federal City Administrations where Industrial Park project experiments have been implemented. The selection of these specific areas is based on the authorization granted by the federal government, as reported by the Investment Commission. The establishment of Industrial Parks in these zones and city administrations is contingent upon factors such as geographic location, the development of industrial sectors, and the availability of the labor market. Currently, the Industrial Parks project is operational in 28 zones, special zones, and 2 city administrations. Consequently, these areas are identified as the treated zones, while the remaining zones and city administrations are considered as the controlled zones in this study.

### **2.3. Dataset on Ethiopian Zones area**

To assess the economic impact of Industrial Parks development projects, a panel dataset was compiled, encompassing 68 zones, special zones, and two federal-level city administrations in Ethiopia. This dataset captures a range of variables related to the zones and city administrations, including annual investments classified by type and sources, outcomes in terms of products and by-products, total wages and employee benefits, as well as domestic capital formation. The construction of these panel datasets primarily relied on raw data obtained from various sources, including the Central Statistical Agency, Ethiopian Investment Commission, Ethiopian

Industrial Park Development Corporation, as well as surveys conducted within all Ethiopian industrial parks and the respective offices representing each zone.

### **Industrial Parks/Industrial Zone Development Index**

IDzonedummy

$$= \begin{cases} 1, & \text{if zones, special zones or city administrations are granted Industrial Parks} \\ 0, & \text{if zones, special zones or city administrations aren't granted industrial parks} \end{cases}$$

IDzonedummy = represent industrial park dummy

## **2.4. Econometric Models of the study**

### **2.4.1. The Difference in Differences Research Design (DID Model)**

#### **2.4.1.1. The treated and controlled zones**

Ethiopia encompasses over 30 industrial parks located in various special zones, zones, and two city administrations. These geographic areas are classified as the treated geographic area in this study. The treated geographic area consists of the following regions: Hawasa Special Zone, Mekelle Special Zone, Adama Special Zone, Jimma Special Zone, Bahir Dar Special Zone, Bole Special Zone, Oromia Special Zone (Finfine Zuria Special Zone), AkakiKality Special Zone, NefasSelke Special Zone, Dire Dawa City Administration, North Shewa Zone (Amhara region), East Shewa, West Shewa, Asosa, Zone 3, Zone 1, Shinile Zone, South Tigray Zone, South Gojam Zone, Sidama Zone, South Wello, and West Tigray Zone. These locations constitute the treated geographic area under investigation in this study.

The controlled geographic area, comprising regions that serve as a comparison group, includes the following: Jijiga Special Zone, Konso Special Zone, Alaba Special Zone, Kirkos Special Zone, Arada Special Zone, Yeka Special Zone, Woliata, Arba Minch, South Gondar, Kamashi, Harari, East Wellega, Bale, Hadiya, Horogudru, Gujji, Borena, Sheka, West Wellega, Ilu Ababora, North Shewa (Oromia region), Silite, East Hararge, Guraghe zone, Zone 5, Anuak, and Mezhenger. These regions are classified as the controlled geographic area in this study, providing a contrasting reference to the treated geographic area.

### **Industry Production Decision / Investment Decision**

If one firm decides to invest his or her capital, he or she should make two major decisions: a location decision and an investment level decision. For instance, if one

firm wants to invest in zone 'i', let  $i = 0, 1, 3, \dots, 70$ , where  $i = 0$  represents the option of investing in other countries and  $i = 1, 2, 3, \dots, 70$  represents the option of investing in one of Ethiopia's special zones, zones, and city administrations. Then its profit optimization model is designed as follows:

$$\begin{aligned} & \max_{L_i, FDI_i, Land_i} \pi_i = (1 - \tau_i)(1 - t_i)(pq_i - w_iL_i - R_iLand_i - rFDI_i - F) \\ \text{subject to } & q_i = Q(FDI_i, Land_i, L_i) \text{ ----- (1)} \end{aligned}$$

$\pi_i$  = the profit in zone  $i$ ;  $\tau_i$  = the possibility of expropriation in zone, special zone, or city administration 'i';  $t_i$  = the corporate tax rate;  $p$  = the price of the product produced by the investors;  $q_i$  = the quantity sold;  $w_i$  = the wage rate in zone, special zone, or city administration 'i';  $L_i$  = number of laborers hired in zones, special zones, or city administration 'i';  $R_i$  = the land use fee in zone, special zone, or city administration 'i';  $Land_i$  = land firm used in zone, special zone, or city administration 'i';  $r$  = opportunity cost of capital;  $FDI_i$  = foreign direct investment in zone, special zone, or city administration 'i';  $F$  = fixed cost of production.

