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Article

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Article

Place-Based Approach to Rural Development: Ethiopia in Context

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Abstract: Place-specific socioeconomic features are unique and, unlike first-nature geography, are shaped and reshaped by human and institutional interactions. In Ethiopia, however, policy thinking has not progressed much beyond first-nature geography, overlooking the multidimensional socio-spatial formations of rural areas. This study, based on nationally representative socioeconomic panel data from 2018/19 and 2021/22, used a place-based framework to explore the complex nature of rural development and its relationship with multidimensional, place-specific key determinants, namely rurality and entrepreneurial ecosystems. Indices for the key variables were developed by reducing their dimensions using Principal Component Analysis to measure multidimensional variables, including rural development, and undertake subsequent examinations. The study examines the effects of the key determinants on rural development using the Fixed Effects Instrumental Variables–Two-Stage Least Squares regression model, owing to endogeneity concerns with the key determinants. The study shows significant effects of both rurality and entrepreneurial ecosystems on rural development. It offers insights into the complex socio-spatial formations and explanatory power of rural contexts and contributes to the understanding of a place-based approach to rural development. The study also contributes to national and sub-national strategies to address rural challenges in Ethiopia and beyond.

Keywords: socio-spatial; place-based; rurality; entrepreneurial ecosystem; FE-2SLS

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1. Introduction

Africa is primarily rural (Christiaensen & Maertens, 2022), yet it struggles with critical policy challenges in rural development (RD). Particularly, Sub-Saharan countries lack a clear focus on RD, and often, there is a narrow emphasis on agricultural productivity. They also inadequately adapt to changing socioeconomic conditions, such as high rural fertility, rural-to-urban migration and regional inequalities (OECD, 2016; OECD/PSI, 2020). Moreover, they overlook growth potential through a place-based approach (OECD, 2016, p. 181). For instance, Côte d'Ivoire and Tanzania present a compelling case. Côte d'Ivoire focused on agricultural productivity and has achieved impressive results in farming. Likewise, Tanzania pursued an explicit RD strategy and achieved notable economic growth since 2000. However, Côte d'Ivoire still confronts extreme poverty and low human development, and Tanzania has struggled to translate growth into improved rural socioeconomic welfare. While the labour force is growing rapidly, African countries including Ethiopia are not offering adequate job opportunities (OECD, 2016; OECD/PSI, 2020).

With 130 million inhabitants, and being 77% rural, Ethiopia is the second most populous and the fifth most rural country in Africa (OECD/PSI, 2020; Trading Economics, 2024). It implemented the world's most prominent Chilalo Agricultural Development Unit (CADU) and Wolaita Agricultural Development Unit (WADU) rural programmes five decades back (Cohen, 1987). However, existing rural development strategies in Ethiopia often overlook the diverse socioeconomic contexts of rural areas (OECD/PSI, 2020), relying on the defective conceptualization of rural areas that classify areas as non-urban spaces, mainly using population threshold (FAO, 2018). While rural areas are shaped and reshaped by complex interactions between human and institutional factors affecting their development trajectories (Gaddefors & Anderson, 2019; Lazaro et al., 2019; Zahra et al., 2014), policy thinking in the country has not progressed much beyond first-nature geography, overlooking the multidimensional socio-spatial formations of rural areas, making it a key study country for this topic.

Against this background, this study aims to understand the complex socio-spatial nature of rural development and its relationship with key multidimensional, place-specific determinants, namely rurality and the entrepreneurial ecosystem, to inform effective policymaking. Drawing from the concepts, theories, and empirical evidence and using the Living Standards Measurement Study (LSMS) data for Ethiopia, it tests a central hypothesis (H) that multidimensional, place-specific features are key determinants of rural development (RD), expounded with two specific hypotheses: H_1: rurality (RUR) of a place has a statistically significant effect on RD, and H_2: the entrepreneurial ecosystem (EE) of a place has a statistically significant effect on RD. In associating these determinants directly with RD and quantifying their effects, to the best of the authors' knowledge, there are no substantive studies, particularly in Ethiopia.

The existing knowledge base in understanding such socio-spatial dimensions in Ethiopia is limited. The failure to improve this may result in difficulty in addressing the persistent socio-spatial micro-level challenges such as inequalities and migration. Most studies on economic growth in Ethiopia are not directly related to the rural context; instead, they differ from the present study in various common aspects. They often focus on the macro-economy, rely on (real) GDP as a singular indicator of economic performance, and have no substantive concern in distinguishing urban and rural spatial settings (Alemu et al., 2019; Negera, 2021; Tesfaye & Bekana, 2020; Rao & Bedada, 2017). Studies from Africa also primarily emphasize macroeconomic determinants that underplay the detrimental role played by local communities and multidimensional development aspects (Nguyen, 2023; Sendi et al., 2022; Thaddeus et al., 2024). Though GDP is a popular economic indicator, it falls short of assessing RD as it emphasizes monetary values (Kačar et al., 2016). In rural economies like Ethiopia, important economic activities such as subsistence farming, community services and environmental concerns are vital for livelihoods but are often ignored in GDP measurements. Thus GDP overlooks the essential and multidimensional aspects of RD. This study addresses the drawbacks of GDP by directly measuring and analyzing RD. Moreover, GDP data are unavailable at the grassroots (micro) level for many Sub-Saharan countries, including Ethiopia, where one cannot find them even at a regional level, usually due to a lack of statistical capacity (Gates, 2013). Thus, direct measurement has an additional benefit in tackling data unavailability.

The micro-level evidence available in Ethiopia tends to emphasize individual factors or was merely collected at the sub-national level, or without concern for endogeneity problems (see Kruseman et al., 2006; Ogunleye, 2010; Panahi, 2015; Yilmaz et al., 2010). The empirical representation of place-specific factors is commonly limited to simple and single-dimensional variables such as market access (Hausmann et al., 2021). Unlike some experiences in objectively analyzing rurality and entrepreneurial ecosystems (Leendertse

et al., 2021; Li et al., 2015; Sánchez-Mateos, 2018; Yilmaz et al., 2010), the present study identifies these indicators as multidimensional place-specific regressors and qualifies them as key explanatory powers. The authors are unaware of a study that applied multidimensional regressors as factors directly affecting RD, or if so, at least empirically established to what extent such entities explain RD, anywhere or at least in Ethiopia. This study leverages quantitative panel data and effectively confronts the challenges of place heterogeneities and endogeneities, offering considerable technical advantages (see Greene, 2020; Wooldridge, 2020).

In line with the shift in the concepts of RD to a territorial, "bottom-up" approach that acknowledges rural places (Beer et al., 2020; Cattaneo et al., 2022), this study applies place-based development modelling and offers insight into the rural context's complex socio-spatial formations. It further underscores the explanatory nature of the multidimensional socio-spatial features in driving socioeconomic changes. The study informs policymakers and practitioners of "what" and "how" to target the fundamental socio-spatial concerns feasibly. The analytical framework enables the effective identification and measurement of place-specific features and highlights the spatial interplay that can help the growing conceptualization of a place-based approach. Adopting a place-based approach and integrating it into broader regional and national strategies will help address the unique rural challenges and enhance policy effectiveness in Ethiopia and beyond.

The rest of the paper includes five parts. First, a short account of the place-based approach is presented. Following this, the determinants of RD, data and methods, key findings, discussions, and conclusions are elaborated on.

