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Governance and Institutional Frameworks in Ethiopian Integrated Agro-Industrial Parks: Enhancing Innovation Ecosystems and Multi Stakeholder Coordination for Global Market Competitiveness

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Abstract: This study investigates the interrelationships between institutional frameworks, innovation ecosystems, and stakeholder coordination in enhancing the global competitiveness of Ethiopia's Integrated Agro-Industrial Parks (IAIPs) in Yirgalem and Bulbula. A mixed-methods approach combining qualitative thematic analysis, Partial Least Squares Structural Equation Modeling (PLS-SEM), and SWOT analysis was employed to evaluate the influence of governance structures on innovation and competitiveness. Findings suggest that while strong institutional frameworks and effective stakeholder coordination foster innovation, a misalignment between the innovation ecosystem and global market demands limits competitiveness. Rigid institutional structures hinder IAIPs' adaptability to market fluctuations. Future research should explore the role of digital transformation, such as digital agriculture tools and traceability systems, in enhancing competitiveness. Additionally, examining the influence of public-private partnerships and conducting longitudinal studies on adaptive governance's effect on IAIP resilience could provide valuable insights for the development of Ethiopia's agro-industrial sector. The study underscores the need for flexible, market-responsive frameworks and enhanced stakeholder engagement.

Keywords: innovation ecosystem; governance framework; integrated agro-industrial parks; global competitiveness; Ethiopia; stakeholder coordination



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1. Introduction

Integrated Agro-Industrial Parks (IAIPs) represent a transformative approach to bridging the gap between agriculture and industry, particularly within developing economies such as Ethiopia (Boru et al., 2025a). By integrating industrial processes into the agricultural sector, IAIPs hold significant potential to enhance agricultural productivity, strengthen value chains, and increase global competitiveness (World Bank, 2021). This transformation is especially crucial in Sub-Saharan Africa, where agriculture remains a cornerstone of the economy, primarily dominated by smallholder farming, traditional practices, and subsistence production (Ruppel, 2022). Despite the challenges faced, agriculture in Africa offers immense opportunities for economic growth, poverty alleviation, and job creation, particularly when combined with industrial frameworks (Collier & Dercon, 2014; Palacios-Lopez et al., 2017).

In Ethiopia, one of Africa's most populous countries, agriculture plays a critical role in the economy. It employs approximately 65% of the labor force and contributes nearly 32% of the Gross Domestic Product (GDP) (NBE, 2023; ESS, 2021). However, smallholder farmers in Ethiopia encounter several challenges, including limited access to modern technologies, constrained market access, inadequate infrastructure, and vulnerability to climate change (Anbes, 2020). To address these barriers and accelerate economic development, the Ethiopian government has strategically prioritized the industrialization of agriculture, with IAIPs serving as a central component of this agenda. These parks are designed to foster synergies between the agricultural and industrial sectors, thereby promoting innovation, enhancing productivity, and supporting sustainable economic growth.

The success of IAIPs depends largely on their ability to create innovation ecosystems that enhance the global competitiveness of agro-industries. Innovation ecosystems are networks of interconnected institutions, organizations, and individuals that collaborate to generate and disseminate knowledge, technology, and resources to drive innovation (Lundvall, 1992). In the context of IAIPs, these ecosystems typically include agro-industrial firms, research institutions, financial services, and smallholder farmers. Effective coordination among these stakeholders is essential to boosting the global competitiveness of agro-industries (Porter, 1990; Fagerberg et al., 2005). Key indicators of global competitiveness, as outlined by Porter (1990), include productivity, technological advancements, infrastructure quality, and the ability to access and compete in international markets. As such, understanding the role of innovation in IAIPs and how it contributes to global competitiveness is critical for formulating effective policy interventions (Malerba, 2002).

One important metric for fostering innovation within IAIPs is the adoption of climate-smart agricultural technologies that enhance productivity while reducing postharvest losses (Urugo et al., 2024). These innovations not only contribute to economic growth but are also expected to transform Ethiopia's agricultural production from being fragmented and supply-driven to becoming organized, safe, demand-led, and quality-oriented (UNIDO, 2025). Moreover, innovation ecosystems within IAIPs can support the development of resilient local supply chains, reducing dependence on international markets and enhancing Ethiopia's ability to withstand external shocks (Ostrom, 2005). The relationship between innovation and global competitiveness is multidimensional, requiring analysis of technological adaptation, institutional efficiency, and stakeholder collaboration as key performance indicators (Fagerberg et al., 2005).

Governance structures within IAIPs are integral to facilitating the coordination of resources, innovation processes, and policy implementation. Effective governance frameworks provide clear rules and regulations, reduce transaction costs, and promote collaboration among diverse stakeholders (North, 1990). Research by Litha et al. (2024) highlights the importance of strong governance structures in optimizing resource allocation, facilitating access to finance, and promoting research and development. In the Ethiopian context, a robust governance system is essential for maximizing the impact of IAIPs on both agricultural and industrial productivity, ultimately strengthening global competitiveness.

Despite the growing recognition of IAIPs as a critical strategy for agricultural and industrial development in Ethiopia, significant gaps remain in both the literature and practical implementation. While research has primarily focused on the economic dimensions of IAIPs, such as productivity improvements and market access (Anbes, 2020; Shabanov et al., 2021), there is a notable lack of comprehensive tools for assessing the broader governance and institutional dimensions. These aspects are crucial for understanding the effectiveness of IAIPs in enhancing global competitiveness. Schmidt (2012) argues that the success of innovation ecosystems and the competitive performance of industries depends on well-

structured governance frameworks that facilitate collaboration and the efficient allocation of resources.

This study aims to address these gaps by exploring the interactions between governance frameworks, institutional arrangements, and innovation ecosystems within Ethiopia's IAIPs. By examining the roles and contributions of various stakeholders—including government entities, private sector firms, research institutions, and local communities—this research seeks to provide valuable insights into how effective governance can foster innovation and promote sustainable development. A particular focus will be placed on multi-stakeholder coordination, which is critical for achieving global competitiveness, as well as the role of institutional frameworks in creating an enabling environment for innovation. Additionally, a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis will be used to identify key challenges and opportunities for enhancing governance and institutional frameworks within Ethiopia's IAIPs.

The research methodology employed in this study incorporates a well-defined and robust sampling strategy, essential for capturing the complexity of relationships within Ethiopia's IAIPs, specifically in the Bulbula and Yirgalem parks. Given the multi-dimensional nature of the research, a stratified sampling approach will be used to select participants from various sectors within the parks' value chains, including smallholder farmers, industrial firms, research institutions, and government representatives. This stratified approach ensures that diverse perspectives from all relevant stakeholders are incorporated, providing a comprehensive understanding of the factors influencing the success of IAIPs. This methodology aligns with the multi-stakeholder approach advocated by [Porter \(1990\)](#) and [Lundvall \(1992\)](#), which is essential for understanding the dynamics of agro-industrial integration and governance in Ethiopia.

The justification for using a stratified sampling approach lies in its ability to ensure representativeness and inclusivity. This strategy enables the collection of data that reflects the experiences, challenges, and opportunities faced by key actors involved in the development and management of IAIPs. As [Bryman \(2016\)](#) suggests, stratified sampling enhances the validity and reliability of the study by providing a more detailed and nuanced understanding of the research subject. Moreover, it ensures that the study captures the multi-faceted nature of stakeholder interactions, which is critical for understanding the role of governance and institutional frameworks in fostering innovation and competitiveness within IAIPs.

By addressing gaps in the literature and providing an in-depth analysis of the role of governance and institutional frameworks in IAIPs, this study seeks to contribute to both theoretical and practical knowledge. The insights generated will not only inform policymakers and practitioners in Ethiopia but also contribute to the broader discourse on agro-industrial development in Sub-Saharan Africa. The findings are expected to provide actionable recommendations for enhancing the effectiveness of IAIPs, thereby promoting sustainable agricultural growth, industrialization, and global competitiveness.

The structure of this paper is as follows: Section 2 presents a review of relevant literature and conceptual frameworks, highlighting key theories and previous studies on agro-industrial integration, governance, and innovation ecosystems. Section 3 outlines the research methodology, including the sampling strategy, data collection methods, and analytical techniques employed. Section 4 presents the study's findings, discussing their implications for policy and practice. Section 5 concludes with recommendations for optimizing IAIPs in Ethiopia, while Section 6 addresses the ethical considerations and limitations of the study.

2. Literature Reviews and Conceptual Framework

2.1. Literature Review

Integrated Agro-Industrial Parks (IAIPs) in Ethiopia is embedded in several theoretical frameworks that address governance structures, multi-stakeholder coordination, and innovation ecosystems. Institutional Theory offers a fundamental understanding of how formal and informal structures (rules, norms, and practices) influence organizational behavior and the coordination of activities (Dong et al., 2021; Jenson et al., 2016). IAIPs, this theory is crucial for understanding how governance and institutional frameworks shape the behavior of stakeholders, including government agencies, businesses, and local communities, in facilitating collaboration and fostering innovation.

The Innovation System Theory further extends this understanding by emphasizing the role of networks and partnerships among various actors—government, private sector, research institutions, and communities—in fostering technological advancements and enhancing productivity within agro-industrial sectors (Lundvall, 1992; Adamides, 2023). This theory asserts that innovation ecosystems are essential for creating a collaborative environment that accelerates knowledge sharing, technology transfer, and productivity improvements. Empirical evidence from studies on IAIPs, such as Adamides (2023), suggests that the establishment of strong networks is pivotal for the successful functioning of IAIPs.

Sustainability Transition Theory provides another layer of understanding, highlighting the importance of adopting eco-friendly practices and sustainable resource management within IAIPs. This theory underscores the need for long-term resilience and environmental sustainability in agro-industrial processes (Costa et al., 2023; Ghazinoory et al., 2011). The literature emphasizes the need for IAIPs to integrate value chain approaches that promote resource efficiency, waste reduction, and the adoption of renewable energy sources to reduce environmental footprints while simultaneously boosting productivity (Zhang et al., 2025).

In addition, Governance Theory presents a framework for examining the decentralized, participatory processes that involve multiple actors in decision-making and resource allocation. It extends beyond traditional hierarchical models and suggests that inclusive, transparent, and accountable governance is crucial for effective stakeholder coordination within IAIPs (Hassan et al., 2020; Liu et al., 2022). The theory underscores the necessity of governance structures—such as advisory boards and public–private partnerships—that allow for the alignment of diverse stakeholders' interests, ensuring that the benefits of IAIPs are equitably distributed.

Moreover, Complex Adaptive Systems Theory offers insights into how IAIPs function as dynamic systems that evolve through the interactions of interconnected components (Brown, 2006; Stroink, 2020). This theoretical lens helps in understanding how IAIPs can adapt to external pressures, such as market changes, environmental challenges, and technological advancements. It stresses the need for flexibility and adaptive management in fostering resilience and long-term success in agro-industrial contexts.