The value of industrial output decisions in zone 'i' is the function of the following policy package:

$$\text{IndOutDec}_{ij}^* = f(\tau_i, t_i, R_i, w_i | \{i: \pi_j^* > \pi_i^*, \forall j \neq i\}) \text{----- (2)}$$

Where  $\text{IndOutDec}_{ij}$  is the industrial output decision in zone, special zone, or city administration 'i' for 'j' firms. The industrial parks proclamation provides special property rights protection (lower the tax burden (lower  $t_i$ ) and land fee reduction (lower  $R_i$ ) for investors that invest inside the Ethiopian industrial parks). measure the wage rate in the labor market. Thus, by including these industrial parks in the in the policy package, it leads to the following difference in difference estimation techniques:

$$\text{Inindoutdec}_{it} = \alpha + \varphi * \text{IPdummy}_{it} + \delta_i + \gamma_t + \beta X_{it} + \varepsilon_{it} \text{----- (3)}$$

Where is zone, special zone, or city administration 'i' Industrial Output Decision at Time't', which includes all macro-economic variables (products and by-products, the value of fixed assets, wages and other benefits for employees, and employment opportunities), zones, special zones, or city administrations 'i' fixed effect, time/year fixed effect, and all other exogenous variables that affect the industrial outcome decision in the zones, special zones, or city administration 'i' at the time't' such as property right protection, different types of tax rate, land use fee, and others?



**2.4.1.2. Domestic Capital Formation:**

If the construction and operation of Ethiopian industrial parks enhance the inflows of foreign investors, we believe that it will also affect the domestic business formation tendency:

directly,  $K_{ift} = K_{ift-1} * (1 - \delta) + FDI_{it}(IDzonedummy)/deflator$   
 indirectly,  $K_{idt} = K_{ift-1} * (1 - \delta) + domI_{it}(IDzonedummy)/deflator$  ----- (4)

Where represents for foreign owned capital stock in zone ‘i’ at a time ‘t’, one year lag of foreign owned capital stock in zone ‘i’ at time ‘t’, measure foreign owned investment in zone, special zone, or city administration ‘i’ at a time ‘t’; domestic owned capital stock in zone, special zone, or city administration ‘i’; domestically owned investment in zone, special zone, or city administration ‘i’. The impact of industrial park development projects on the tendency of domestic business formation would be determined by the relationship between the tendency of domestic business formation and the inflow of foreign-owned capital. Thus, this interaction would determine the crowding out or crowding in effect of domestic investment through the inflow of foreign-owned capital. This drives the following empirical research:

$\ln DOMI_{it} = \alpha + \gamma * IDzonedummy_{it} + \delta_i + \gamma_t + \beta X_{it} + \varepsilon_{it}$   
 $\ln K_{idt} = \alpha + \gamma * IDzonedummy_{it} + \delta_i + \gamma_t + \beta X_{it} + \varepsilon_{it}$  ----- (5)

Where is a natural logarithm of domestically owned investment in zone, special zone, or city administration 'i' at time 't'; is a natural logarithm of capital stock in zone, special zone, or city administration ‘i’ at time ‘t’; is a dummy variable that shows the existence of industrial parks in zones, special zones, or city administration 'i' at time 't'; zone, special zone, or city administration fixed effect; is time or year fixed effect; and is all other exogenous explanatory variables that could affect the amount of domestic investment or domestically owned capital stock in zone, special zone, or city administration ‘i’ at time ‘t’.

**2.5. Methods of data analysis**

In this study, the author employed advanced economic estimation techniques called difference-in-difference to examine how industrial park development affects the economy. To analyse the data, I used Stata version 17 software, which allowed me to run regression analyses and draw meaningful conclusions.

**3. Results and Discussion**

The main aim of this study was to evaluate the economic impact of industrial park development projects in Ethiopia. To address this research question, the authors

utilized difference-in-difference estimation techniques. The subsequent sections of this study present the regression results, offer a thorough interpretation of the findings, and provide a comprehensive discussion of the implications derived from the analysis.

### 3.1. Summary Statistics for Panel Data

This study utilizes pooled panel data analysis to investigate the macroeconomic impact of industrial park development projects. Summary statistics are presented in columns two and three of the table, categorizing the data into treatment and control groups. The authors enhance the significance level of the coefficient by focusing on the intersection year of the second generation of Ethiopian Industrial Parks as the post-treatment period (2016–2018), while the pre-treatment period spans 2012–2013. Prior to implementing the program, it is crucial to verify the absence of a significant difference between treated and controlled zones. The 'p' value test under summary statistics assesses the presence of such a difference. The null hypothesis states no significant difference exists, while the alternative hypothesis argues for its presence. Failing to reject the null hypothesis enables the estimation of the difference-in-differences model to proceed.