2. Place-Based Approach and Determinants of Rural Development

2.1. Place-Based Approach to Rural Development: Spatial Concepts and Empirical Evidence

Rural development (RD) is a broad concept that incorporates agricultural and non-agricultural activities, with due emphasis on improving the living standards of rural society (Singh & Shishodia, 2023). The approaches in addressing RD have shifted from their simplistic approaches to tackle the 'falling' rural areas with urbanization, modernization, and industrialization into the broader concept of a territorial model and more toward community and place-based approaches (Beer et al., 2020; Cattaneo et al., 2022) that emphasize concepts of space, place, and territory. Space is the basic layer embracing territory and place. It is geographically conceptualized with location, territory, and place (Duarte, 2017). Both territory and place are slices of space with which people's (individual, group, or social) meaningful interactions and values are ascribed. The place is a specific geographic location where people live, and it exhibits affective and subjective values. Territory on the other hand has enforced values that tend to govern the occupants (pp. 4, 79). The place-based approach to rural development (PBRD) is an approach to development that seeks to achieve desired socioeconomic changes in a given geographic place such as local rural areas or regions (Beer et al., 2020). Though connoted as place-based, it is ultimately designed to improve the well-being of rural people, making people–place duality unnatural (Byron, 2010).

The underlying principle of the place-based approach is equity and efficiency. While the equity concern is due to commonly seen uneven spatial development, the efficiency concern is due to market failure (Duranton & Venables, 2021). In this regard, the PBRD approach recognizes two essential elements: (i) the unique identity and *sense of place* inherent in communities, and (ii) the tailoring of local strategies with regional and national policies. The first element focuses on the thematic concerns of a place. This enables leveraging tangible and intangible unique endowments and bottom-up planning. The emphasis thus is on the needs and pressing concerns of the local (regional) development (Manioudis &

Angelakis, 2023). In a heterogeneous context of a place, the approach goes beyond the traditional sectors such as manufacturing or finance to further promote the growing sector of alternative economies such as creative economies such as craft, gaming, and media. These sectors differ from traditional capitalist models that intensify inequalities and environmental challenges. This economy relies less on natural resources and notably offers job opportunities for young citizens and women compared to traditional sectors and helps efficiently drive development in local areas (Healy, 2020; Manioudis & Angelakis, 2023).

The second element, i.e., tailoring, emphasizes the importance of the interaction and interdependence between local and extra-local factors, and active community engagement (Manioudis & Angelakis, 2023). Consequently, the place-based approach encourages a socio-spatial understanding of both local and broader factors. Between the local and the broader national and global factors are regional factors serving as a part of a larger national strategy aimed at addressing socioeconomic challenges, including regional inequalities, economic stagnation, and unemployment. Place-oriented regional planning thus recognizes the significance of place-specific features such as rurality and local entrepreneurship and innovation (Beer et al., 2020). Entrepreneurship is usually a regional phenomenon and when connecting and interacting with other components to form an EE, it has a strong and effective capacity to mobilize the capital, labour, and resources of places (O'Connor et al., 2018). Such mechanisms urge harnessing the untapped local potential and addressing social exclusion in a specific (regional) context. Thus, the PBRD approach through its equity and efficiency concerns promotes sustainable (regional) development (Almusaed & Almssad, 2023).

The prominent proponents of place-based policymaking include the EU, OECD, the Australian government, and AfDB (African Development Bank) (AfDB/OECD, 2015; Geatches et al., 2023; OECD/PSI, 2020). With the place-based approach, while the EU addresses continental challenges such as population decline, ageing, and limitations in social services (Barca et al., 2012; European Union, 2022), the Australian government deals with area marginalization and regional inequalities (Geatches et al., 2023). The application of the approach is growing in African countries such as Nigeria and South Africa (Abagna et al., 2024; AfDB/OECD, 2015; Pugalis & Gray, 2016). In Nigeria, for instance, while Lawal and Osayomi (2021) applied cross-sectional place-based modelling for COVID-19 social vulnerability analysis, KTN (2021) conducted a place-based innovation audit in a rural state. Using a three-decade (1990–2020) household dataset from 10 African countries, Abagna et al. (2024) also showed the effectiveness of a place-based policy (Special Economic Zones—SEZs) on household wealth[1]. An OECD study on Ethiopia argued against the rural–urban divide and recommended shifting away from a sectoral-based policy to a PBRD (OECD/PSI, 2020, pp. 22, 102) that strengthens rural–urban linkage and addresses growing regional inequalities (p. 162).

2.2. Determinants of Rural Development

Determinants of economic development are complex and vary across and within countries (Nguyen, 2023). They are generally grouped into economic (e.g., resources and capital) and noneconomic (e.g., institutions) categories (Jhingan, 2016). Within this broad framework, several factors affect the level of RD such as resource endowments, human resources, available capital, cutting-edge technology, and the effectiveness of institutions and organizations (Agarwal et al., 2009; Banakar & Patil, 2018; Singh & Shishodia, 2023; Tae-Hwa & Seung-Ryong, 2016). Understanding the interactions between each of these various factors in spatial and social settings is essential for a successful policy (Gaddefors & Anderson, 2019; Lazaro et al., 2019).

Recent empirical research on factors affecting RD was performed in different parts of the world such as Turkey (Yilmaz et al., 2010), Iran (Panahi, 2015), and Nigeria (Ogunleye, 2010), and review work in Czech (Straka & Tuzová, 2016), among others. Evidence from Turkey's rural province indicated that RD is affected by natural, land-use, demographic, infrastructure, and socioeconomic structures (Yilmaz et al., 2010). In determining development in a rural context, i.e., RD, resource endowments such as land and livestock; technology such as improved seed, fertilizers, and machinery; and human capital such as general and technical education are important factors (Singh & Shishodia, 2023). Local organizations and institutions generally apply to the optimum utilization of production factors (Jhingan, 2016). In rural Poland, for instance, increased institutional quality was associated with higher socioeconomic development (Bartkowiak-Bakun, 2018). Moreover, RD is affected not only by local factors but also by extra-local factors (Kim, 2024) such as urban agglomeration (Frick & Rodríguez-Pose, 2017), continental road network (Pavel & Moldovan, 2019), and globalization (Beer et al., 2020).

In understanding the determinants of rural development, the socio-spatial conceptualization of rural areas is also helpful as socio-spatial factors are among the major determinants of RD (Agarwal et al., 2009). Beyond being a geographic entity, space is where socioeconomic phenomena are put together and shaped. Such socioeconomic interactions produce a place with distinct features that act as explanatory factors (Beer et al., 2020; Coe et al., 2013). The distinctiveness of a place (within and between territories) emerges from its physical nature (e.g., resource endowment, touristic and settlement landscape) as well as from human activity (e.g., forms of government, culture, religion, wealth status, built environment, social relationships, etc.), and the interaction between each of these. A place is formed of historical and existing changes within an area and elsewhere (Coe et al., 2013). Moreover, a place is a secure portion of space, and one experiences space through a *sense of place*—a factor in geographic identity that is acknowledged as intangible capital within a geographic space (a rural place) that can affect labour availability, entrepreneurship, and commodity supply (Bolton, 1992). Thus, a place with socio-spatial features and interactions affects RD (Beer et al., 2020; Coe et al., 2013; Gaddefors & Anderson, 2019; Zahra et al., 2014).

The major socio-spatial features influencing rural development include rurality (RUR) and the rural entrepreneurial ecosystem (EE). Rurality embodies a unique socioeconomic identity shaped by a strong sense of place, socioeconomic interactions, and historical context (Woods, 2011). The rural entrepreneurial ecosystem represents the interactions among entrepreneurial players—entrepreneurs, businesses, government organizations, and research institutions—that can either support or hinder entrepreneurial performances (Stam, 2015; World Economic Forum, 2013). While entrepreneurship is often driven by individual initiative, it is meaningfully affected by unique rural contexts, which, with its marked socio-spatial feature, shapes rural entrepreneurship differently than general/urban entrepreneurship (Muñoz & Kimmitt, 2019). Rural areas are characterized by strong social interaction and are sensitive to market demands, but they face challenges such as limited access to finance, skills, technology, infrastructure, and distribution channels. Unlike urban entrepreneurship, which focuses on seizing opportunities, rural entrepreneurship primarily relies on available resources (Asmit et al., 2024; Pato & Teixeira, 2014).