Empirical research has also underscored the relationship between governance, institutional frameworks, and agro-industrial productivity. For instance, (Guteta & Worku, 2022) demonstrate how well-defined governance structures enhance stakeholder coordination and resource sharing, thus, driving innovation and improving agricultural competitiveness in Ethiopia. Furthermore, Okogwu et al. (2023) highlights the importance of integrating sustainable practices within IAIPs, showing that eco-friendly technologies and resource-efficient strategies are essential for minimizing ecological footprints and aligning with global market demands.

While there is growing interest in IAIPs, significant gaps remain in the literature. First, while stakeholder coordination is frequently discussed, there is a need for more

in-depth analyses of governance structures that optimize this coordination within unique socio-political contexts, such as Ethiopia's (UNCTAD, 2015). Second, despite increasing attention to sustainability, there is limited research evaluating the long-term effectiveness of sustainability practices in IAIPs. Third, while technological adoption is often mentioned, fewer studies offer insights into the barriers to innovation and how these can be overcome to enhance productivity and competitiveness in IAIPs.

2.2. Conceptual Framework

The conceptual framework for IAIPs is centered around the institutional framework, which plays a pivotal role in shaping stakeholder coordination and facilitating the development of innovation ecosystems. Institutional frameworks consist of formal (laws, regulations) and informal (norms, practices) structures that establish the context within which economic activities occur, thereby influencing stakeholder interactions and behaviors (Aldersey-Williams et al., 2020; Barlagne et al., 2023). According to Romani et al. (2020), institutions provide the underlying structure that guides how stakeholders engage with one another, which is crucial for fostering innovation ecosystems.

An innovation ecosystem, as defined by Adner (2006), is a network of interconnected organizations, actors, and institutions that share knowledge, resources, and capabilities to foster innovation. In the context of IAIPs, effective stakeholder coordination is essential for enhancing this ecosystem by promoting the exchange of knowledge and the collaborative development of agricultural technologies. The creation of such an ecosystem is key to improving productivity and positioning IAIPs as competitive hubs in both local and global markets.

The relationship between innovation ecosystems and global competitiveness is facilitated by various factors and indicators. For instance, technological advancements and the adoption of cutting-edge innovations enhance agricultural productivity and improve product quality (Lundvall & Johnson, 1994) for the case of Ethiopian IAIPs too (Boru et al., 2025b). Policy frameworks that support research and development, enable technology transfer, and ensure access to financing are essential in nurturing innovation within IAIPs (UNCTAD, 2015). Institutional capacity is another critical factor, as it ensures that the necessary regulatory frameworks and governance mechanisms are in place to manage stakeholder interactions and foster a conducive environment for innovation (Gibson et al., 2014).

These factors collectively contribute to global competitiveness—the ability of IAIPs to compete effectively in the global market. As Porter (1990) argues, competitiveness is driven by technological capability, a skilled workforce, and effective stakeholder coordination. For IAIPs, this means that a robust institutional environment, coupled with strong networks and innovation ecosystems, enables the development of products that meet global market demands, thus, driving economic growth and sustainability in the agri-food sector.

The comparative analysis of similar industrialization initiatives offers valuable insights into the applicability of these frameworks. For example, South Korea's successful industrialization through public–private partnerships and technological innovation offers relevant lessons for IAIPs in Ethiopia. According to Lundvall and Johnson (1994), South Korea's emphasis on technological advancement and policy support facilitated its transition into a competitive agro-industrial economy. Similarly, China's agricultural industrialization (Amsden, 2001) underscores the critical role of government policy in shaping innovation ecosystems and enhancing global competitiveness.

By drawing comparisons with these successful case studies, the conceptual framework for IAIPs can be enriched, offering a more comprehensive understanding of how institutional frameworks, stakeholder coordination, and innovation ecosystems contribute to global competitiveness as indicated in Figure 1, below. Consequently, by enhancing

the coordination among stakeholders and fostering a thriving innovation ecosystem, agro-industrial parks can improve their competitiveness on a global scale, driving economic growth and sustainability in the agri-food sector.

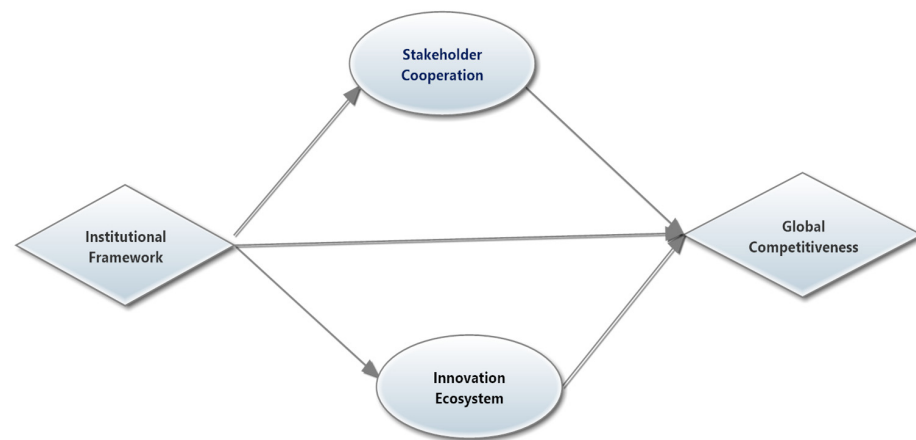


Figure 1. Conceptual framework. Source: Researchers own sketch.

3. Materials and Methods

3.1. Research Design

This study adopted a mixed-methods approach, combining both qualitative and quantitative techniques to investigate the governance and institutional frameworks within Ethiopia's Industrial Agro-Processing Parks (IAIPs). Due to the multifaceted nature of the research, a comprehensive and robust sampling strategy was employed to capture the complexity of interactions within the IAIPs, with a particular focus on the Bulbula and Yirgalem parks.

A stratified sampling approach was utilized to select participants from various sectors within the parks' value chains. These sectors included smallholder farmers, industrial firms, research institutions, and government representatives. This methodology ensured the inclusion of diverse perspectives from all relevant stakeholders, allowing for a comprehensive understanding of the factors influencing the success of the IAIPs.

The approach aligns with the multi-stakeholder model proposed by Porter (1990) and Lundvall (1992), which is crucial for understanding the dynamics of agro-industrial integration and governance within Ethiopia. The rationale for adopting stratified sampling lies in its ability to guarantee representativeness and inclusivity, thereby ensuring that the data reflects the experiences, challenges, and opportunities encountered by key actors in the development and management of IAIPs. According to Bryman (2016), stratified sampling enhances the validity and reliability of the study, providing a detailed and nuanced understanding of the research subject. Furthermore, this approach captures the complex nature of stakeholder interactions, which is vital for understanding the role of governance and institutional frameworks in promoting innovation and competitiveness within the IAIPs.

Qualitative data were analyzed using thematic analysis and SWOT analysis, which provided an in-depth understanding of the interactions between stakeholder coordination, sectoral innovation systems, and global competitiveness (Fiss & Zajac, 2004). Quantitative data were analyzed through the application of Partial Least Squares Structural Equation Modeling (PLS-SEM), a method employed to assess the relationships between the key variables of innovation, governance, and competitiveness (Henseler et al., 2009). By integrating qualitative and quantitative perspectives, the study aims to offer comprehensive insights

into the role of governance in enhancing the competitiveness of IAIPs (Chin, 2010; Kock & Hadaya, 2018).

3.2. Data Collection

Data for this study were collected from two of the four Industrial Agro-Industrial Parks (IAIPs) in Ethiopia, namely Bulbula and Yirgalem, involving a diverse group of stakeholders, including park managers, one-stop-shop staff, private sector representatives, producers, researchers, and development partners. To ensure a comprehensive understanding of the governance dynamics at play in IAIPs operating in Ethiopia, a multi-method approach was employed for data collection (Bryman, 2016). This method integrates both qualitative and quantitative data collection techniques to offer richer insights and better triangulate findings (Denzin, 2017).

The first method involves conducting in-depth interviews with key informants, such as park managers, government officials, industry leaders, development partners, and academics. These semi-structured interviews focus on evaluating the institutional frameworks that support stakeholder coordination, innovation ecosystems, and global competitiveness (Gioia et al., 2013). Semi-structured interviews are ideal for capturing the diversity of opinions and experiences of stakeholders while providing a consistent framework for comparison (Patton, 2002). An interview guide was developed with open-ended questions designed to promote discussion around major themes, including governance effectiveness, stakeholder engagement, and innovation barriers (Bauer & Gaskell, 2000). Each interview was audio-recorded, with participant consent, and subsequently transcribed for detailed analysis, allowing for the capture of nuanced insights (Creswell & Poth, 2017).

In addition to interviews, focus group discussions were organized to gather qualitative data from small and medium-sized enterprises (SMEs), agro-industrial firms operating within the IAIPs, park administrators, government ministries, and development partners. Focus groups are valuable for examining group dynamics, exploring shared experiences, and generating diverse perspectives on complex issues like innovation challenges and multi-stakeholder coordination (Morgan, 1997). Each focus group consisted of 6–12 participants and was facilitated by a trained moderator, ensuring that all voices were heard, and discussions remained productive and on topic (Krueger & Casey, 2014). These sessions were also audio-recorded and transcribed, ensuring a comprehensive capture of perspectives to enrich the data set (Lindlof & Taylor, 2011).

Finally, a comprehensive document review was conducted, analyzing governance documents, IAIP operational frameworks, and policy-related materials on industrial park development and innovation diffusion. Document analysis allows researchers to access rich, secondary data sources that provide context and background on formal structures and policies (Bowen, 2009). The document analysis aimed to understand the vital context and background information regarding the formal structures, policies, and strategies guiding governance practices, innovation ecosystems, and global competitiveness within IAIPs (Patton, 2002). Relevant documents were systematically collected from governmental reports, industry associations, and the IAIPs themselves. A coding scheme was developed to categorize key information extracted from these documents, focusing on aspects such as governance structures, institutional effectiveness, and mechanisms supporting global competitiveness (Saldaña, 2015).

By using a combination of in-depth interviews, focus group discussions, and document analysis, this study leverages triangulation, enhancing the validity and credibility of the research findings (Flick, 2018). These methods provide a rich, multi-faceted view of the governance and institutional frameworks within IAIPs, thereby offering compre-

hensive insights into the factors influencing their effectiveness in fostering innovation and competitiveness.

3.3. Data Analysis

The analysis of the collected data will employ two primary methods: qualitative analysis (thematic analysis and SWOT analysis) and inferential analysis (Partial Least Squares Structural Equation Modeling, PLS-SEM) for quantitative analysis.

Qualitative Analysis: Thematic analysis will be used to examine the interview and focus group transcripts, with an emphasis on identifying and analyzing patterns and themes related to institutional capacity, governance effectiveness, and innovation ecosystems. These themes will be assessed for their individual and cumulative impacts on promoting global competitiveness within Integrated Agro-Industrial Parks (IAIPs). To ensure the validity and rigor of the analysis, qualitative data analysis software such as NVivo 9 (Gibbs, 2007) will be employed. These tools facilitate systematic categorization and coding of emerging themes, ensuring a comprehensive understanding of the subject matter (Miles & Huberman, 1994).