**Table 5: Summary Statistics for Panel Data**

Variables	Summary Statistics for DID Treated Zones		Summary Statistics for DID Control Zones		p-value
	Observation	Mean	Observation	Mean	
Total export value	32,251	6183403	22,400	7290331	<b>0.459</b>
Total wage for Male employees	45,350	956338	28,818	1115104	<b>0.219</b>
Working Capital	55,350	2.79e+07	34,468	3.13e+07	<b>0.419</b>
The total sales value	74,704	1.44e+07	49,236	1.63e+07	<b>0.062</b>
The total Value of Production	75,606	1.51e+07	50,246	1.60e+07	<b>0.279</b>
The total wage for employees	45,708	1469920	29,070	1653341	<b>0.219</b>
Commission, bonus and professional allowances	27,003	149708.2	10,663	163841.2	<b>0.468</b>
The book value of fixed assets	68,469	6397126	42,929	1.04e+	<b>0.95</b>

				07	<b>6</b>
Investment on purchase and capital repair of fixed investment	54,548	2076400	34,441	24229 89	<b>0.23</b> <b>4</b>
Total wage for Male employees	45,350	956338	28,818	11151 04	<b>0.218</b> <b>7</b>
Total number of domestic investors	8,931	5.16202	5,756	4.3424 25	<b>0.11</b> <b>3</b>
Total current paid up capital	9,227	5.54e+0 7	5,892	7.53e+ 07	<b>0.06</b> <b>0</b>
Investment on fixed assets	49,214	4010489	1,231	46051 64	<b>0.25</b> <b>1</b>
Total Female hired	37,275	68.4050 4	23,322	68.016 38	<b>0.93</b> <b>3</b>
Total Engaged per months	2,856	268.074 2	2,677	436.05 49	<b>0.74</b> <b>4</b>

The analysis presented in the table reveals that the p-value associated with the null hypothesis, which suggests no significant difference between control and treatment zones prior to the implementation of Ethiopian Industrial Parks Development Projects, is found to be statistically insignificant at a significance level of five percent. This indicates that there is insufficient evidence to support the presence of a substantial difference between the controlled and treated zones prior to the program's implementation. Consequently, we are unable to reject the null hypothesis. These findings provide a valid basis for employing the difference-in-differences estimation technique to effectively evaluate and estimate the Economic Impact of Industrial Parks Development Projects.

### **3.2. The Economic Impact of Industrial Parks Development Projects in Ethiopia**

#### **3.2.1. Impact of Ethiopian Industrial Parks Development Project on Products and by Products of Industrial Output**

The provided table presents the macroeconomic impact of industrial parks development projects on the annual products and by-products within zones that have implemented industrial park initiatives, in comparison to zones without such projects. The annual products and by-products are measured through key indicators, including total sales values, total export values, and the annual value of production.

**Table 15: Impact of Ethiopian Industrial Parks Development Project on Total sales value, Total export value and value of production**

Variables	Ln of total annual sales value			Ln of total annual Export Value			Ln of annual value of Production	
Treatment *Post	.166 (.033)* **	1.550 (.606)* *	2.417 (.616)* **	.585 (.190)* **	1.285 (.590)**	2.147 (.532)** *	4.099 (1.814)* *	5.223 (1.891)* **
Post	.453 (.037)* **	.0157 (.434)	.196 (.487)	-.232 (.223)	-.047 (.499)	-.768 (.271)** *	2.094 (1.574)	-.185 (1.555)
Treatment	1.300 (.327)* **	-3.363 (.818)* **	-2.730 (.605)* **	-.462 (.155)* **	-1.608 (2.008)	-1.184 (.438)** *	-4.086 (1.781)* *	-9.121 (2.317)* **
Ln of total wage		-.114 (.031)* **	-.108 (.031)* **		-.405 (.200)**	-.401 (.206)*	-.001 (.005)	-.002 (.005)
Ln of working Capital		.112 (.015)* **	.194 (.025)* **		.185 (.085)**	.093 (.060)*	.001 (.002)	.0022 (.0018)
Ln of total tax paid		-.460 (.891)	-.349 (.975)		-5.276 (1.656)* **	-1.761 (1.064)*	-.145 (.108)	-.213 (.107)**
Constant	12.827 (.3194) ***	18.663 (.834)* **	- 1.731(1 .320)	15.003 (.163)* **	105.685 (11.222) ***	105.370 (7.506)* **	5.007 (.197)** *	3.77 (.15)***
Fixed Effect	Yes	Yes	No	Yes	Yes	No	No	Yes
Additional exogenous covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional exogenous covariates controlled in the model are:ln of annual depreciation values, ln of investment on fixed assets, ln of imported raw material values, ln of total raw material value and ln of electricity values								
<b>Source authors' estimation</b>								
***, **, * one, five and ten per cent significance level, respectively								

The table above presents the findings on the impact of industrial parks development projects on the products and by-products in Ethiopia. Model one specifically examines the effect of constructing and operating industrial parks on the total annual sales values in treated zones compared to controlled zones. The study reveals that,

on average, the implementation of industrial parks results in a significant increase of over 100 percent in the annual total sales value of production for zones with industrial parks, relative to zones without industrial parks, while holding other controlled variables constant. Furthermore, the results indicate that the total wage value and total working capital significantly influence the total sales value of companies. Specifically, a one percent increase in the total wage value leads to a decrease of 0.108 percentage points in the total sales value, assuming all other factors remain constant. Similarly, a one percent increase in the total working capital value corresponds to a 0.112 percentage point increase in the total annual sales value, all else being equal.