2.3. Rural Development in Ethiopia

Since the mid-1990s, "agriculture and rural development (ARD)" has been the focus of Ethiopia's development strategy, guided by the ADLI's (Agricultural Development-Led Industrialization) framework. The ADLI's main objective is to increase the agricultural productivity and the productive capacity of smallholder farmers. ADLI helped to bring

forth several subsequent development plans including the Sustainable Development and Poverty Reduction Program (SDPRP) and the Growth and Transformation Plans (GTP I and II) (OECD/PSI, 2020). Within the ADLI framework, the most notable RD strategy is the "Rural Development Policy and Strategies", endorsed in 2003; though it considers agroecological variations (MoFED, 2003, p. 16), it fails to acknowledge the overall socioeconomic heterogeneities of rural areas. Following the design and implementation of those plans and strategies, albeit with uneven outcomes, the country has experienced significant economic growth, particularly since 2004. The current regime, in place since 2019, has made no major change to the approach. Recently, the country implemented a ten-year perspective plan of the country (2021–2030). However, the plan continues to prioritize smallholder agriculture and transformation into commercial farming, although private sector involvement remains limited. The plan does not comprehensive rural development model. Rather, there is a high emphasis on urban development (see PDC, 2020). The overall policy directions, though with registered GDP growth, failed to achieve economic transformation and the much-required quality growth in Ethiopia. A recent OECD/PSI study identified three main challenges for Ethiopia: demographic, economic, and spatial. The ongoing population growth, particularly in rural areas, poses significant labour market challenges. Ethiopia is experiencing a decline in agricultural GDP and employment, yet agriculture still employs a remarkable percentage of the workforce (73%). For most rural households, crop farming is essential, contributing over 70% of their income, while the non-farm sector plays a minimal role. The OECD/PSI study underscored that the ADLI framework struggles to address the current issues (OECD/PSI, 2020).

3. The Analytical Framework for Place-Based Rural Development

This study applies a place-based analytical framework which structures the different socio-spatial factors affecting rural development. It frames the factors in a specific place taking account of the formation of multidimensional, place-specific determinants with local and extra-local interplay. In this context, endogenous (local/micro-level) and exogenous (extra-local/macro) forces interact within and between rural areas. Such interactions usually generate multidimensional factors unique to a place. As illustrated in Figure 1, these forces influence rural development (RD), empowering grassroots communities. In this study, the unique features of rural places—specifically rurality (RUR) and entrepreneurial ecosystems (EEs)—are assumed to be key socio-spatial determinants. Thus, rural areas are not merely first-nature geography or non-urban homogenous spaces. They are complex socio-spatial contexts integral to development processes. Because economic development has a spatial dimension (Komor, 2020) and places, with their varying socio-spatial features and interactions, affect RD (Beer et al., 2020; Coe et al., 2013; Gaddefors & Anderson, 2019; Zahra et al., 2014), a rural place with a spatial element acts as an important factor affecting RD (Komor, 2020).

Here, it is important to underscore the basic notion underlying RUR and RD. RUR represents the unique socio-spatial characteristics of a rural place, and RD, on the contrary, reflects the level of development achieved. It is the outcome of the development process shaped by various place-specific factors, including RUR. While RUR can be quantified through aspects such as agricultural engagement, population size, or coverage of communal spaces, measuring RD requires a different set of indicators. These include evaluating productivity levels (of labour or land) and consumption levels (both food and non-food). Ultimately, the concept of RD seeks to capture the results of a development process, while RUR aims to define the attributes that characterize a specific area.

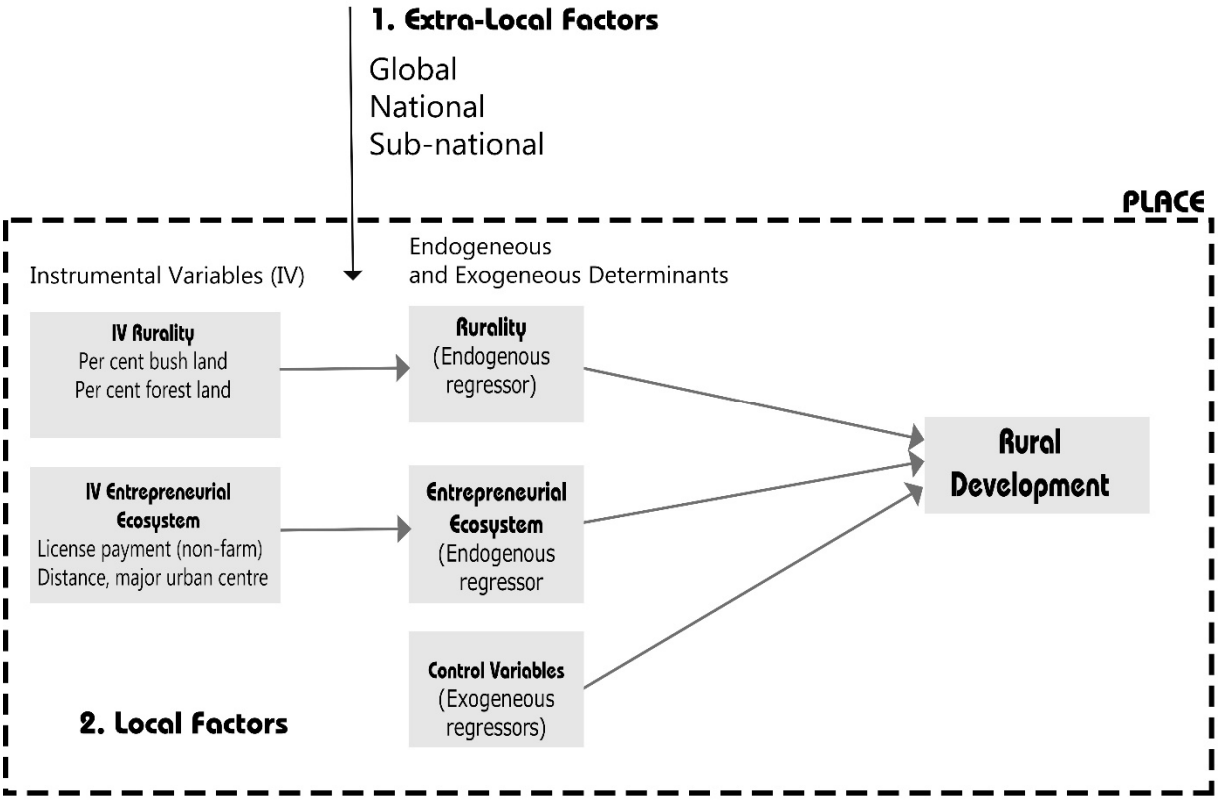

Figure 1. A place-based analytical framework for the proposed RD process (authors' presentation).

4. Data and Methods

4.1. The Study Area and Data

This study was conducted in Ethiopia, a federal country in East Africa. With over 130 million people (in 2024), it is Africa's second most populous nation, and with a 76.84% rural population, it is the fifth most rural country (Trading Economics, 2024). Known for its diverse geography, culture, and livelihood (Lie & Mesfin, 2018; OECD/PSI, 2020), Ethiopia's economy relies heavily on agriculture, with smallholder farmers accounting for 90% of production. However, the country faces significant challenges, particularly land fragmentation; 40% of landholders cultivate less than 0.5 hectares each (OECD/PSI, 2020).