In addition to thematic analysis, a SWOT analysis will be conducted to evaluate the strengths, weaknesses, opportunities, and threats within the governance and institutional frameworks. This analysis will focus on identifying aspects of governance that support effective innovation, pinpointing areas where shortcomings exist and exploring external factors that could enhance innovation processes. The SWOT analysis will also identify potential challenges and risks that may hinder successful coordination and innovation within IAIPs. The findings from both the thematic analysis and document reviews will form the foundation for the SWOT analysis, offering a comprehensive understanding of how governance influences the development of an innovation ecosystem (Ghazinoory et al., 2011).

Quantitative Analysis (Inferential PLS-SEM): For the inferential analysis, Partial Least Squares Structural Equation Modeling (PLS-SEM) will be used to assess the relationships between key variables: sectoral innovation, trade policy, agro-industrial competitiveness, and global value chain integration. PLS-SEM is particularly well-suited for this study due to its ability to handle complex models involving latent variables, small sample sizes, and the capacity to estimate multiple relationships simultaneously (Hair et al., 2017).

The structural model will include latent constructs representing sectoral innovation, trade policy, agro-industrial competitiveness, and global value chain integration. These constructs will be measured through a set of observed indicators derived from the theoretical framework. The relationships between these constructs will be tested to understand how sectoral innovation and trade policy influence agro-industrial competitiveness and the integration of Ethiopia's agro-industrial sector into the global value chain.

The analysis will be conducted using SmartPLS 4.0 (Ringle et al., 2023), which is widely recognized for its robust analytical capabilities and user-friendly interface. The evaluation will proceed in two stages: (1) the assessment of the measurement model to confirm the validity and reliability of the constructs, and (2) the evaluation of the structural model to test the hypothesized relationships.

In the first stage, the measurement model will be evaluated for reliability and validity using indicators such as composite reliability (CR), average variance extracted (AVE), and Cronbach's alpha (α). A valid model requires that CR exceeds 0.7 and AVE exceeds 0.5 (Hair et al., 2017). In the second stage, the structural model will be assessed to evaluate the relationships between constructs. Path coefficients will be estimated, and the significance of relationships will be tested using bootstrapping methods (5000 resamples).

To further enhance the rigor of the analysis, heterotrait-monotrait (HTMT) ratio analysis and the Goodness-of-Fit (GoF) index will be used to assess discriminant validity and overall model fit, respectively (Henseler et al., 2015).

3.4. Econometric Model and Estimation Strategies

To model the interplay among governance, institutional frameworks, innovation ecosystems, and multi-stakeholder coordination in shaping global competitiveness, this study employs Structural Equation Modeling (SEM). SEM is a widely used and robust statistical technique, ideal for capturing complex relationships between both observed and latent variables (Fan et al., 1999; Sarstedt et al., 2021; Kirby & Bollen, 2009; Williams et al., 2018). The methodology facilitates the simultaneous testing of models with multiple dependent and independent variables, enabling an integrated approach to exploring these intricate relationships (Sarstedt et al., 2021; Kirby & Bollen, 2009; Sun et al., 2021).

By combining factor analysis, path analysis, and regression analysis, SEM offers a comprehensive approach to examining underlying constructs that might not be easily addressed using direct methods (Saris et al., 1987). Additionally, SEM accounts for both direct and indirect effects among variables, providing valuable insights into the dynamics that drive global competitiveness (Memon et al., 2021). This makes SEM an excellent tool for hypothesis testing and model evaluation, as it enables a thorough understanding of how governance frameworks and institutional arrangements influence innovation ecosystems and contribute to global competitiveness.

For the purposes of this study, Partial Least Squares Structural Equation Modeling (PLS-SEM) is employed to address potential challenges associated with small sample sizes. PLS-SEM is particularly advantageous in contexts where data constraints limit the applicability of traditional SEM approaches. It is specifically designed to handle smaller sample sizes without compromising the robustness of the results (Juliandi, 2018; Mendy et al., 2019). Furthermore, this method adopts a predictive-oriented approach, making it especially suitable for exploratory research. PLS-SEM excels in estimating complex models that involve multiple constructs and indicators (Hair et al., 2017).

PLS-SEM enables the analysis of both latent and observed variables, which is essential for investigating the complex relationships between governance frameworks, institutional factors, innovation ecosystems, and multi-stakeholder coordination. Its ability to generate reliable results despite smaller sample sizes allows for meaningful insights relevant to the study's objectives.

This study considers several latent variables, including Institutional Framework (IF), Innovation Ecosystem (IE), Stakeholder Coordination (SC), Global Competitiveness (GC), and Other Exogenous Variables (OE). The relationships between these latent constructs (unobserved variables) and their respective observed indicators are specified using the following general form:

$$IE_i = \beta_0 + \beta_1 IF_i + \beta_2 OE_i + \varepsilon_i \quad (1)$$

$$SC_i = \beta_{20} + \beta_{21} IF_i + \beta_{22} OE_i + \varepsilon_{2i} \quad (2)$$

$$GC_i = \beta_{30} + \beta_{31} IF_i + \beta_{32} SC_i + \varepsilon_{3i} \quad (3)$$

where;

β_{ij} is Path coefficients (weights) indicating the strength and direction of the relationships between the constructs.

ε_i is Error terms representing the unexplained variation in each equation.

Moreover, each latent variable ($l = IF, OE, IF, SC, \text{ and } GE$) is computed using the following:

$$l_j = \eta_{j0} + \eta_{j1} l_1 + \eta_{j2} l_2 + \dots + \eta_{jk} l_k + \psi_j \quad (4)$$

where;

$\eta_{jn(n=1,2,...,k)}$ are factor loadings for the relationship between each observed indicators and their respective latent variables; l_n is the latent variable representing the underlying construct.

ψ_j is the error term associated with indicator j .

In this study, the Innovation Ecosystem (IE) is conceptualized as a dynamic network comprising various systems that collaboratively facilitate the commercialization and diffusion of new ideas, products, and services. It encompasses several key components, including innovation outcomes (e.g., products, processes, and technology), access to R&D facilities, and partnerships with organizations such as universities. The effectiveness of the ecosystem is influenced by institutional factors, including access to funding, skilled labor, supportive policies, and a culture of creativity (Pigford et al., 2018; Liu et al., 2022).

Stakeholder Coordination (SC) refers to the collaborative efforts among various entities within the innovation ecosystem, including public–private partnerships (PPPs) and strategies that ensure collaboration among stakeholders. These may include integrated platforms that facilitate knowledge sharing, joint research initiatives that leverage diverse expertise, and the development of innovative strategies for multi-stakeholder coordination (Ebrahimi et al., 2021).

Table 1 below summarizes the constructs and their respective labels used in our model.

Table 1. Variable definition (labelling).

Variable Name	Variable Label
inst_1	Access to Financial Support
inst_2	Cost of Technology
inst_3	Access to Skilled Labor
inst_4	Infrastructure Accessibility
inst_5	Supportive Government Policies
inst_6	Degree of Acceptance to New Technologies
net_3	Public–Private Partnerships for Innovation
net_1	Actions or Strategies to Accelerate Diffusion of Innovation in IAIPs
net_2	Strategies to Enhance Collaboration and Coordination Across IAIP Stakeholders
glbc_2	Degree of Competition in Global Market
glbc_3	Percentage Exported to International Markets
innv_2	Involvement in Process Innovation
innv_3	Involvement in Technological Innovation
innv_4	Involvement in Organizational Innovation
innv_13	Access to R&D Facilities or Expertise
innv_14	Partnerships with Other Organizations
innv_15	Innovation Diffusion Strategy in Place
innv_16	Policy Advocacy
innv_17	Frequency of Seeking Agricultural Information
hhs	Household Size
lage	Logarithm of Age of Respondent

Note: Inst = Institutional Frameworks; Net = Stakeholder Cooperation; Glbc = Global Competitiveness and Innv = Innovation Ecosystem.

To calculate each indicator defined in Table 1 above, we follow the works of [Hair et al. \(2017\)](#) and [Ringle et al. \(2023\)](#):

Model Specification: Define measurement as in Table 1 above (indicator-latent variable relationships) and structural models (latent variable relationships).

Run PLS Algorithm: Import data, link variables, and run the PLS algorithm via Calculate → PLS Algorithm.

Extract Output: Obtain loading values (strength of indicator relationships), path coefficients (direct effects between latent variables), and *p*-values (statistical significance).

Bootstrapping: Use bootstrapping (Calculate → Bootstrapping) to generate *t*-statistics and *p*-values for significance testing.

Interpret Results: Path coefficients > 0.7 are strong; *p*-values < 0.05 indicate statistical significance. Thus, the procedure provides a robust framework for investigating the relationships among governance, institutional frameworks, innovation ecosystems, and multi-stakeholder coordination, all of which are key drivers of global competitiveness. This method not only accommodates small sample sizes but also allows for a detailed examination of both direct and indirect effects within the complex ecosystem of Integrated Agro-Industrial Parks (IAIPs). The results of this analysis will contribute to a deeper understanding of how governance and institutional arrangements can influence innovation and competitiveness at a global scale.

4. Results and Discussion

This section is divided into two distinct subsections. In the first subsection, we present the findings from the inferential estimation, which employs PLS-SEM to capture the interlinkages among institutional factors, the innovation ecosystem, the governance framework, and global competitiveness in the IAIPs. The second subsection deals with qualitative analysis, utilizing both thematic analysis and SWOT analysis. The thematic analysis employed QDA to systematically categorize the qualitative data into distinct themes, allowing us to identify and highlight key patterns in the data. In the second subsection, we further examine the identified themes using the SWOT analysis, which provides a comprehensive overview of the strengths, weaknesses, opportunities, and threats related to our subject of study.

4.1. Econometric Analysis Results and Discussion

This section presents the results of the PLS-SEM regression analysis. We begin by examining the broader relationships among the identified variables—namely, the institutional framework, innovation ecosystem, stakeholder coordination, and global competitiveness. From there, we systematically refine our approach to develop a more parsimonious model, focusing on the role of each variable in enhancing overall model performance. Figure 2 represents the diagrammatic illustration of our model, displaying the loading values, path coefficients, and their corresponding *p*-values in parentheses as calculated by following the ([Hair et al., 2017](#); [Ringle et al., 2023](#)) in SmartPLS4.0 software. A detailed definition of each construct is presented in Table 1.

Table 2 presents a summary of quality criteria that highlight essential metrics for evaluating the latent constructs in our PLS-SEM model. The Average Variance Extracted (AVE) values indicate how well a construct captures the variance of its observed indicators, with higher values reflecting stronger construct validity. Composite Reliability (CR) assesses the internal consistency of the constructs, ensuring they accurately represent their respective concepts. Additionally, Cronbach's alpha offers further insights into the reliability of the indicators. However, we still tolerate some a Cr-alpha < 0.7 for some construct given that it is statistically significant at the 1% level suggests that, despite being below the commonly

accepted threshold, the constructs still represent meaningful associations. This indicates that even though the internal consistency of the scale may not be optimal, it may still effectively capture the underlying construct, and the relationships in our SEM model are strong enough to warrant consideration despite reliability concerns. Moreover, the criticisms by Cronbach (1951) further supports this argument, which caution against treating threshold values as strict rules and highlight an increased risk of model misspecification with high quality criteria values. Starting with complex structures, we iteratively drop some of the constructs based on the quality criteria.