Model two examines the impact of establishing and operating industrial parks development projects on the total annual export values within zones that have industrial parks, compared to zones without industrial parks in their geographic setting. The results demonstrate that the establishment and operation of industrial parks have a substantial effect, doubling the total annual export value for zones with industrial parks relative to zones without industrial parks, assuming all other controlled variables remain constant in the model. Furthermore, the regression analysis reveals consistent signs for all other controlled variables in the model. Notably, the total wage value, total working capital, and total tax paid significantly influence the total export value. Specifically, a one percent increase in the total wage value and total tax paid leads to a decrease of 0.4 and 1.761 percentage points, respectively, in the total annual export value, all else being equal. Conversely, a one percent increase in the value of annual working capital corresponds to a 0.092 percentage point increase in the total annual export value, assuming all other factors remain constant.

Model three examines the impact of establishing and operating industrial parks development projects on the total annual value of production in Ethiopia. The results indicate that the establishment and operation of Ethiopian industrial parks have a substantial effect, leading to a doubling of the total annual value of production for zones that have established industrial parks in their geographic setting, compared to zones without industrial parks. This finding holds true when all other controlled variables in the model remain constant. Furthermore, the regression analysis reveals consistent signs for all other controlled variables in the model. Specifically, the total wage value and total tax paid have a negative impact on the annual value of production. As the total tax paid increases by one percent, the annual value of

production significantly decreases by 0.212 percentage points, assuming all other factors remain constant.

### **Parallel Line Test /Placebo test**

The validity of the parallel trend assumption is a fundamental aspect to examine when employing Difference in Differences estimation techniques. In this study, we assess this assumption using time-varying (event study specification) Difference in Differences setup, as supported by the numerical evidence presented in the following tables.

To generate the pseudo post value, we construct three distinct time-varying Difference in Differences setups based on the year of establishment of the Industrial Parks Development Projects: 2012-2013, 2013-2014, and 2014-2015. In the 2012-2013 setup, a value of 1 is assigned to data collected in 2013, while a value of 0 is assigned to data collected in 2012. Similarly, in the 2013-2014 setup, a value of 1 is assigned to data collected in 2014, and 0 is assigned to data collected in 2013. Finally, in the 2014-2015 setup, a value of 1 is assigned to data collected in 2015, and 0 is assigned to data collected in 2014.

For all setups, the authors utilize post-treatment data to generate the pseudo post value, which varies based on the year of industrial park establishment in Ethiopia. Consequently, the ensuing table presents the placebo test conducted by the authors using the time-varying Difference in Differences setup. This analysis aims to determine whether the total annual sales value, annual export value, and annual value of production exhibit similar trends before the implementation of Industrial Parks Development Projects, utilizing the pseudo post value.

**Table 16: Placebo Test/Parallel Line test for Product and by-Products**

Variables	Ln of Total annual sales value			Ln of Total annual export value			Ln of Total annual value of production		
	2012 - 2013	2013-2014	2014 - 2015	2012-2013	2013-2014	2014-2015	2012-2013	2013-2014	2014 - 2015
Treatment* pseudo post	1.051 (.971)	-.188 (.421)	.042 (.171)	.858 (1.155)	-	1.64 (2.26)	1.5800 (1.2618)	-.265 (.411)	
Treatment	-.861 (.591)	-.195 (1.464)	-.099 (.179)	-.010 (.794)	.320 (1.93)	2.789 393 (1.99)	1.130 (.709)	-.180 (1.583)	.137 (.165)
Pseudo Post	1.801 (1.355)	- 2.121 (.113)***	-.137 (.115)	-2.007 (1.737)	-.232 (.611)	1.26 (1.07)	2.431 (1.845)	-2.070 (.114)***	.072 (.084)
Ln of total wage	.101 (.240)	.081 (.084)	-.013 (.041)	-.010 (.325)	.594 (.400)	-.873 (.684)	-.049 (.235)	.088 (.082)	-.025 (.021)
Ln of working capital	.002 (.110)	.060 (.016)***	-.034 (.021)	.0180 (.152)	.149 (.087)*	-.334 (.206)	-.111 (.097)	.062 (.016)***	-.026 (.021)
Constant	6.014 (2.848)**	12.827 (.748)***	1.150 (.685)	16.183 (2.880)***	9.20 (2.32)**	15.31 (7.29)**	15.314 (4.191)***	12.963 (1.038)***	.331 (.354)
Zones exogenous variables	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Zone and time fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Source authors' estimation</b>									
<b>***, **, * one, five and ten per cent significance level, respectively</b>									

The table above shows placebo test results for the economic impact of industrial park development projects. It indicates that there was no significant impact on sales,

exports, or production prior to the implementation of the program. This supports the assumption of parallel trends in the estimation techniques.