This study employs nationally representative panel datasets from the Ethiopian Socioeconomic Panel Survey (Panel II: ESPS 4 for 2018/19 and ESPS 5 for 2021/22), which is produced by the Ethiopian Statistical Service (ESS, formerly the Central Statistical Agency), in partnership with the Living Standards Measurement Study (LSMS) of the World Bank. The sample units are the same within the panel. Data were collected from predefined rural and urban centres, including small, medium, and large towns, covering community, household, and agricultural activities, with specific attention to crops and livestock production. Enumeration Areas (EAs), the smallest local-level sampling units, served as the study's unit of analysis (ESS and LSMS, 2024). In this study, the EA is a specifically defined geographic section of a community representing a rural place.

EAs effectively represent rural communities, allowing for detailed micro-level analysis and the consideration of broader sub-national effects. A two-stage probability sampling technique was used for data collection, with EAs selected in proportion to their size within regions, followed by household selection. The focus on rural development (RD) restricts the analysis to EAs in rural areas and small towns, excluding medium and large urban centres, ensuring the findings are relevant to rural contexts and enhancing this study's applicability (see Table 1).

Table 1. Survey datasets with their basic statistics.

Description	Planned Observation		Observations in the Study [a]	
Year	**ESPS-4**	**ESPS-5**	**ESPS-4**	**ESPS-5**
Number of Enumeration Areas:				
Rural	297	223	262 [b]	223
Urban	244	215	—	—
Total	541	438	262	223
Number of Households:				
Rural	3239	2325	2841	2325
Urban	3655	2674	—	—
Total	6894	4999	2841	2325

Note: [a] Some EAs in the country and the whole Tigray region were not included in the ESPS-5 due to security reasons, [b] Because follow-up (ESPS-5) data from Tigray region were not available, Tigray EAs from ESPS-4 were also excluded. Source: authors' presentation.

4.2. Variables and Measurement Using Principal Component Analysis

The major variables employed are as follows.

(1) Dependent variable: rural development (RD)

This study constructed the dependent variable, RD, as a composite variable by adapting the dimensions and variables presented by Singh and Shishodia (2023). The status of RD was measured by including potential outcome variables, making it a "result index" (see Table 2). According to Tae-Hwa and Seung-Ryong (2016), a result index is a component value made of different indicator domains to investigate the level of development. Development in Ethiopia is also explained by improvement in agricultural productivity and the level of investment in public infrastructure (Dube et al., 2019).

Table 2. Domains and indicators employed in the index construction for rural development.

No.	Domains and Indicators	Description and Unit of Measurement
A	**Agricultural productive efficiency**	
1	Land (agricultural) productivity	Crop harvested in quintals per farm size (crop yield)
2	Labour (agricultural) productivity [a]	Total crop harvested in kilogram per total man-hours (adult equivalent adjusted) (labour activity post-planting and post-harvesting season)
B	**Workforce diversification**	
3	Percent non-agricultural workforce	Total off-farm employment per working-age population) × 100
C	**Rural educational and health infrastructure**	
4	Primary and secondary schools	Number
5	Primary health centres	Number
6	Electrified facilities: primary and secondary schools	Number
D	**Rural amenities**	
7	Rural HHs with drinking water	(HH members using clean drinking water in a place/population size) × 100 (%)
8	Rural HHs with electricity connection	(HH members with electricity utilities in a place/population size) × 100 (%)
9	Rural HHs with toilets	(HH members with toilet facilities in a place/population size) × 100 (%)

Table 2. *Cont.*

No.	Domains and Indicators	Description and Unit of Measurement
10	Rural modern houses	Total number of improved/modern house types: wall, roof and floor materials (%)
11	Rural HH with modern household amenities	(HH members with all basic modern facilities in a place/population size) × 100 (%) [b]
E	**Transport infrastructure**	
12	Types of road surfaces in the community	Asphalt, gravel, dirt
F	**Human capital**	
13	Effective literacy rate	(People who can read and write (age >=5) to the total age group population in the locality) × 100 (%)
14	School enrollment	The mean total population enrolled in school
H	**Rural financial infrastructure**	
15	Borrow on credit from someone out	Total number of HH members having credit services
16	Accessibility to commercial banks	(proxy used: the nearest distance in KM to the commercial bank)
17	Accessibility to cooperative societies	(proxy used: the nearest place distance where there is an SACCO)
G	**Rural standard of living**	
18	Per capita annual consumption expenditure	Total consumption per population
19	Per capita annual food consumption expenditure	Total food consumption per population
20	Annual expenditure on non-food items	Total HH expenditures on non-food items
21	Annual expenditure on education	Total expenditure on education
22	Annual expenditure on utilities	Total expenditure on utilities

Note: [a] Labour activity in post-planting and post-harvesting seasons was taken. Total man-hour adult equivalent adjusted, [b] clean drinking water, improved toilet, modern kitchen, cooking fuel, modern oven, electricity utilization. Adapted from Singh and Shishodia (2023); HH: household.

(2) Place-specific endogenous regressor: rurality (RUR)

In this study, rurality represents multidimensional socio-spatial features characterizing a rural place (i) exhibiting qualities of first-nature geography and beyond, and (ii) made of the interaction between the rural place, the inhabitants, and institutions. The major domains in objectively measuring rurality include remoteness, economic, social (socio-cultural), and environmental (natural and physical) aspects. In alignment with this, choosing the original variables was based on the literature on rurality (see Table S1).

(3) Place-specific endogenous regressors: entrepreneurial ecosystem (EE)

An entrepreneurial ecosystem (EE) is a dynamic system composed of interconnected elements within a geographic area that supports entrepreneurs in accessing essential resources and knowledge (Meier & Asinde, 2019; Michigan State University, 2022; Stam, 2015). Such a system is vital for harnessing the potential of rural context through rural entrepreneurship. Analyzing EEs involves categorizing elements into groups of actors such as academics, businesses, and governments, as well as important non-actor categories, including human capital (education, research and development), networks, entrepreneurial culture, financial systems, governance frameworks, infrastructure, and market accessibility. The actors influence the non-actors (Asmit et al., 2024). In this study, the rural entrepreneurial ecosystem refers to a multidimensional socio-spatial feature specifically formed by networks of interconnected components in a rural place, including the rural entrepreneurs, enterprises, the inhabitants, and various institutions, that support enterprise start-ups and development. The analytical framework for EEs is based on foundational

work by Isenberg (2011) and has been refined by others like Flores and Kovács (2018) and Maroufkhani et al. (2018), and other context-specific indicators as suggested by ecosystem pillars and indicators by Spigel (2020), Stam (2015), Stangler and Bell-Masterson (2015) and the World Economic Forum (2013) (see Table S2).

(4) Control variables

Based on the literature (Singh & Shishodia, 2023), community-level factors with a potential effect on RD were included. These are agricultural technology (improved crop seed), cost of fertilizer (with global price), resources (TLU per landholding)[2], rural institutions (percent HHs with a legal certificate of use right), and farm capital (farm tools per landholding).

4.3. Methods

4.3.1. Principal Component Analysis

RD can be measured either directly using an indicator that can capture its multifaceted attributes or indirectly using a single indicator like real GDP. The latter has severe limitations in representing rural welfare, particularly in developing countries where statistical capacity is inadequate (Gates, 2013; Singh & Shishodia, 2023). This study applied the direct method that better addresses the complexity of RD (dependent variable) and its welfare objective by taking into account the social, economic, environmental, and institutional dimensions of places. The same method was applied in measuring the two major multidimensional place-specific determinants (RUR and EE). In measuring RD directly, the study applied the multivariate method of Principal Component Analysis (PCA) which is commonly used for dimensionality reduction and index construction (Hair et al., 2019; Pavel & Moldovan, 2019; Yilmaz et al., 2010). The technique also helped to better deal with the potential risk of multicollinearity among the various explanatory variables, and resolve the possible problem of over-specification (the occurrence of redundant variables).