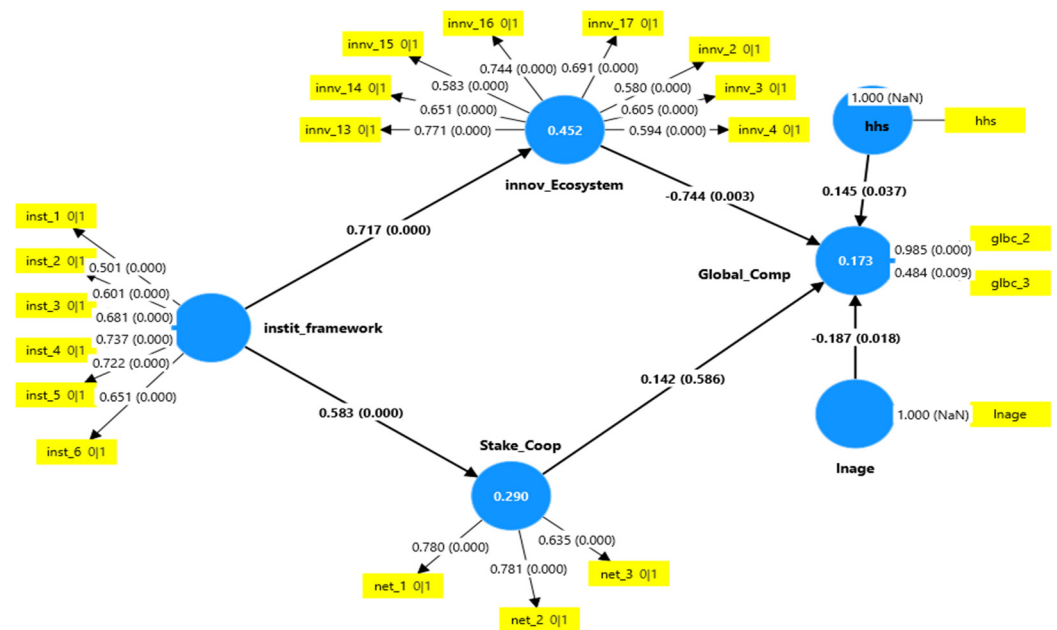


Figure 2. Results from PLS-SEM estimation using SmartPLS.

Table 2. Summary of quality criteria.

	AVE	CR	Cr-Alpha
Global Comp	0.603 (0.058) ***	0.731 *** (0.085)	0.494 *** (0.081)
Stake Coop	0.540 *** (0.037)	0.777 *** (0.028)	0.580 *** (0.062)
hhs	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)
innov_Ecosystem	0.430 *** (0.032)	0.857 *** (0.017)	0.811 *** (0.025)
instit_framework	0.428 *** (0.035)	0.815 *** (0.023)	0.729 *** (0.039)
Inage	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)
Threshold	0.500	0.700	0.700

Note: standard deviation in parenthesis; *** $p < 0.01$; AVE = Average variance extracted; CR = Composite reliability; Cr-alpha = Cronbach's alpha.

The results presented in Table 3 summarize the outer loadings for various constructs, demonstrating robust relationships between the measurement indicators and their respective constructs. The high outer loading values, (>0.5), indicate that these indicators strongly contribute to their constructs, showcasing their reliability and significance. Most indicators for the Innovation Ecosystem and Institutional Framework also exhibit substantial

loadings, reflecting their relevance in capturing the subtle aspects of innovation and governance within IAIPs. The consistently low p -values (typically below 0.01) further affirm the statistical significance of these relationships.

Table 3. Outer loadings (Mean, Standard deviation, t-values, p -values).

	Coefficient	Standard Deviation	T Statistics	p Values
glbc_2 <- Global_Comp	0.985	0.033	30.185	0.000 ***
glbc_3 <- Global_Comp	0.484	0.186	2.601	0.009 ***
innv_13 <- innov_Ecosystem	0.771	0.040	19.239	0.000 ***
innv_14 <- innov_Ecosystem	0.651	0.055	11.759	0.000 ***
innv_15 <- innov_Ecosystem	0.583	0.067	8.669	0.000 ***
innv_16 <- innov_Ecosystem	0.744	0.051	14.502	0.000 ***
innv_17 <- innov_Ecosystem	0.691	0.055	12.512	0.000 ***
innv_2 <- innov_Ecosystem	0.580	0.071	8.190	0.000 ***
innv_3 <- innov_Ecosystem	0.605	0.072	8.439	0.000 ***
innv_4 <- innov_Ecosystem	0.594	0.081	7.296	0.000 ***
inst_1 <- instit_framework	0.501	0.074	6.760	0.000 ***
inst_2 <- instit_framework	0.601	0.068	8.866	0.000 ***
inst_3 <- instit_framework	0.681	0.064	10.718	0.000 ***
inst_4 <- instit_framework	0.737	0.056	13.242	0.000 ***
inst_5 <- instit_framework	0.722	0.061	11.814	0.000 ***
inst_6 <- instit_framework	0.651	0.069	9.426	0.000 ***
net_1 <- Stake_Coop	0.780	0.045	17.172	0.000 ***
net_2 <- Stake_Coop	0.781	0.044	17.722	0.000 ***
net_3 <- Stake_Coop	0.635	0.085	7.439	0.000 ***

*** $p < 0.01$.

Table 4 presents the path coefficients and the total effects from the PLS-SEM estimation. The results indicate the significant relation between innovation Ecosystem and Global Competitiveness: The coefficient of -0.744 reveals the existing innovation ecosystem has a negative effect on global competitiveness. This finding is highly statistically significant ($p < 0.01$), indicating that, innovation ecosystem in the IAIPs is linked to decreased competitiveness on a global scale. This unexpected result may reflect inefficiencies or misalignments within the innovation processes that fail to yield competitive advantages, suggesting a need for a more strategic approach to innovation that aligns better with market demands. Such inefficiencies are echoed in the work of [Fagerberg et al. \(2005\)](#), who notes that innovation systems must be effectively aligned with market demands to foster competitiveness. Similarly, institutional Framework and Global Competitiveness (With a coefficient of -0.451) are found to go contrarily. This relationship suggests that a stronger institutional framework correlates with lower levels of global competitiveness. The result is significant ($p < 0.01$), implying that while strong institutions provide necessary stability, each action to realize it might also introduce regulatory hurdles or inflexibilities that inhibit the rapid adjustments often required in the competitive global environment. This dilemma is supported by [North \(1990\)](#), who argues that while institutions are essential for economic performance, overly rigid frameworks can stifle innovation and responsiveness in dynamic markets.

Our findings further imply the positive influence (0.583 ($p < 0.01$)) from Institutional Framework to Stakeholder Coordination. It indicates a strong positive relationship between a robust institutional framework and enhanced stakeholder coordination, a notion supported by [Helfat \(2011\)](#). He posits that well-defined institutions facilitate cooperative interactions, which are crucial for successful innovation and competitiveness. This result emphasizes the role of effective governance structures in fostering coordination among various stakeholders, which is essential for successful innovation and competitiveness.

Well-defined institutions can create an environment favorable to coordination, ultimately driving collective progress. Moreover, institutional framework is found to have a positive influence on Innovation Ecosystem in the IAIPs. The coefficient of 0.717 ($p < 0.01$) reflects a significant positive impact of the institutional framework on the innovation ecosystem. This finding aligns with the work of [Ebrahimi et al. \(2021\)](#) who suggest that solid institutions provide essential support and resources, enhancing stakeholder coordination and overall innovative output. It supports the notion that strong institutions facilitate the creation and enhancement of an innovative environment. By providing the necessary support and resources, robust institutional frameworks can help stakeholders collaborate more efficiently, thus, improving overall innovative output and capabilities.

Table 4. Final results (Path coefficients and total effects Mean, STDEV, and p values).

	Path Coefficient			Total Effect		
	Coefficients	Standard Deviation	p Values	Coefficients	SD	p Values
Stake Coop -> Global Comp	0.142	0.260	0.586	0.142	0.260	0.586
innov_Ecosystem -> Global_Comp	−0.744	0.251	0.003 ***	−0.744	0.251	0.003 ***
instit_framework -> Global_Comp				−0.451	0.130	0.001 ***
instit_framework -> Stake_Coop	0.583	0.058	0.000 ***	0.583	0.058	0.000 ***
instit_framework -> innov_Ecosystem	0.717	0.045	0.000 ***	0.717	0.045	0.000 ***
lnage -> Global_Comp	−0.187	0.079	0.018 **	−0.187	0.079	0.018 **
hhs -> Global_Comp	0.145	0.070	0.037 **	0.145	0.070	0.037 **

*** $p < 0.01$, ** $p < 0.05$.

Household size and age are the two exogenous variables in our model. Household Size has a positive relation with Global Competitiveness considering individual households (farmers, cooperatives, and processors). The positive coefficient of 0.145 ($p < 0.05$), indicates that an increase in household size is associated with greater global competitiveness. This effect could be attributed to larger households providing a more substantial labor force or increased consumption capacity, which in turn drives economic activity and market dynamism. On the other hand, age is found to be among the deterrent factors of Global Competitiveness. This relationship could indicate that older generations may be less adaptive to shifts in global market conditions, potentially undermining competitiveness. This result raises important questions about the implications of age dynamics in the workforce and the need for strategies that leverage the strengths of various age groups in fostering competitive advantages.

Overall, the figure emphasizes the interconnectedness of institutional frameworks, innovation ecosystem, and stakeholder coordination in enhancing the competitiveness of IAIPs in the global market. It illustrates that while innovation ecosystems are vital, their impact on competitiveness can be complex and influenced by various factors, including the effectiveness of governance structures and stakeholder engagement. The findings prompt important policy recommendations, suggesting a need to strengthen institutional frameworks and earmark resources for fostering stakeholder coordination, which can significantly drive global market competitiveness. Additionally, the negative relationship from the innovation ecosystem to global competitiveness invites further investigation into

how innovation ecosystem can be practically applied to meet market needs, suggesting the need for targeted strategies.

The findings hold significant implications for practitioners and researchers in the field of agro-industrial development. These implications can be discussed across multiple dimensions. First, the strong positive relationship between the Institutional Framework and the Innovation Ecosystem highlights the critical role of governance in fostering innovation within IAIPs. This finding implies that effective, transparent, and adaptable governance structures are essential for nurturing a conducive environment for innovation. This could involve defining clear roles, responsibilities, and processes that facilitate stakeholder engagement and streamline decision making. Second, the moderate positive influence of Stakeholders Coordination on Global Competitiveness underscores the importance of building networks among various stakeholders, including government entities, private sector actors, development partners, and local communities. The findings suggest that for IAIPs to gain their global competitiveness, they must cultivate collaborative efforts leveraging shared resources, knowledge, and expertise. This may involve establishing formal partnerships, joint ventures, and collaborative initiatives that enhance mutual understanding and promote investment in innovation initiatives.