The above analysis rejected the null hypothesis of the absence of a significant impact of industrial park development projects on products and by-products of industrial outcomes measured by total export value, total sales value, and the total annual value of production. This finding revealed the positive and statistically significant impact of industrial park development projects on products and by-products of industrial outcomes in Ethiopia. The findings of the study are in line with the conclusions reached by (Devereux and Chen, 1995; FIAS, 2008; Johansson and Nilsson, 1997; Rhee et al., 1990; Johansson, 1994; Farole, 2011; Kusago and Tzannaos, 1998; Milberg and Amangual, 2008; Cling et al., 2005; ILO, 2008; VerBeek, 2001; and Zohir, 2001). On the other hand, this finding rejected the findings of the study conducted by Aggarwal et al. (2005), War (1989), and Ayres (1994).

#### **4.4.4. Impact of Ethiopian Industrial Parks Development Projects on Wages and other benefits for employees**

Table 19 presents the economic impact of Ethiopian Industrial parks development projects on employee wages and salaries. It compares zones with industrial parks to zones without industrial parks. The study measures wages and salaries using total wages of employees, total wages for male employees, and total commission, bonus, and professional allowances for employees.



**Table 19: Impact of Ethiopian Industrial Parks Development Project on total wage and other benefits for employees**

Variables	Ln of Total wage value for employees			Ln of wage for Male employees		Ln of commission, bonus and professional allowances		
	<b>Treatment *Post</b>	.077 (.036)* **	.426 (.176)* *	.422 (.176)* *	.449 (.264)*	.458 (.266)*	.111 (.120)	1.036 (.486)* *
<b>Post</b>	.634 (.040)* **	.365 (.112)* **	.265 (.120)* *	.479 (.165)***	.365 (.160)**	.368 (.131)** *	.408 (.396)	.558 (.387)
<b>Treatment</b>	-1.257 (.798)	.047 (.068)	.048 (.067)	.072 (.100)	.0750 (.101)	1.582 (.302)** *	.004 (.112)	-.114 (.113)
<b>Ln of working capital</b>		.109 (.013)* **	.109 (.013)* **	.093 (.013)***	.093(.013)***		.064 (.023)* **	.098 (.024)* **
<b>Ln of total raw material values</b>		.027 (.010)* **	.019 (.010)* *	.025 (.010)**	.015 (.010)		.065 (.065)	.086 (.068)
<b>Source of Finance</b>		.044 (.017)* *	.034 (.014)* *	.027(.014)**	.026 (.014)*		.024 (.024)	.036 (.025)
<b>Constant</b>	12.410 (.797)* **	8.825 (.389)* **	9.258 (.370)* **	8.813 (.380)***	9.335 (.361)** *	9.336 (.321)** *	7.869 (.595)* **	8.368 (.541)* **
<b>Fixed effect</b>	Yes	Yes	No	Yes	No	Yes	Yes	No
<b>Additional exogenous covariates</b>	No	Yes	Yes	Yes	Yes	No	Yes	Yes
Source authors' estimation ***, **, * one, five and ten percent significance level, respectively								
Additional exogenous covariates controlled in the model are Ln of average annual sales, Ln of value of the product at full capacity, Ln of average value of the product, Ln of difference in the annual value of stocks and Ln of total value of domestic capital								

The table above shows the economic impact of constructing and operating Ethiopian industrial parks development projects on employee wages and salaries. It compares zones with industrial parks to zones without industrial parks. The first two columns

indicate that the construction and operation of industrial parks projects increased the total annual wages of employees by 5% in zones with industrial parks, assuming all other variables remain constant. This model also reveals that an increase in working capital by 1% leads to a 0.109 percentage point increase in employee wages, while a 1% increase in total raw material value results in a 0.019 percentage point increase in employee wages. Furthermore, compared to domestic sources of finance, other sources of finance lead to a 0.03 percentage point increase in employee wages, assuming all else remains constant.