Originally, 22 RD variables were selected from their respective seven domains supported by various studies (see Section 4.2 and Table 2). Due to differences in the scale of measurements, all the original variables were subject to standardization and checked for outliers. Correlation analysis and check for appropriateness of the matrix were also performed, where redundant and low-performing variables were removed. In all cases, *Bartlett's test of Sphericity* with the determinants of the matrix, and *Kaiser–Meyer–Olkin* (KMO) *sampling adequacy test* were used. While the first indicated that there is sufficient intercorrelation ($p < 0.000$), the latter showed a significant measure for the overall variables (>0.64). Following this, all components fulfilling the Kaiser Criterion[3] were retained. This procedure was carried out to analyze the respective principal components of the key variables. The same procedure was carried out to reduce the dimensions of RUR and EE. Originally, 28 and 21 variables were analyzed for RUR and EE, respectively (see Table S2)[4].

4.3.2. Constructing and Normalizing Indices

The different indices for a locality are constructed by summing up the product of the proportions of component variances to the predicted scores as follows:

$$Index_k = \sum_i^n \left(\left(\frac{proportion\ of\ variance\ of\ component\ i}{cummulative\ proportion\ of\ varaince\ of\ n\ components} \right) \times \text{predicted score i.} \right. \quad (1)$$

where '*i*' is the number of components (with eigenvalues greater than 1) from 1, …, *n*; *n* is the total number of components. The resulting index represents a score for a multidimensional place-specific feature for a place '*k*'. The same procedures were applied to construct indices for RD, RUR, or EE.

The overall value of each principal component may have positive or negative interpretations depending on their relation to the values of the multidimensional place-specific variables. Likewise, the resulting overall score may have negative or positive values for a place that may complicate the interpretation of the key variables. Thus, for a better understanding, indices were normalized using Max-Min normalization, where score values are changed to vary in a range between 0 (minimum) and 1 (maximum).

$$Z_i = \frac{[x_i - Min(x)]}{[Max(x) - Min(x)]} \tag{2}$$

where Z_i is the normalized score of a multidimensional place-specific variable i; x_i, $Min(x)$ and $Max(x)$ are the actual, minimum, and maximum index values of a multidimensional place-specific variable i.

4.3.3. Basic Panel Data Model

The determinants of RD (see Section 2.2) can be specified as a function of natural resources (R), human resources (H), capital (K), technology (T), and institutions and organizations (O).

$$\mathrm{RD} = f(R, \mathrm{H}, K, T, O) \tag{3}$$

Following the panel nature of the data, this study applied panel data modelling. Panel data have a combined cross-section and time-series elements where data from the same unit of entities (N) (e.g., localities) are followed through time. The present data have large cross-sectional units (N) and only a few periods (2 T). Within the basic panel model, there are two alternative models: fixed effects (FEs) and random effects (REs). Heterogeneity is evident from the basic FE model ($p < 0.01$)[5]. Also, the Hausman specification test confirmed the FE panel data regression model ($p < 0.01$)[6]. The FE model has benefits over the random effects model as it controls for time-invariant unobserved heterogeneities among communities (Greene, 2020). Following the result from the Hausman test and based on Greene (2020, p. 433), the basic FE (linear) regression model is presented as follows:

$$RD_{it} = \mathrm{X}_{it}{}'\beta + \alpha_i + \varepsilon_{it} \tag{4}$$

where RD_{it} is the dependent variable which is represented by continuous scores ranging from a minimum of 0 to a maximum of 1 for a community 'i' in time 't'; (t = 1 and 2) denotes community cross-sectional units; X'_{it} is a 1 × K-dimensional vector of explanatory (endogenous and exogenous) variables; η_i captures the effects of those variables that are peculiar to the ith community and that are constant over time called unobserved community fixed effects (unobserved time-invariant heterogeneity). ε_{it} is a time-varying idiosyncratic error that is assumed to be independent and identically distributed over individuals and time, with mean zero and variance, $\sigma_\varepsilon{}^2$; β is a K × 1 vector of parameters.

The FE model assumes that the unobserved individual heterogeneity correlates with the other explanatory variables. This is particularly true where the rural households and the rural localities are expected to be very diverse (e.g., differences in community culture and governance quality) where the within-community differences are important. This type of longitudinal data also gives more information and more efficiency. In the FE modelling, $E[X_{it}e_{it}] = \mathrm{E}[\varepsilon \mid x_1, x_2, \ldots, x_k] = 0$, which implies that the expected value of the error term (e) in the model is not a function of the independent variables observed. The presence of the unobserved variables that correlate with the explanatory variables (X_{it}) is a reason to deviate from estimating by OLS, where the OLS estimates become biased and inconsistent (p. 416). In the fixed effects model, α_i has N fixed unknown parameters. The random effects model is when the individual effects, α_i, are treated as random. This assumes that

the intercepts of the individuals are different but that they can be treated as drawings from a distribution with mean μ and variance, ${\sigma_\alpha}^2$.

4.3.4. Estimation Strategy Using Fixed Effects Instrumental Variables–Two-Stage Least Squares Regression Modelling

Some important issues are acknowledged before considering the functional form in Equation (3). First, the components in the equation serve as theoretical domains for deriving empirical indicators. However, its practicality depends on the data availability and the specific context of the study area. As Singh and Shishodia (2023) remarked, identifying a few variables that determine RD is challenging, as it is complex and can take various forms. Second, RD cannot be reduced to a straightforward relationship where all determinants are considered "exogenous". Numerous factors affect RD, and it faces problems of indirect relationships among some variables, potential data unavailability or measurement errors. Finally, with the lack of a comprehensive model, it is essential to validate existing assumptions when introducing new variables like spatial factors (Boldeanu & Constantinescu, 2015). This means that there is a need for careful refinement of context-specific determinants for specification. Therefore, in this study, multidimensional, place-specific features—RUR and EE—were included as stochastic regressors alongside potential exogenous variables in Equation (3):

$$\text{RD} = f(RUR, \text{EE}, \text{other local and extra\_local factors}) \quad (5)$$

As indicated above, the complex spatial phenomenon and multidimensionality of the key variables (RD, RUR and EE) made the possibility of endogeneity non-excludable, and thus not all variables in the, X_{it}, of Equation (4) were expected to be exogenous, making the conventional OLS estimation with its exogeneity (strict assumption) difficult to apply. This is confirmed by the endogeneity test of the two regressors (RUR and EE) which rejects the null that they are exogenous ($p < 0.05$)[7]. Furthermore, a more robust test than the Hausman specification, also called the "variable addition test" or "control function test", can address the case where unbalanced panel data are applied (Semykina & Wooldridge, 2010)[8]. The test rejects the FE model and favours the FE IV model ($p < 0.01$). Thus, two of the explanatory variables correlate with the error term. Such endogeneity problems could arise from unobserved heterogeneity (self-selection), omitted variables, erroneous data, or reverse causation. This problem needs to be controlled as it introduces correlations between one or more independent variables with the error term, leading to biased and inconsistent estimators (Greene, 2020).