Moreover, the negative path coefficient from the Innovation Ecosystem to Global Competitiveness raises critical questions about the effective translation of innovative efforts into competitive advantages. This outcome suggests that while innovation is being generated, it may not be sufficiently aligned with market needs or effectively communicated to consumers. Therefore, there is a need for clearer strategies that ensure innovations are market-oriented. Practitioners should conduct market assessments to better understand the evolving demands of global markets and adjust their innovation strategies accordingly. This may involve engaging in customer feedback loops and employing agile development approaches that can quickly adapt to market changes.

In general, the implications of our findings provide important insights for developing effective governance structures, enhancing stakeholder coordination, bridging the gap between innovation and market competitiveness, and addressing factors related to the age and maturity of IAIPs. By focusing on these areas, policymakers and practitioners can significantly enhance the capacity of IAIPs to compete in the global market, fostering innovation and economic growth in the agro-industrial sector.

4.2. Qualitative Analysis Results and Discussion

4.2.1. Thematic Analysis

In this section, the key themes were derived from FGDs, KIIs, and government reports, utilizing QDA software LITE V. 2.0.9. Figure 3 illustrates the broader areas (key phrases) identified, while Figures 4 and 5 provide a more detailed breakdown of the key strengths, weaknesses, challenges, and opportunities observed in the IAIPs in Ethiopia in the process of ensuring productivity and global competitiveness. Site selection of for the IAIPs was designed to align with specific product potentials. This strategic choice is considered a significant strength and presents potential opportunities because it will provide a solid foundation for specialized agricultural development by facilitating product clustering.

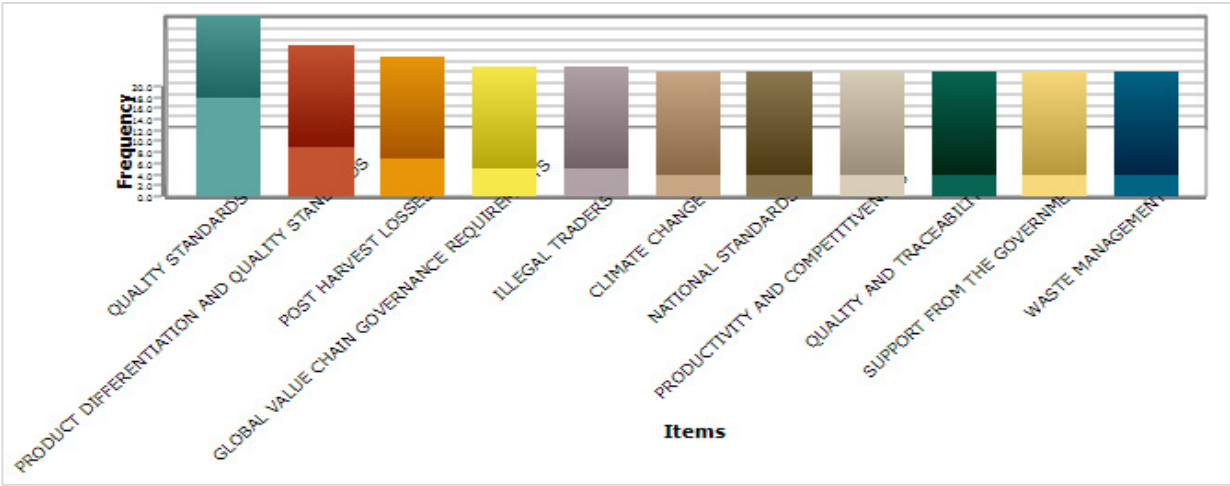


Figure 3. Distribution of key phrases (frequency) fetched from FGD and KII.

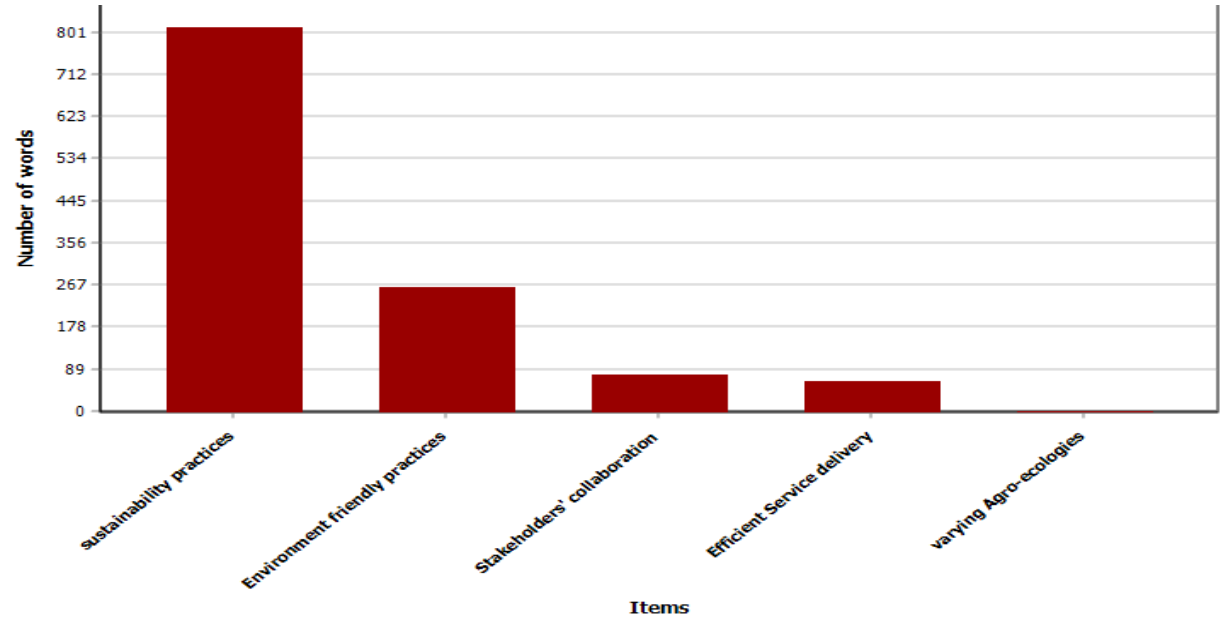


Figure 4. Key Themes Identified as Strength/Opportunities/ in IAIPs.

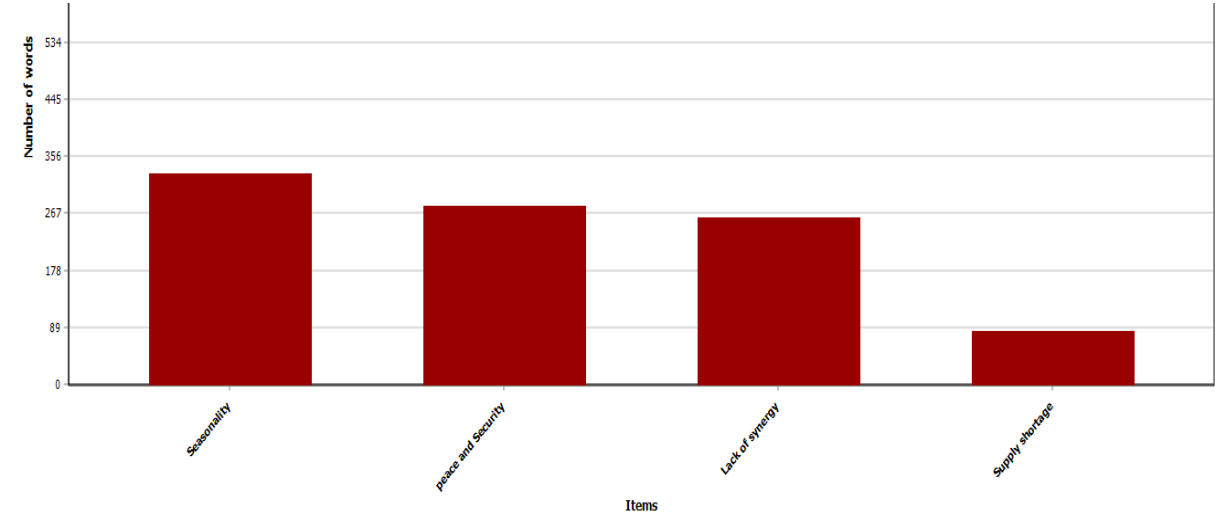


Figure 5. Key Themes Identified as Weaknesses/Threats in IAIPs.

IAIPs also present a significant opportunity for efficient specialization, product differentiation, and production clustering in the agricultural sector as shown in Table 5. Each IAIP has been strategically identified with unique commodities that highlight their individual strengths and potential contributions to the regional economy. For instance, in Yirgalem and Bulbula, five of the seven shortlisted commodities are unique to each park. This concentration of unique products within each park lays the groundwork for specialized production processes tailored to the specific demands of these commodities.

Table 5. Shortlisted and longlisted commodity potentials in each region.

	IAIPs	
	Yirgalem	Bulbula
Shortlisted Commodities	Avocado processing; Coffee processing; Pineapple processing; Animal feed; Organic fertilizer; Packaging material	Tomato processing; dairy processing; production of bakery products; Animal feed; Canning of beans; Honey; Pasta production

Source: (FDRE, 2021).

Moreover, the identified commodities such as avocado not only support climate-smart agricultural practices but are also available for recycling, aligning with national and international climate regulations. Furthermore, the region benefits from a relatively low-cost labor force, and partnerships with nearby academic institutions can facilitate access to research and development, further boosting productivity within the value chains. This multifaceted approach, emphasizing the linkage between infrastructure development, agricultural innovation, and market access, positions the IAIPs as a catalyst for sustainable economic growth and enhanced productivity in Ethiopia.

On the other hand, apart from the highlighted strength and potential opportunities, some weaknesses and potential threats have been underscored during the interview. Among others, persistent peace and security concerns present major challenges to sustainable investment and operational stability.

... Another important area that the government must address is peace and security, as these are crucial for building confidence among private firms to invest in the country. ... One reason private sectors hesitate to invest is due to concerns about peace and security. ... Moving forward, the government needs to ensure peace and security to guarantee the safe movement of goods from production sites to final consumers. ...

Moreover, the discussions from FGD indicated that current efforts concerning food safety, traceability, and product quality are still in their infancy and require considerable advancement.

... The efforts related to food safety, traceability, and product quality are still in their early stages. ... Traceability systems, which are essential for tracking the origin and quality of products, are not yet fully implemented, and there are gaps in ensuring that food safety standards are consistently maintained across the supply chain. ... Food safety and traceability issue has to be underscored to ensure global competitiveness. ... Quality issues with products, and challenges with traceability, making it difficult to meet market demands.

Specifically, traceability systems—crucial for monitoring the origin and quality of agricultural products—have not been fully established, resulting in inconsistencies in maintaining food safety standards throughout the supply chain. The importance of addressing these concerns is critical for achieving global competitiveness. Additionally, existing quality

issues and challenges in implementing effective traceability make it difficult for producers to satisfy market demands, highlighting an urgent need for improvement in these areas.

The governance structure of development partners often faces challenges due to a lack of synergy (enhanced outcomes that can be achieved when multiple stakeholders collaborate effectively) and alignment which ensures all partners share a common understanding of goals, objectives, and strategies.