Model two demonstrates the impact of industrial parks development projects on the total wages of male employees. The study found that in zones with industrial parks, the establishment and operation of these projects increased total wage payments for male employees by 55% compared to zones without industrial parks, assuming all other variables remain constant. Additionally, industrial parks development projects led to a 7% increase in total wage payments for male employees in zones with industrial parks. The model also highlights that the annual value of working capital and the source of finance have a significant effect on the wages of male employees. Specifically, a 1% increase in working capital results in a 0.09 percentage point increase in wages for male employees, assuming all else remains constant. Furthermore, compared to domestic sources of finance, other sources of finance result in a 0.03 percentage point increase in wages for male employees, assuming all else remains constant.

Model three examines the impact of Ethiopian Industrial parks development projects on employee commission, bonus, and professional allowances. The study finds that in zones with industrial parks, the establishment and operation of these projects significantly increased these allowances by over 100% compared to zones without industrial parks, assuming all other variables remain constant. Furthermore, the annual working capital has a significant effect on the value of commission, bonus, and professional allowances. Specifically, a 1% increase in annual working capital leads to a 0.1 percentage point increase in these allowances, assuming all else remains constant.

### **Parallel Line Test /Placebo test**

In order to test the validity of the parallel trend assumption in Difference in Differences estimation, we utilize time varying (event study specification) setups. The subsequent tables provide numerical evidence supporting the parallel trend

assumption. To create the pseudo post value, we employ three time varying Difference in Differences setups based on the year of establishment of Industrial Parks Development Projects: 2012-2013, 2013-2014, and 2014-2015. For the 2012-2013 setup, we assign a value of 1 to data collected in 2013 and 0 to data collected in 2012. Similarly, for the 2013-2014 setup, we assign 1 to data collected in 2014 and 0 to data collected in 2013. For the 2014-2015 setup, we assign 1 to data collected in 2015 and 0 to data collected in 2014. Consequently, the following table presents the placebo test conducted using the time varying Difference in Differences setup to determine if there is a similar trend in the total wages of employees, total wages of male employees, and total annual commission, bonus, and professional allowances of employees before the implementation of Industrial Parks Development Projects. This analysis is performed using the pseudo post value.

**Table 20: Placebo test/ Parallel Line Test for Wages and other benefits for Employees**

Variables	Ln of total wage value for employees			Ln of total wage for male employees			Ln of commission, bonus and professional allowance		
	2012-2013	2013-2014	2014-2015	2012-2013	2013-2014	2014-2015	2012-2013	2013-2014	2014-2015
Treatment* pseudo post	.417 (.345)	.508 (.551)	-.366 (.821)	.429 (.336)	.070 (.935)	-.207 (.754)	-.045 (1.44)	-.761 (1.462)	.608 (.994)
Treatment	-1.063 (.755)	-.041 (.553)	.644 (.648)	-.601 (.825)	-.532 (.537)	.204 (.729)	-3.110 (2.298)	-.399 (.505)	-.085 (1.139)
Pseudo Post	-.210 (.260)	.078 (.171)	-.776 (.401) *	-.235 (.250)	.040 (.168)	-.709 (.411) *	.564 (1.127)	(.144) (.320)	-.574 (.482)
Ln of working capital	.135 (.039) ***	-.066 (.030) **	.184 (.044) ***	.121 (.037)* **	-.065 (.029) **	.150 (.043)	.248 (.121) **	-.071 (.053)	.157 (.088) *
Constant	11.082 (1.136)	9.183 (.743) ***	8.451 (.854) ***	10.566 (1.133) ***	9.170 (.733) ***	8.818 (.836) ***	2.113 (3.534)	13.440 (1.286) ***	4.42 (1.87)
Zones exogenous variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zone and Time fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Source authors' estimation</b>									
<b>***, **, * one, five and ten per cent significance level, respectively</b>									

The table above presents the placebo test results for the economic impact of industrial parks development projects in Ethiopia. The findings indicate that there is no significant placebo effect of the projects before their implementation, supporting the assumption of parallel trends in the difference in differences estimation techniques.

The above finding rejects the idea that industrial parks development projects have no positive and statistically significant impact on employee wages and benefits, as measured by total wage, annual wage for male employees, and commission, bonus, and professional allowance. The study confirms that these projects indeed have a positive and statistically significant effect on wages and salaries in industrial parks enterprises in Ethiopia. This supports the conclusions reached by several previous studies (Selam, 2017; Rhees, 1990; Farole, 2011; Kusago and Tzannaos, 1998; Milberg and Amangual, 2008; Romero, 1995; Mondol, 2003; FIAS, 2008; Warden, 2000; Cling et al, 2005; ILO, 2008; VerBeek, 2001; Zohir, 2001; Wang, 2013; Johansson and Nilsson, 1997; Warr, 1989; Summerfield, 1995; and Aggarwal et al, 2008 in the long run). However, this finding contradicts the conclusions reached by other studies (Hamada, 1974; ICFTU, 2004; PRIA, 2000; Hossain, 2001; Mazumdar, 2001; and Kemal, 2001).