Thus, to address the endogeneity problem, this study extended the basic fixed effects panel model (Equation (4)) to the IV estimation method using the Fixed Effects Instrumental Variables–Two-Stage Least Squares (FE IV-2SLS) regression (Equations (6)–(8)). The instrumental variable (IV) estimation model is more efficient than the OLS estimator in such cases (see Wooldridge, 2020). The dependent variable, RD, was regressed against observations on RUR, EE, and other control variables. The model is specified based on Greene (2020, p. 433), as presented below in two stages.

$$R_{it} = \sum \hat{\mathrm{K}}'_{it}\Phi + \sum {X'}_{it}\beta + \eta_i + \varepsilon_{it} \ (\text{Structural form}) \quad (6)$$

$$\mathrm{K}_{it} = \mathrm{f}(X_{it}, Z_{it}, v_{it}) \ (\text{Reduced form}) \quad (7)$$

First-stage Regression: In Equation (8), using OLS, each of the two endogenous regressors (RUR and EE), K_{it}, are separately regressed on a set of Ivs, Z_{it} (that are correlated with K_{it}) and explanatory variables X_{it} in the system to estimate their predicted values, $\hat{\mathrm{K}}_{it}$; v_{it} is the error term. It is assumed that there exists a $1 \times L$ vector of instruments,

Z_{it}, satisfying the validity and relevance conditions, and where L ≥ M (M = endogenous variables) such that the assumption of the contemporaneous exogeneity holds for all variables in Z_{it}: E

$(\varepsilon_{it}|Z_{it}) = 0$, t = 1, . . ., T. These variables were used as instruments in Equation (8).

$$\hat{K}_{it} = \sum Z'_{it}\theta + \sum X'_{it}\psi + \nu_{it} \text{ (First-stage regression)} \quad (8)$$

Second-stage regression: Based on the structural Equation (6), the RD was regressed against the predicted values obtained from the first regression (Equation (8)) ($\hat{K}_{it}$). ε_{it} is an idiosyncratic error term. The resulting coefficient (Φ) on the predicted variables ($\hat{K}_{it}$) is the fixed effect IV estimate. The two stages were estimated together using Stata 17 software as it is advised to do so instead of conducting the two steps separately (Wooldridge, 2020).

5. Results and Discussions

5.1. Descriptive Statistics

Based on the ESPS[9] panel data, the descriptive statistics are presented for major variables in Table 3. The mean scores of the major operational variables, i.e., RD, RUR, and EE, in the panel period (2018/19–2021/22) are 0.203, 0.436, and 0.322, respectively[10]. The table also presents the statistics for other major variables such as agricultural technology (use of improved crop seed), livestock resources in tropical livestock units (TLUs), percentage of households with a legal certificate of use right, and cost of chemical fertilizer in terms of global price.

Table 3. Descriptive statistics of the operational variables employed.

Variable Name	Description	Mean	SD	Min	Max
Dependent variable					
Rural development (RD)	Score (0,1)	0.203	0.123	0	1
Endogenous explanatory variables (instrumented)					
Rurality (RUR)	Score (0,1)	0.436	0.163	0	1
Entrepreneurial Ecosystem (EE)	Score (0,1)	0.322	0.207	0	1
Exogenous control variables (included instruments)					
Agricultural technology (Improved seed)	Percent HH utilizing improved crop seed	0.079	0.147	0	0.411
Cost of chemical fertilizer (global price)	Global price multiplied by local quantity consumed (USD)	449,848	199,796	0	3,050,000
Livestock resource	Tropical livestock unit (TLU)	49.76	69.38	0	604.89
Farm capital	Farm tools per farm holding, unit	15.27	59.58	0	1126.21
Land certificate (rural institution) [a]	The proportion of HHs with a legal certificate of use right	0.40	0.16	0	0.71
Excluded instruments					
Bushland	Percent of land covered by bush in the community	23	21.412	0	100
Forest land	Percent of land covered by bush in the community	25.730	7.147	0	100
Licence payment	Payment made for licencing non-farm enterprises, ETB	1666.0	3757	0	20,000
Urban distance	Distance to the nearest major urban centre	55.1	43.8	1	160

Note: [a] Certificate of ownership, hereditary acquisition, lease or rental. SD: standard deviation; N: number of observations. Source: authors' calculations.

5.2. Patterns and Extent of Key Variables

As evident from the scatter plot and line graph (Figures 2 and 3), the ESPS data reveal three important outputs: (i) the relationships between the dependent variable (RD) and key endogenous regressors (RUR and EE), (ii) trends in RD, RUR, and EE from 2011/12 to 2021/22, and (iii) regional inequalities in rural development. Figure 2 shows a distinct linear relationship where RUR has an inverse (negative) correlation and rural EE has a direct (positive) relationship with RD. The findings agree with Rusu (2017), who identified an inverse relationship between rurality and territorial competitiveness (a proxy for living standards and territorial development). Evidence from China also agrees with the present findings indicating the correlation between high rurality and low RD (Li et al., 2015).

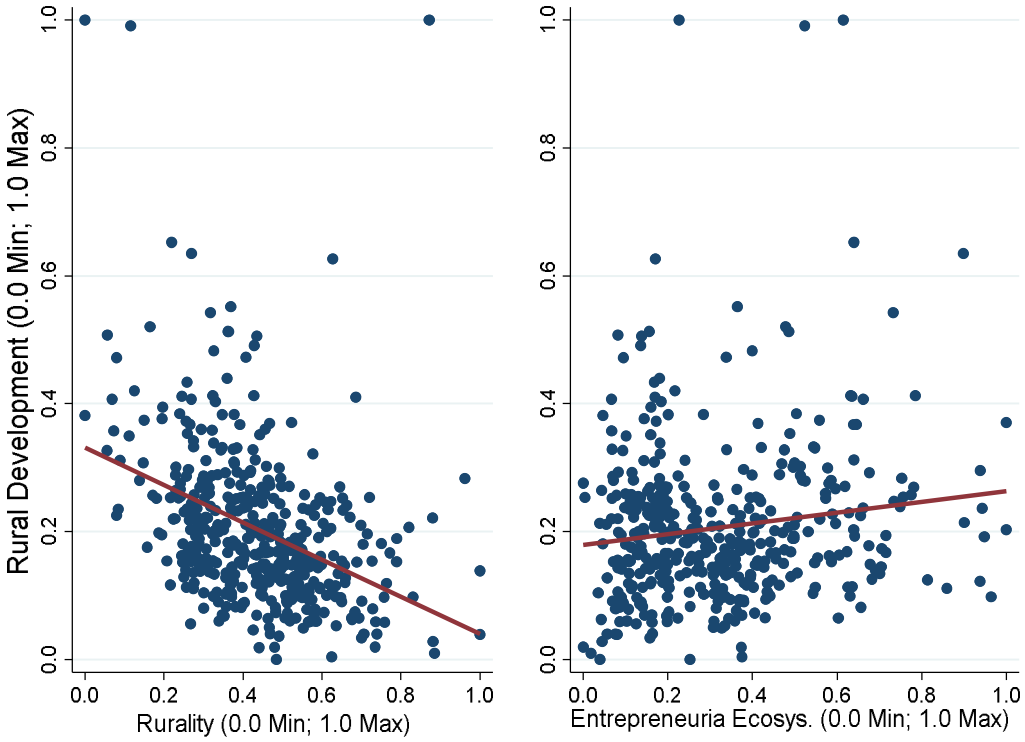

Figure 2. Linear relationship between RD with RUR and EE. Authors' representation.

This study clearly shows that the country has low levels of RD and EE, alongside high rurality (RUR), revealing the country's predominantly rural nature across time (Figure 3). This trend is consistent across various regions (see Figure 4). The patterns for the three variables between 2011/12 and 2021/22 are that RUR is decreasing and RD is increasing. Although EE has grown since 2014, it has recently started to decline. In 2013/14, RD peaked while both RUR and EE were at their lowest. Conversely, 2015/16 saw RUR reach its high, but RD dropped significantly.