... Another area of concern in terms of governance structure is the lack of synergy and alignment. Therefore, the development partners' coordination platform needs to establish alignment to avoid overlapping tasks and ensure synergy among development partners.

In this context, a development partners' coordination platform is essential for facilitating collaboration and communication, allowing partners to coordinate their efforts and share resources efficiently. By establishing clear roles and responsibilities, the platform can help to avoid overlapping tasks and associated resource wastage. Eventually, prioritizing alignment and synergy not only enhances the effectiveness of development efforts but also maximizes the impact of collaborations, ensuring that each partner contributes uniquely and effectively to the shared objectives.

The agricultural sector is predominantly informal and not commercially oriented, which fosters a substantial informal market. Additionally, the shortage of appropriate post-harvest handling technologies, where currently, the PHL (Post Harvest Loss) of some commodities like avocado is as high as 40% (Urugo et al., 2024), and insufficient aggregation facilities hinders efficiency. Moreover, cooperative collection centers often lack the necessary warehousing and cold storage facilities, leading to supply seasonality and misalignments between prices paid to rural producers (very low in on-season) and the actual costs of production and transport.

4.2.2. SWOT Analysis

In this section, we conduct a SWOT analysis based on the themes identified through thematic analysis. Table 6 summarizes landscapes in the context of IAIPs in Ethiopia characterized by various strengths, weaknesses, opportunities, and threats (SWOT) that affect their operational efficiency and growth potential, which in turn has implications on global competitiveness. Below is a discussion of each theme in the SWOT analysis, highlighting the implications for firms and local communities.

Robust infrastructure provisions, such as water, electricity, roads, and waste treatment plants, in the park are repeatedly mentioned as strengths. The presence of substantial infrastructure is a significant strength, as it enhances operational efficiency, connectivity, and overall productivity. Adequate infrastructure can facilitate smoother logistics, which is essential for attracting investment. However, there are weaknesses associated with this strength, such as the risk of underutilization and resource wastage, particularly if the infrastructure capacity exceeds current demands. Furthermore, while extensive infrastructure is advantageous, the high costs associated with maintaining this infrastructure pose a considerable threat to sustainability, requiring ongoing investment and strategic management to mitigate costs effectively. This problem becomes even more pressing if the park fails to generate sufficient payoffs over its lifetime to be self-sufficient, which is essential for ensuring long-term viability and a return on investment.

Investors in the park have been introducing climate-smart varieties of crops to improve resilience to climate change and enhances yields, which is critical for long-term sustainability and competitiveness. This strength is complemented by the interest of firms in supporting local farmers, fostering greater coordination in agricultural practices. Nonetheless, the limited access of these improved seeds and knowledge gaps among farmers concerning cultivation techniques present significant weaknesses. Additionally, while there

are opportunities for better market access and sustainable practices, firms must navigate potential threats such as dependency on external seed suppliers and the risk of indigenous varieties disappearance, which could undermine local biodiversity.

Table 6. SWOT analysis.

Theme	Strengths	Weaknesses	Opportunities	Threats
Infrastructure in the Park	Robust infrastructure enhances operational efficiency, connectivity, and productivity.	Potential under-utilization and resource wastage.	Attracting investment by showcasing infrastructure advantages.	High maintenance costs associated with infrastructure upkeep.
Application of Climate-Smart Varieties	- Increased resilience to climate change impacts. - Improved yields and overall productivity. - Strong interest from firms to support local farmers.	- Limited availability of seeds and planting materials. - Knowledge gaps among farmers, necessitating training in cultivation techniques.	- Expanded market access due to climate-smart agricultural practices. - Potential support for sustainable farming practices that align with global sustainability goals.	- Risk of dependency on external suppliers for seeds and agricultural inputs. - Loss of indigenous varieties due to over-reliance on introduced climate-smart seeds.
Quality, Food Security, and Traceability Issues (not fully addressed in the park)	N/A (this issue is considered a weakness).	- Insufficient focus from both government and NGOs on improving quality standards. - Lack of traceability systems to monitor product quality and safety throughout the supply chain.	- Implementation of traceability systems could improve product marketability and consumer trust. - Greater transparency could enhance product value in global markets.	- Increased regulatory pressures for traceability compliance. - Failure to implement traceability could lead to loss of access to global markets and reduced export opportunities.

Table 6. *Cont.*

Theme	Strengths	Weaknesses	Opportunities	Threats
Seasonality of Agricultural Supplies	• Ability to capitalize on seasonal advantages for targeted marketing strategies. • Aligning maintenance schedules with off-peak seasons to minimize production disruptions.	• Inconsistent raw material supply throughout the year. • Dependence on seasonal agricultural cycles leading to production planning challenges.	• Development of storage and processing solutions to extend supply availability year-round. • Exploration of off-season crops and diversification to mitigate seasonality.	• Climate change exacerbating seasonality issues, affecting crop yields and supply consistency. • Market volatility driven by fluctuations in supply availability and consumer demand.
Limited Agricultural Supply (Local Farmers' Capacity to Produce Excess Output)	• Focus on quality: Limited supply may encourage processors to prioritize high-quality, locally sourced ingredients, enhancing product quality and market reputation. • Opportunities for processors to build direct relationships with farmers, promoting local agriculture and fostering community ties.	• Supply chain disruptions due to farmers' limited capacity to meet production demands, creating uncertainty in production schedules. • Increased operational costs arising from the scarcity of raw materials, leading to reduced competitiveness.	• Investment in training programs to enhance farmers' productivity and agricultural practices. • Encouraging crop diversification to reduce dependency on a narrow range of crops.	• Food security risks associated with limited local supply. • Over-reliance on a few suppliers, increasing vulnerability to supply shocks and production halts.
Low Willingness of Foreign Firms to Join the Park	• Reduced competition for local firms, providing opportunities to strengthen domestic capabilities. • Opportunity to build a solid local industrial base before attracting foreign investments.	• Limited foreign investment hampers infrastructure development and overall economic growth. • Reduced access to international markets and expertise.	• Creation of targeted incentives and policies to attract foreign firms. • Enhanced marketing strategies to showcase the park's benefits.	• Competitors from other countries may offer more attractive incentives for foreign firms. • Economic or political instability may discourage foreign investments.

Table 6. Cont.

Theme	Strengths	Weaknesses	Opportunities	Threats
Ongoing Peace and Security Concerns for Investors	- Strong local and international interest in stabilizing the region, promoting peace-building initiatives. - Potential for investment in security infrastructure to improve overall safety and investor confidence.	Ongoing conflicts or instability can deter business operations and investments, creating an atmosphere of fear among stakeholders.	- Opportunities for development partners to invest in peace-building initiatives. - Attraction of firms focused on social responsibility and sustainability.	- Continued unrest or security issues could result in operational disruptions, financial losses, and reputational damage. - Negative perception of safety may reduce foreign investment and tourism potential.

Source: Authors analysis: 2025.

Product traceability has emerged as a key criterion to ensure global competitiveness (Fang & Ge, 2023; Tessitore et al., 2022). Traceability allows tracking a product's journey and origin throughout its supply chain. This in turn enhances transparency, quality control, and compliance with regulations. Moreover, it builds consumer trust and brand loyalty in the global market as well as enables a rapid response to safety issues, ultimately strengthening companies' competitive edge in the global market. Thus, this has been underscored during the interviews. The absence of robust systems to address quality and traceability throughout its value chain is a notable weakness in the IAIPs. This hinders both local and international market competitiveness, as insufficient attention from governmental and non-governmental organizations compounds the issue. However, this challenge also presents substantial opportunities as it pushes firms to engage in introducing traceability systems. Moreover, the varying agroecological zones of the country coupled with seasonal supply variation further complicate the traceability efforts of the private processors.

It is relatively easy to track outputs from farms within a defined 100-km radius. However, challenges arise when the supply within the radius stops in off-season and products must be sourced from outside it since there is no mechanism to trace the later.

The processors' efforts to ensure traceability for certain products, such as avocados, represent a significant strength; however, their interventions are limited to a 100 km radius. This means that products sourced from outside this radius remain untraceable, particularly during the off-season when supply may extend beyond the 100 km limit. On the other hand, the potential threat of regulatory pressures for compliance with traceability standards necessitates immediate attention, as failure to adapt could lead to loss of market access and reduced activity in export sectors.

Backward linkages, farmers' limited production capacity, and the associated limit in agricultural supply to meet demand pose other challenges. On one hand, it encourages processors to prioritize high-quality, locally sourced ingredients, potentially enhancing market reputation. Moreover, the opportunity for processors to foster stronger community relations with farmers can lead to a more integrated supply chain. Conversely, the limited supply creates disruptions in production schedules and increases operational costs, straining firms financially and reducing their competitiveness. However, firms have the

opportunity to invest in training programs that enhance farmers' abilities and encourage diversification, which would mitigate reliance on a limited number of crops. A significant threat associated with this situation is the risk to local food security and the potential for prices surge, limiting its access to the local market, especially when total supply fails to satisfy both local consumers and processors.

In addition to supply shortage, the seasonality of agricultural supplies, while posing challenges, offers firms an opportunity to leverage seasonal advantages for targeted marketing efforts. Aligning machinery maintenance schedules with off-peak agricultural seasons can minimize production disruptions, ensuring that firms are operationally ready when raw materials are available. However, the inconsistent supply of raw materials often leads to production planning difficulties and increased operational costs for firms. To counteract these weaknesses, there is an opportunity to develop storage and processing solutions to extend supply availability throughout the year, as well as to explore crop diversification strategies. That said, climate change could exacerbate these seasonal limitations, further complicating supply dynamics.

The reluctance of foreign firms to invest in the parks presents both an opportunity and a challenge. Initially, this limitation allows existing local firms to strengthen their capabilities without facing intense competition. However, the scarcity of foreign investment can restrict access to international markets, presenting a clear weakness. Specifically, the absence of foreign investors may complicate market access for domestic firms, as foreign firms typically possess better resources and networks to locate and penetrate international markets effectively. However, a strategic opportunity lies in creating targeted incentives and policies designed to attract foreign entities, coupled with strong marketing strategies to highlight the benefits of operating in the parks. The main threats include competitor countries that could lure foreign investments away and the potential for economic or political instability that may further deter investment. This low interest could partly be explained by the persisting peace and security concern. Recent peace and security concerns in the region pose significant challenges for attracting investment. The continual unrest not only disrupts operations but also contributes to a negative perception that can deter foreign investment and impact tourism, further complicating the economic landscape.

The governance structure and institutional framework surrounding IAIPs are essential for capitalizing on strengths such as infrastructure and climate-smart agricultural practices. Effective governance optimizes resource utilization, mitigates underutilization risks, and requires clear policies and transparent regulations to manage maintenance budgets, given the high costs of infrastructure upkeep. A solid institutional framework that promotes traceability systems can enhance accountability and food safety, while also improving resilience to climate change and agricultural productivity through innovative seed varieties. However, to unlock these potential benefits, it is crucial to close knowledge gaps among farmers via training and support programs. Stakeholder coordination plays a vital role in addressing the challenges related to limited agricultural supply and seasonal inputs, with firms encouraged to build direct relationships with farmers to boost engagement and productivity. As global competitiveness increasingly hinges on the ability of IAIPs to adapt to market demands and uphold high-quality production standards, addressing issues of quality, food security, and supply chain constraints is paramount. Ultimately, implementing robust traceability systems can significantly elevate product value and consumer trust, key components in enhancing the international reputation of Ethiopian agricultural products.