#### **4.4.5. Impact of Ethiopian Industrial Parks Development Projects on the Domestic Capital formation**

Table 21 presents the economic impact of Ethiopian Industrial parks development projects on domestic capital formation. Domestic capital formation is measured by three indicators: the total number of domestic investors/owners, the total initial paid-up capital by domestic investors, and the total working capital of domestic investors. The table compares zones with industrial parks to zones without industrial parks in terms of their domestic capital formation.

**Table 21: Impact of Industrial Parks Development on Domestic Capital Formation**

Variables	Total number of domestic investors (Both sex)		Variables	Ln of total initial paid up capital by domestic investors		Variables	Ln of total working capital by domestic investors	
Treatment*Post	.127 (1.171)	1.099 (1.169)	Treatment*Post	.374 (1.447)	.920 (.800)	Treatment*Post	7.747 (9.466)	-4.045 (3.063)
Post	-2.070 (2.959)	-1.224 (1.010)	Post	-1.936 (.955)**	-1.826 (.482)**	Post	-5.800 (9.900)	1.914 (2.294)
Treatment	-.525 (1.149)	-1.014 (1.136)	Treatment	1.661 (2.081)	-.771 (.723)	Treatment	-8.508 (10.738)	4.583 (3.040)
Source of finance	.090 (.170)	.041 (.185)	Ln of Working Capital	-.288 (.100)***	-.133 (.074)*	Source of finance	.270 (.365)	-.157 (.250)
Ln of working Capital	-.145 (.236)	-.112 (.195)	Ln of License fee Paid	-.141 (.144)	-.061 (.102)	Ln of working capital	.581 (1.038)	-.632 (.493)
Ln of Banking charge	-.022 (.190)	-.004 (.124)	Ln of total wage value	-.004 (.098)	-.001 (.075)	Ln of total tax paid	-16.185 (24.818)	-12.784 (10.662)
Ln of income tax paid	-.076 (.249)	-.050 (.215)	Ln of Income tax paid	-.019 (.130)	-.006 (.097)	Ln of book value of fixed asset	.0193 (.077)	.556 (.633)
Ln of total wage value	-.304 (.154)**	-.180 (.113)*	Ln of Banking charge paid	-.075 (.114)	-.032 (.082)	Ln of annual export value	.572 (.811)	-.365 (.401)
Constant	14.288 (6.787)**	10.609 (3.741)***	Constant	20.162 (3.308)***	16.376 (2.187)***	Constant	2.7505 (23.4350)	-7.829 (9.691)

Fixed Effect	Yes	No	Fixed Effect	Yes	No	Fixed Effect	Yes	No
Additional exogenous covariates	Yes	Yes	Additional exogenous covariates	Yes	Yes	Additional exogenous covariates	Yes	Yes
Source authors' estimation								
***, **, * one, five and ten percent significance level, respectively								
Additional exogenous covariates controlled in the model are ln of value of total raw material, ln of total sale value, ln of the value of bank service charges, ln of value of total tax paid and ln of the value of products at full capacity								

The above analysis examines the impact of Ethiopian industrial parks development projects on domestic capital formation, specifically the total number of domestic enterprise owners in zones with industrial parks compared to zones without industrial parks. The coefficient of the interaction terms in the table is positive, indicating a potential influence, but it is not statistically significant. Therefore, we lack substantial evidence to reject the null hypothesis. It suggests that the establishment and operation of industrial parks development projects do not have a significant impact on the total number of domestic investors. However, the analysis also reveals that the total wage value has a significant effect on the total number of domestic investors. For every one percent increase in employee wages, the total number of domestic investors is expected to decrease by 30 percentage points, assuming all other factors remain constant.

Model two examines the effects of industrial parks development projects on domestic capital formation, specifically the total initial paid-up capital by domestic investors. The result indicates that the coefficient of the interaction term is positive, suggesting a potential influence, but it is not statistically significant. Therefore, we do not find significant evidence to support the notion that the establishment and operation of industrial parks development projects have a significant impact on the initial paid-up capital by domestic investors.

Model three investigates the impact of Ethiopian industrial parks development projects on the total working capital of domestic investors. The coefficient on the interaction terms indicates that there is no significant effect of industrial parks

development projects on the total working capital of domestic investors. In other words, the presence or absence of industrial parks does not have a statistically significant impact on the overall working capital of domestic investors.