This study showed marked regional inequalities in the mean score values of RD, RUR, and EE across regions (Figure 4). Rural Oromia, Gambela, and Harari rank highest in development, and Somali, Amhara, and Afar score the lowest in descending order. While Oromia is leading in RD, Afar is at the bottom. Additionally, the Somali, Afar, and Benishangul-Gumuz regions exhibited the highest rurality, with Somali having the most. In terms of EE, Oromia ranks highest, followed by Amhara and the former SNNP (Southern Nations, Nationalities, and Peoples) region. These findings reveal substantial performance differences among rural areas[11]. The regional inequalities found agree with earlier findings in Ethiopia by Argaw (2017) and Kuznar (2019), who attributed disparities to differences in opportunities, socioeconomic status, and ethnic diversities. While Argaw focuses on

socioeconomic factors like education, employment, safe water, and sanitation, Kuznar discusses the rural–urban gap. However, this study uncovers remarkable disparities within rural areas. Given regions in Ethiopia are structured by ethnic criteria, inequalities in line with the ethnicity of Kuznar's findings also have implications for regional disparities.

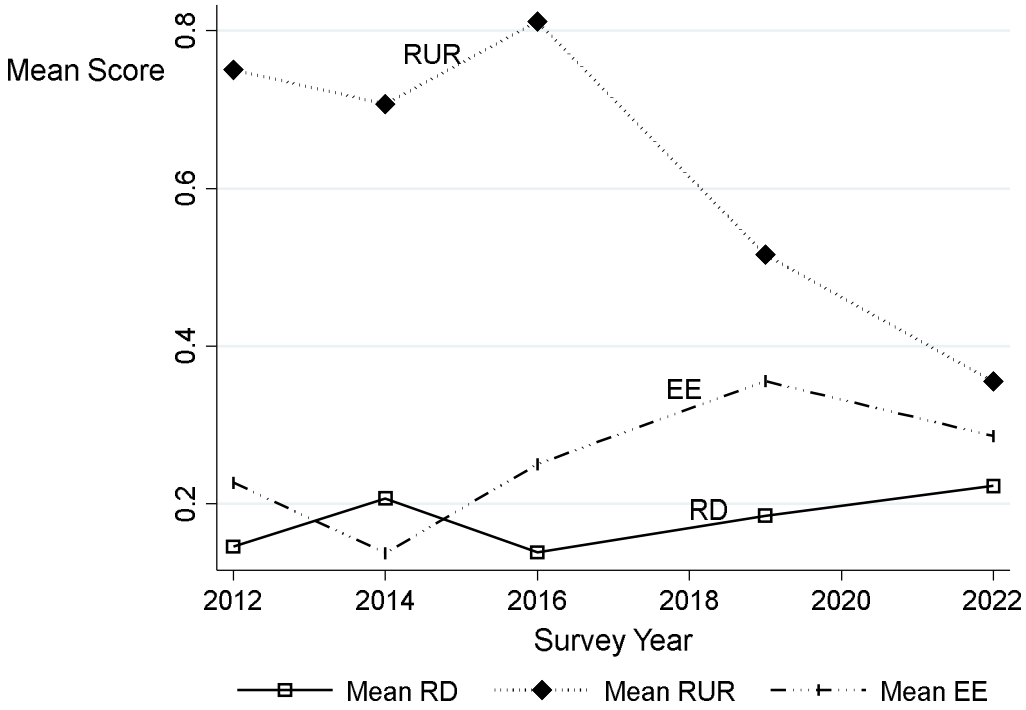

Figure 3. Patterns of RD, RUR, and EE over time. Authors' representation.

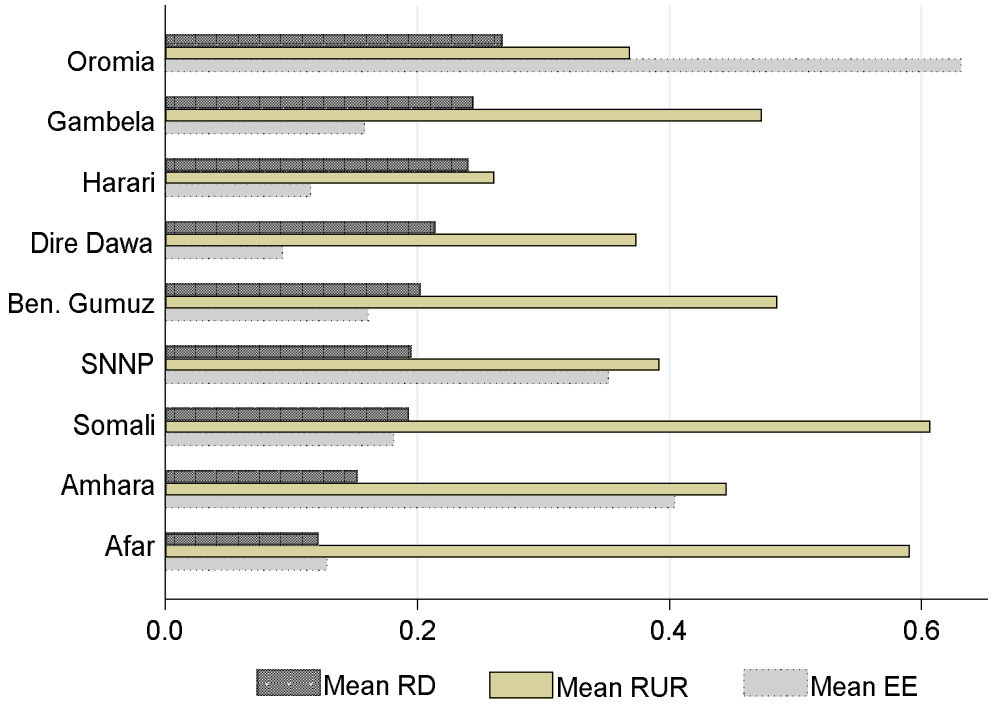

Figure 4. The extent of RD, RUR, and EE in the regional states of Ethiopia. Authors' representation.

Such disparities in development levels call for urgent, place-based interventions (Moretti, 2022). Remote rural areas are struggling with population decline in Europe (Castillo et al., 2023) and economic stagnation in China (Li et al., 2015). The regional differ-

ences make private and public service delivery difficult, worsening regional inequalities (Castillo et al., 2023). Place-based strategies are generally more relevant to specific challenges and marginalization, as they utilize local social dynamics and networks (Winterton et al., 2014). Initiatives for PBRD are gaining recognition in Europe (Sánchez-Zamora & Gallardo-Cobos, 2020), Australia (Geatches et al., 2023), the USA (Parker et al., 2022) and Africa (AfDB/OECD, 2015), with Ethiopia alerted to adopt similar solutions (OECD/PSI, 2020, pp. 22, 104). The PBRD approach aligns with Ethiopia's constitutional commitment to federation and decentralization that aims for inclusive growth. Also, by addressing local needs, the approach can enhance the low entrepreneurship and strengthen the weak rural–urban linkages in the country.

5.3. Findings from the Principal Component Analysis

After *varimax* rotation, four components (Comp1, Comp2, Comp3, and Comp4) were extracted in the PCA of RD with proportions of 0.2188, 0.1490, 0.1406, and 0.1371 in the first survey year 2018/19; and 0.1939, 0.1860, 0.1557 and 0.1124 in the second survey year 2021/22 (Table 4). The first and the overall components have jointly explained a high percentage of the total variation in the original dataset of both survey years. While the first component value was 21.9% and 19.4%, for ESPS-4 and ESPS-5, respectively, the overall variation in the data explained by the four components was 64.55% and 64.8%, respectively, which implies that the variation explained is adequate to determine the structure of RD (Finch, 2013), and the model, thus, is acceptable (Hair et al., 2019).