5. Policy Recommendations, Conclusions, and Future Research Directions

5.1. Policy Recommendations

This study underscores the importance of adaptive governance and targeted policy frameworks to address the misalignment between innovation and global market demands while strengthening Ethiopia's agro-industrial sector. To foster sustainable development and enhance the global competitiveness of Integrated Agro-Industrial Parks (IAIPs), the following practical and detailed policy recommendations are proposed:

Promote Market-Oriented Innovation: Policymakers should prioritize aligning innovation strategies with consumer needs and global market trends. This can be achieved by promoting agile development practices, facilitating direct consumer feedback loops, and supporting market-driven R&D efforts. Regular assessments of innovation strategies will ensure they remain responsive and relevant to real-world market demands, enabling IAIPs to capitalize on emerging global opportunities.

Enhance Institutional Flexibility: While strong institutional frameworks are essential for stability, they must be adaptable to shifting market conditions. Policymakers should reduce bureaucratic barriers and foster dynamic governance structures that balance regulation with flexibility. This will enable IAIPs to swiftly respond to market changes while maintaining necessary oversight, creating an environment conducive to innovation and competitiveness. Specifically, adaptive governance frameworks can balance regulatory consistency with flexibility through mechanisms such as periodic policy reviews, stakeholder feedback loops, and regulatory sandboxes to test new policies before broader implementation.

Strengthen Stakeholder Coordination: Effective stakeholder coordination is critical for enhancing competitiveness. Policies should foster collaborative networks involving governments, private sector actors, development partners, and local communities. Establishing formal partnerships, joint ventures, and innovation platforms would promote knowledge exchange, resource sharing, and joint problem solving, strengthening the collective capacity of IAIPs to compete globally.

Leverage Intergenerational Knowledge Transfer: The diversity of age groups within the workforce is a valuable asset for IAIPs. Policymakers should promote intergenerational knowledge transfer through targeted skills development programs, mentorship schemes, and initiatives that encourage collaboration across generations. This would create a resilient, adaptable workforce, better equipped to navigate the challenges of global competitiveness.

Invest in Innovation Hubs and Market Research Infrastructure: To bridge the gap between innovation and market demands, policymakers should invest in innovation hubs and market research infrastructure. These platforms will facilitate collaboration between industry leaders, researchers, and policymakers, providing real-time market intelligence. Strengthening market research capabilities will enable informed decision-making, ensuring innovation strategies remain aligned with global market dynamics.

Promote Public–Private Partnerships (PPPs): PPPs are essential for the financial sustainability and growth of IAIPs. Policies should encourage greater private sector involvement, particularly in R&D, infrastructure development, and commercialization of innovative outputs. These collaborations will foster a more dynamic and resilient agro-industrial ecosystem, improving market access and export competitiveness.

Develop Digital Agriculture Tools and Traceability Systems: To meet international standards and enhance export competitiveness, policies should prioritize the integration of digital agriculture tools and traceability systems within IAIPs that is not well considered in today's interventions of the parks under study. These technologies will streamline the

flow of information, ensure product quality, and enable compliance with global market requirements, further boosting Ethiopia's global competitiveness.

Timeline and Expected Outcomes: Furthermore, this study has discussed the timelines and expected outcomes of these policy measures, addressing both short-term actions and long-term goals. Short-term actions include improving market access for smallholder farmers, optimizing infrastructure, and facilitating immediate stakeholder collaborations. Long-term goals involve fostering technological innovation, strengthening global competitiveness, and ensuring IAIPs' integration into international value chains. By clearly delineating these timelines, the policy recommendations provide actionable guidance for policymakers, helping them prioritize both immediate interventions and sustainable, long-term strategies.

5.2. Conclusions

This study explores the dynamics within Ethiopia's two Agro-Industrial Innovation Parks (IAIPs) in Yirgalem and Bulbula, focusing on the roles of institutional frameworks, innovation ecosystems, and stakeholder coordination in enhancing global competitiveness. The findings reveal that while strong institutional frameworks and effective stakeholder coordination positively contribute to innovation and competitiveness, there exists a significant misalignment between the innovation ecosystem and global market demands. Specifically, the negative relationship between the innovation ecosystem and global competitiveness points to inefficiencies in innovation processes that fail to meet the evolving needs of global markets.

Additionally, the study highlights that overly rigid institutional frameworks impede the adaptability of IAIPs to global market shifts, restricting their competitiveness. To address these issues, the study advocates for the development of more flexible and market-responsive institutional frameworks that can better align innovation strategies with consumer demands and changing market trends. Ethiopia's agricultural sector, a cornerstone of its economic foundation, holds significant potential for growth through the strategic integration of industrialization. The adoption of IAIPs can catalyze this transformation by fostering synergies between agriculture and industry, driving both sustainable economic development and enhanced global competitiveness.

Key strengths of the IAIPs include standardized infrastructure and the adoption of climate-smart agricultural practices, positioning them as potential growth hubs. However, challenges such as limited private sector involvement, inadequate traceability systems, and misaligned innovation processes hinder the full realization of their potential. Additionally, external threats, such as political instability, pose significant risks to the sustained competitiveness of IAIPs. Addressing these challenges is essential to maximizing the global competitiveness of Ethiopia's agro-industrial sector.

To sum-up, a comprehensive approach that integrates innovation, adaptive governance, and strengthened stakeholder coordination is critical for overcoming the challenges faced by Ethiopia's agro-industrial sector. By fostering market-oriented innovation, creating flexible institutional frameworks, and enhancing stakeholder collaboration, Ethiopia can improve the competitiveness of its IAIPs, thereby contributing to sustainable economic growth and reinforcing its position in the global market. These policy recommendations, grounded in empirical findings, highlight the need for governance mechanisms that are flexible, yet stable, and capable of adapting to dynamic market conditions. By incorporating periodic reviews, stakeholder feedback, and testing policies in regulatory sandboxes, Ethiopia's agro-industrial sector can establish a robust framework for long-term growth and global competitiveness.

5.3. Future Research Directions

Building on the findings of this study, future research could further explore the impact of digital transformation in agro-industrial parks, particularly the role of digital agriculture tools and traceability systems in enhancing global competitiveness. Additionally, investigating the influence of public–private partnerships on IAIP performance and competitiveness would provide deeper insights into fostering private sector engagement. Finally, longitudinal studies examining the long-term effects of adaptive governance structures on IAIP resilience to external challenges, such as political instability or market volatility, could provide valuable contributions to the ongoing development of Ethiopia's agro-industrial sector.

6. Ethical Considerations and Limitations

This study adhered to stringent ethical standards and employed a robust methodological framework. However, it is important to acknowledge several limitations that could potentially influence the reliability and generalizability of the findings. These limitations include challenges related to data availability, governance dynamics, subjective biases, and external factors.

First, the availability of up-to-date data, particularly regarding Integrated Agro-Industrial Parks (IAIPs), posed a significant challenge. Inconsistent data updates and privacy concerns hindered access to comprehensive and current datasets, potentially affecting the accuracy of the analysis. Additionally, regional disparities in IAIP development may limit the applicability of the results to all areas of Ethiopia, as variations in infrastructure and policy implementation across regions could lead to differing levels of competitiveness and integration into global value chains. Second, the study considered the trade-off between governance flexibility and stability in Ethiopia's agro-industrial policies. While flexibility is crucial for adapting to changing economic conditions, stability is equally necessary to ensure long-term growth. This dynamic may influence the alignment between governance structures and the study's conclusions regarding competitiveness and global value chain integration.

Furthermore, the reliance on qualitative data introduces an element of subjectivity, as participant perceptions, biases, and personal experiences could shape responses. To mitigate this, the study employed a triangulation approach, integrating qualitative and quantitative methods, and drawing from multiple data sources, including government reports, academic literature, and expert opinions. This approach enhanced the validity of the findings and provided a more comprehensive understanding of the research topic. In addition to these challenges, external factors, such as political shifts, macroeconomic changes, and market fluctuations, could also influence the findings. The evolving political and economic environment in Ethiopia may impact agro-industrial policies and the country's global value chain integration, further complicating the interpretation of the results.

Despite these limitations, the triangulation method and the dynamic SWOT analysis employed in this study provided valuable safeguards, enhancing the credibility and robustness of the findings. The insights derived contribute significantly to understanding the roles of innovation, trade policy, and governance in shaping Ethiopia's agro-industrial competitiveness and its integration into global value chains. Nonetheless, ongoing research is required to monitor the evolving nature of these relationships and their impact over time.

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References

- Adamides, E. D. (2023). Activity theory for understanding and managing system innovations. *International Journal of Innovation Studies*, 7(2), 127–141. [\[CrossRef\]](#)
- Adner, R. (2006). Match your innovation strategy to your innovation ecosystem. *Harvard Business Review*, 84(4), 98–107. [\[CrossRef\]](#) [\[PubMed\]](#)
- Aldersey-Williams, J., Strachan, P. A., & Broadbent, I. D. (2020). Validating the “seven functions” model of technological innovations systems theory with industry stakeholders—A review from UK offshore renewables. *Energies*, 13(24), 6673. [\[CrossRef\]](#)
- Amsden, A. H. (2001). *The rise of the “rest”: Challenges to the west from late-industrializing economies*. Oxford University Press. [\[CrossRef\]](#)
- Anbes, T. (2020). Sources of productivity growth in Ethiopian agriculture. *African Journal of Agricultural Research*, 15(1), 19–32. [\[CrossRef\]](#)
- Barlagne, C., Bézard, M., Drillet, E., Larade, A., Diman, J. L., Alexandre, G., Vinglassalon, A., & Nijnik, M. (2023). Stakeholders' engagement platform to identify sustainable pathways for the development of multi-functional agroforestry in Guadeloupe, French West Indies. *Agroforestry Systems*, 97(3), 463–479. [\[CrossRef\]](#)
- Bauer, M., & Gaskell, G. (2000). *Qualitative researching with text, image and sound: A practical handbook*. Sage Publications.
- Boru, E. M., Hwang, J., & Ahmad, A. Y. (2025a). Sectoral innovation systems for agro-industrial transformation in Ethiopia: A systematic review of integrated agro-industrial parks and global value chains. *Ethiopian Journal of Economics*, 33, 2.
- Boru, E. M., Hwang, J., & Ahmad, A. Y. (2025b). Understanding the drivers of agricultural innovation in Ethiopia's integrated agro-industrial parks: A structural equation modeling and qualitative insights approach. *Agriculture*, 15(4), 355. [\[CrossRef\]](#)
- Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2), 27–40. [\[CrossRef\]](#)
- Brown, C. A. (2006). The application of complex adaptive systems theory to clinical practice in rehabilitation. *Disability and Rehabilitation*, 28(9), 587–593. [\[CrossRef\]](#)
- Bryman, A. (2016). *Social research methods* (5th ed.). Oxford University Press.
- Chin, W. W. (2010). How to write up and report PLS analyses. In V. E. Vinzi, W. W. Chin, J. Henseler, & H. Wang (Eds.), *Handbook of partial least squares* (pp. 655–690). Springer. [\[CrossRef\]](#)
- Collier, P., & Dercon, S. (2014). African agriculture in transition. In *Handbook of agricultural economics* (Vol. 4, pp. 1133–1168). Elsevier.
- Costa, E., Fontes, M., & Bento, N. (2023). Transformative business models for decarbonization: Insights from prize-winning start-ups at the web summit. *Sustainability*, 15(18), 14007. [\[CrossRef\]](#)
- Creswell, J. W., & Poth, C. N. (2017). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage Publications.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–334. [\[CrossRef\]](#)
- Denzin, N. K. (2017). *The research act: A theoretical introduction to sociological methods* (3rd ed.). Routledge.
- Dong, H., Janssen, M., & Nonnenmann, M. (2021). Institutional theory in the study of innovation ecosystems. *International Journal of Innovation Management*, 25(6), 1078–1102. [\[CrossRef\]](#)
- Ebrahimi, H. P., Sandra Schillo, R., & Bronson, K. (2021). Systematic stakeholder inclusion in digital agriculture: A framework and application to Canada. *Sustainability*, 13(12), 6879. [\[CrossRef\]](#)
- Ethiopian Statistical Service (ESS). (2021). *Labour force and migration survey key findings: Employment by major industrial divisions*. ESS.
- Fagerberg, J., Mowery, D. C., & Nelson, R. R. (2005). *The Oxford handbook of innovation*. Oxford University Press.
- Fan, X., Thompson, B., & Wang, L. (1999). Effects of sample size, estimation methods, and model specification on structural equation modeling fit indices. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 56–83. [\[CrossRef\]](#)