**Parallel Line Test /Placebo test**

**Table 22: Placebo Test/ Parallel Line Test for Domestic Capital Formation**

Variables	Total number of domestic investors		Ln of total initial paid up capital by domestic investors		Ln of total working capital by domestic investors	
Treatment* pseudo post	-.124 (1.923)	-.197 (2.021)	-.017 (.115)	.363 (.33.)	-.019 (.120)	-.098 (.280)
Treatment	-1.625 (1.349)	-1.462 (1.406)	.072 (.097)	-.924 (1.049)	.034 (.094)	.048 (.183)
Pseudo Post	.191 (.968)	.149 (1.049)	.111 (.071)	.138 (.213)	.064 (.075)	-1.395 (.877)
Ln of working capital		-.004 (.135)		.070 (.035)		.100 (.029)***
Source of finance		-.070 (.186)		.001 (.035)		-.002 (.031)
Constant	2.908 (.885)***	3.038 (3.096)	15.767 (.3185)***	14.320 (1.168)***	16.831 (.411)	14.865 (1.005)***
Zones exogenous variables	No	Yes	No	Yes	No	Yes
Zone and Time fixed effect	yes	Yes	Yes	Yes	Yes	Yes
Source authors' estimation						
***, **, * one, five and ten percent significance level, respectively						

The table above presents the placebo test results for the economic impact of industrial parks development projects in Ethiopia. It compares zones with industrial parks to zones without industrial parks before the implementation of the program. The second column shows the placebo impact on the total number of domestic investors, using a pseudo post value. The coefficient on the interaction between the



pseudo post value and treatment indicates an insignificant placebo test value for the economic impact of industrial parks development projects. The fourth column displays the placebo test value for the total initial paid-up capital by domestic investors, also using the pseudo post value. The coefficient on the interaction between the pseudo post value and treatment reveals a statistically insignificant placebo test value for the economic impact of industrial parks development projects on the total initial paid-up capital. The last column presents the placebo impact on the total working capital of domestic investors, using the pseudo post value. The coefficient on the interaction between the pseudo post value and treatment signifies a statistically insignificant placebo test value for the economic impact of industrial parks development projects on the total working capital of domestic investors. Overall, the absence of a significant impact of industrial parks development projects before their implementation supports the assumption of parallel trends in the difference in differences estimation techniques.

Based on the above results, we cannot reject the null hypothesis, which suggests that industrial parks development projects do not have a positive and statistically significant impact on domestic capital formation. This conclusion aligns with the findings of previous studies by Aggarwal et al. (2005), Ayres (1994), Zeng (2015), and Hamada (1974), who also did not find a significant impact. However, this finding contradicts the conclusions drawn by Devereux and Chen (1995), Wang (2013), Johansson and Nilsson (1997), Humphrey (2000), Lall (2000), Farole (2011), Kusago and Tzannaos (1998), and Milberg and Amangual (2008), who argued for a positive impact of industrial parks development projects on domestic capital formation.

#### **4. Conclusion and Policy Implication**

##### **4.1. Conclusion**

Industrial parks, also referred to as industrial zones or special economic zones, encompass various economic concepts like free trade zones, export processing zones, and free ports. They are widely employed as a major economic development strategy by policymakers and decision-makers. However, existing empirical research has yielded mixed findings regarding the economic impact of industrial park development projects. While many researchers, such as Chen, Jayanthakumaran, Monge-Gonzalez, Warr, Zeng, Fuller and Romer, Hamada, Madani, World Bank, Kaplinsky, Johansson and Nilsson, Willmore, Farole, FIAS, and Balasubramanyam, have identified a positive and statistically significant impact,

others, including Engman et al., have found the impact to be insignificant and capable of distorting resource allocation. Furthermore, Hamada and Madani have concluded that the impact of these projects is contingent upon specific conditions and limited time horizons, and Warr's study highlighted that most industrial park enterprises primarily capitalize on tax breaks without significantly influencing employment generation and export earnings.

With the exception of domestic capital formation, the findings of this study reject the null hypothesis that industrial park development projects have no positive and statistically significant economic impact on various macroeconomic variables and indicators. The study provides evidence supporting the notion that these projects do influence factors such as industrial output, wages, and employee benefits, despite not affecting domestic capital formation.

#### **4.2. Policy Implication**

Considering the limited impact of industrial park development projects on domestic capital formation, it is crucial for the Ethiopian government to devise and implement special incentive and policy packages. These measures should aim to encourage domestic investors to invest in industrial parks. To create an attractive investment environment, the government can offer targeted incentives such as tax breaks, simplified administrative procedures, and improved access to financing. These steps will help stimulate domestic capital formation and contribute to the overall economic impact of industrial park development projects.

Furthermore, it is important to raise awareness among domestic investors about the potential benefits and opportunities associated with industrial parks. Emphasizing the positive outcomes in terms of industrial output, wages, and employee benefits can help garner interest and participation. By actively involving domestic investors in these projects, Ethiopia can maximize the economic benefits and foster a more inclusive and sustainable industrial development strategy.

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