- Fang, L., & Ge, H. (2023). Research on traceability of agricultural product supply chain information. *Academic Journal of Science and Technology*, 5(1), 126–127. [CrossRef]
- Federal Democratic Republic of Ethiopia Ministry of Industry (FDRE). (2021). *Annual brief report on Ethiopian agro-industrial parks report*. Available online: https://www.unido.org/sites/default/files/files/2022-10/Ethiopia-PCP-AR2021.pdf?_token=233146338 (accessed on 5 March 2025).
- Fiss, P. C., & Zajac, E. J. (2004). The diffusion of ideas. *Organization Science*, 15(5), 498–511. [CrossRef]
- Flick, R. (2018). *Triangulation in research: A valuable tool in qualitative research* (7th ed.). Sage Publications.
- Ghazinoory, S., Abdi, M., & Azadegan-Mehr, M. (2011). SWOT methodology: A state-of-the-art review for the past, a framework for the future. *Journal of Business Economics and Management*, 12(1), 24–48. [CrossRef]
- Gibbs, G. R. (2007). *Analyzing qualitative data*. Sage Publications.
- Gibson, D. V., Foss, L., & Hodgson, R. (2014). Institutional perspectives in innovation ecosystem development. In T. Kliewe, & T. Kesting (Eds.), *Modern concepts of organizational marketing* (pp. 61–75). Springer Gabler. [CrossRef]
- Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research. *Organizational Research Methods*, 16(1), 15–31. [CrossRef]
- Guteta, G., & Worku, H. (2022). Analysis of the governance practices for promoting sustainable industrial parks development in Ethiopia: Challenges and prospects. *International Journal of Sustainable Development & World Policy*, 11(2), 30–46. [CrossRef]
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). Sage Publications.
- Hassan, M. S., Bukhari, S., & Arshed, N. (2020). Competitiveness, governance and globalization: What matters for poverty alleviation? *Environment. Development and Sustainability*, 22(4), 3491–3518. [CrossRef]
- Helfat, C. E. (2011). *Dynamic capabilities: Understanding strategic change in organizations*. Blackwell Publishing.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135. [CrossRef]
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In R. R. Sinkovics, & P. N. Ghauri (Eds.), *Advances in international marketing* (Vol. 20, pp. 277–319). Emerald Group Publishing.
- Jenson, I., Leith, P., Doyle, R., West, J., & Miles, M. P. (2016). Testing innovation systems theory using Qualitative Comparative Analysis. *Journal of Business Research*, 69(4). [CrossRef]
- Juliandi, A. (2018). Structural equation model partial least square (SEM-PLS) menggunakan SmartPLS. *Modul Pelatihan*, 1(4), 1–6.
- Kirby, M. M., & Bollen, K. A. (2009). *Structural equation modeling: Applications in the social sciences*. SAGE Publications.
- Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. *Information Systems Journal*, 28(1), 227–261. [CrossRef]
- Krueger, R. A., & Casey, M. A. (2014). *Focus groups: A practical guide for applied research* (5th ed.). Sage Publications.
- Lindlof, T. R., & Taylor, B. C. (2011). *Qualitative communication research methods* (3rd ed.). Sage Publications.
- Litha, M., Clement, M., & Andrew, P. (2024). Governance, institutional quality and economic complexity in selected African countries. *International Journal of Economic Policy Studies*, 19(1), 159–181. [CrossRef]
- Liu, X., Li, Q., & Zhang, Y. (2022). The role of institutional factors in the effectiveness of innovation ecosystems. *Technological Forecasting and Social Change*, 175, 121315. [CrossRef]
- Lundvall, B. Å. (1992). *National systems of innovation: Towards a theory of innovation and interactive learning*. Pinter Publishers.
- Lundvall, B. Å., & Johnson, B. (1994). The learning economy. *Journal of Industry Studies*, 1(2), 23–42. [CrossRef]
- Malerba, F. (2002). Sectoral systems of innovation and production. *Research Policy*, 31(2), 247–264. [CrossRef]
- Memon, M. A., Cheah, J. H., & Ramayah, T. (2021). *Structural equation modeling: A practical guide to PLS-SEM*. Springer.
- Mendy, J., Rahman, M., & Singh, S. (2019, June 20–21). *Application of PLS-SEM for small-scale survey: An empirical example of SMEs*. Proceedings of the European Conference on Research Methodology in Business and Management, Johannesburg, South Africa. [CrossRef]
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Sage Publications.
- Morgan, D. L. (1997). *Focus groups as qualitative research* (2nd ed.). Sage Publications.
- National Bank of Ethiopia (NBE). (2023). *Annual report on economic performance and outlook*. NBE.
- North, D. C. (1990). *Institutions, institutional change, and economic performance*. Cambridge University Press.
- Okogwu, C., Agho, M. O., Adeyinka, M. A., Odulaja, B. A., Eyo-Udo, N. L., Daraojimba, C., & Bansa, A. A. (2023). Exploring the integration of sustainable materials in supply chain management for environmental impact. *Engineering Science & Technology Journal*, 4(3), 49–65. [CrossRef]
- Ostrom, E. (2005). *Understanding institutional diversity*. Princeton University Press.
- Palacios-Lopez, A., Christiaensen, L., & Kilic, T. (2017). How much of the labor in African agriculture is provided by women? *Food Policy*, 67, 52–63. [CrossRef]
- Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). Sage Publications.

- Pigford, A. A. E., Hickey, G. M., & Klerkx, L. (2018). Beyond agricultural innovation systems? Exploring an agricultural innovation ecosystems approach for niche design and development in sustainability transitions. *Agricultural Systems*, 164, 116–121. [CrossRef]
- Porter, M. E. (1990). *The competitive advantage of nations*. Free Press.
- Ringle, C. M., Sarstedt, M., & Strobl, C. (2023). *SmartPLS 4: A comprehensive guide*. SmartPLS.
- Romani, L. A. S., Bariani, J. M., Drucker, D. P., Vaz, G. J., Mondo, V. H. V., Moura, M. F., Bolfe, E. L., Oliveira, S. R. d. M., de Sousa, P. H. P., & Junior, A. L. (2020). Role of research and development institutions and AgTechs in the digital transformation of agriculture in Brazil. *Revista Ciencia Agronomica*, 51(5), 20207800. [CrossRef]
- Ruppel, O. C. (2022). Soil protection and legal aspects of international trade in agriculture in times of climate change: The WTO-dimension. *Soil Security*, 6, 100038. [CrossRef]
- Saldaña, J. (2015). *The coding manual for qualitative researchers* (3rd ed.). Sage Publications.
- Saris, W. E., Satorra, A., & Sorbom, D. (1987). The detection and correction of specification errors in structural equation models. *Sociological Methodology*, 17, 105. [CrossRef]
- Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In *Handbook of market research* (pp. 1–47). Springer. [CrossRef]
- Schmidt, S. (2012). Governance and innovation ecosystems. *Technology Analysis & Strategic Management*, 24(6), 543–552.
- Shabanov, V. L., Vasilchenko, M. Y., Derunova, E. A., & Potapov, A. P. (2021). Formation of an export-oriented agricultural economy and regional open innovations. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(1). [CrossRef]
- Stroink, M. L. (2020). The dynamics of psycho-social-ecological resilience in the urban environment: A complex adaptive systems theory perspective. *Frontiers in Sustainable Cities*, 2, 31. [CrossRef]
- Sun, Y., Yu, Z., Li, L., Chen, Y., Kataev, M. Y., Yu, H., & Wang, H. (2021). Technological innovation research: A structural equation modelling approach. *Journal of Global Information Management*, 29(6), 1–22. [CrossRef]
- Tessitore, S., Iraldo, F., Apicella, A., & Tarabella, A. (2022). Food traceability as driver for the competitiveness in Italian food service companies. *Journal of Foodservice Business Research*, 25(1), 57–84. [CrossRef]
- UNCTAD. (2015). *World investment report 2015: Reforming international investment governance*. United Nations Conference on Trade and Development (UNCTAD).
- United Nations Industrial Development Organization (UNIDO). (2025). *Ethiopia: Integrated agro-industrial parks*. Available online: <https://downloads.unido.org/ot/51/11/5111361/Integrated-Agro-Industrial-Parks-in-Ethiopia-Overview-document.pdf> (accessed on 5 March 2025).
- Urugo, M. M., Yohannis, E., Tekla, T. A., Gemedet, T., Forsido, S. F., Tessema, A., Suraj, M., & Abdu, J. (2024). Addressing post-harvest losses through agro-processing for sustainable development in Ethiopia. *Journal of Agriculture and Food Research*, 18, 101316. [CrossRef]
- Williams, R., Allison, P. D., & Moral-Benito, E. (2018). Linear dynamic panel-data estimation using maximum likelihood and structural equation modeling. *The Stata Journal: Promoting Communications on Statistics and Stata*, 18(2), 293–326. [CrossRef]
- World Bank. (2021). *World Bank report on African agriculture: Opportunities for agro-industrial integration*. World Bank.
- Zhang, L., Takhumova, O., Borzunov, I., Kalitskaya, V., & Rykalina, O. (2025). The role of green technologies in enhancing agricultural productivity and reducing ecological footprint. *E3S Web of Conferences*, 614(4), 04026. [CrossRef]

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