Table 4. Initial component extraction of rural development, Statistics for Varimax Rotated Components.

Survey Data: ESPS-4				ESPS-5			
Component	**Variance**	**Proportion**	**Cumulative**	**Component**	**Variance**	**Proportion**	**Cumulative**
Comp1	1.9695	0.2188	0.2188	Comp1	2.32653	0.1939	0.1939
Comp2	1.3409	0.1490	0.3678	Comp2	2.23201	0.1860	0.3799
Comp3	1.2654	0.1406	0.5084	Comp3	1.8688	0.1557	0.5356
Comp4	1.2337	0.1371	0.6455	Comp4	1.3483	0.1124	0.6480
Comp5	0.89720	0.0997	0.7452	Comp5	0.90972	0.0758	0.7238
Comp6	0.69803	0.0776	0.8228	Comp6	0.70951	0.0591	0.7829
Comp7	0.63911	0.0710	0.8938	Comp7	0.65126	0.0543	0.8372
Comp8	0.54929	0.0610	0.9548	Comp8	0.57741	0.0481	0.8853
Comp9	0.40681	0.0452	1.0000	Comp9	0.48477	0.0404	0.9257
				Comp10	0.44418	0.0370	0.9627
				Comp11	0.31252	0.0260	0.9888
				Comp12	0.13495	0.0112	1.0000
						ESPS-4	**ESPS-5**
					Number of observations	255	218
					Number of components	9	12
				Kaiser–Meyer–Olkin measure of sampling adequacy (KMO) (overall):		0.6278	0.6454
					Determinant of the correlation matrix	0.338	0.026
					Bartlett test of sphericity [a]		
					Chi-square =	271.204	775.493
					p-value =	0.000	0.000

Note: [a] H_0: Variables are not intercorrelated.

The final best model is obtained from several trials and errors, which ended in 9 and 12 variables in the ESPS-4 and ESPS-5, respectively. See Table 5 for component loadings (eigenvectors of the eigenvalues) which inform the strength of association between the loading variables and the extracted principal components (PCs). It is usually recommended

to include component loading values greater than 0.3 (WinCross, 2022). The components loading on the identified variables were significant and thus, they explain RD (Finch, 2013). This loading allows us to obtain an RD score for each community involved in the study.

Table 5. Component loadings for rural development (for both survey years).

1	Variable	ESPS-4				ESPS-5			
		Comp1	**Comp2**	**Comp3**	**Comp4**	**Comp1**	**Comp2**	**Comp3**	**Comp4**
2	Rural HH with drinking water (%)	0.5406				0.446			
3	HH with toilet facilities (%)	0.5998				0.591			
4	HH with electric utilities (%)	0.5861							
5	Effective literacy rate (read/write:		0.636						0.696
6	School enrollment (mean)		0.642						0.611
7	Primary and secondary schools (number)		0.366		0.564			0.463	
8	Non-agricultural workforce (%)				0.737			0.522	
9	Expenditure on non-food items			0.692			0.558		
10	Annual expenditure on education			0.720			0.547		
11	Electrified facilities, schools; number							0.557	
12	Percent rural HHs with modern household amenities					0.611			
13	Annual expenditure on utilities						0.515		
14	Accessibility to commercial banks							−0.406	
	Component interpretation:	**ESPS-4**				**ESPS-5**			
	Comp1:	Environmental hygiene and sanitation				Environmental hygiene and sanitation			
	Comp2:	Literacy				Non-food consumption			
	Comp3:	Non-food consumption				Infrastructure			
	Comp4:	(Public) Infrastructure				Literacy			

Significant loading: >0.3; empty cells: loadings less than 0.3. Source: authors' computation.

Based on the results in Table 5, there was significant positive loading on Comp 1 for variables such as percent rural households with drinking water, toilet facilities, and electric utilities. From the nature of the variables, it is evident that the component is "Environmental Hygiene and Sanitation". Component 2 has a significant loading on effective literacy rate (household members aged over or equal to 5 and who can read or write), mean school enrollment, and the total number of primary and secondary schools in the community. This component is thus interpreted as "Literacy". Comp3 has a significantly high loading on annual expenditure on non-food items and education. This component is labelled as "Non-food consumption". In the fourth component of the first survey, the important loadings were on the number of primary and secondary schools and the percentage of non-agricultural workforce in the communities. This is thus "non-farm employment". In all four components, the higher the score for the component loadings, the stronger the RD would be and vice versa, i.e., a direct relationship.

In ESPS-5 (2021/22), Comp1 has a high and significant loading on the percent of rural households with drinking water, toilet facilities, and total modern household amenities. This component is similar to the findings in the previous survey. It is interpreted as

"Environmental Hygiene and Sanitation". Component 2 has a high positive loading on annual expenditure on non-food items, education, and utilities. Hence, it is "Non-food consumption". Component 3 has high positive loading on the total number of primary and secondary schools in the community, the percentage of non-agricultural workforce, the total number of electrified facilities in the community (primary and secondary schools), and negative loading on accessibility to commercial banks (distance in km). This is interpreted as public infrastructure. Component 4 has a high and positive loading on effective literacy rate and mean school enrollment. All the components in the ESPS-5 have a direct relationship with RD.

From the above component analysis, RD in Ethiopia as an outcome can be explained mainly in terms of environmental sanitation and amenity levels, literacy rate and school enrollment, non-food consumption, and public expenditure. Outputs for the two key regressors can be found in the Supplementary Materials Tables S1 and S2 for RUR and Tables S3 and S4 for EE.

5.4. Key Findings Using FE IV-2SLS Regression

This study constructed indices for the key multidimensional dependent variable of rural development (RD) and its key endogenous regressors: rurality (RUR) and the rural entrepreneurial ecosystem (EE). Drawing on theoretical insights and empirical research, the study tested the hypothesis that these multidimensional, place-specific features are vital determinants of RD in Ethiopia. The panel fixed effects method enhances our analysis, while the 2SLS method significantly reduces potential endogeneity issues. Residual plots indicate no serious concerns regarding non-linearity, outliers, or heteroskedasticity, with variance around zero appearing uniformly distributed.

The output from the model without and with control variables is presented in Table 6. The final results refer to the prediction with the FE IV-2SLS model including all the control variables with cluster robust standard error[12] (see columns C and D). Given the large clusters in the study, the clusters' robust standard errors remain consistent, even with heteroskedasticity or autocorrelation (Cameron & Miller, 2015)[13]. The estimation is validated by weak instrument and over-identification tests, confirming the relevance and validity of the instruments (see the output at the bottom of Table 6). The first-stage regression demonstrates a statistically significant relationship between the instruments and the endogenous regressors (see Table 6, bottom). Instrument validation is further supported by robust empirical evidence (see Section 5.7). It was found that both the RUR and EE statistically significantly affect RD (see details in the sections below). Moreover, key variables related to technology and capital, such as the percentage of households using improved crop seeds ($p < 0.1$) and the number of farm tools per hectare ($p < 0.01$), are also statistically significant explaining the role played by agriculture in RD (Table 6).

Table 6. FE IV-2SLS estimation output.

	A [a]	B	C	D [b]
Dependent Variable: Rural development (RD)	FE IV-2SLS Coeff (without control vars and non-robust std. err.) (*-xtivreg-* command)	FE IV-2SLS Coeff (control variable and non-robust std. err.) (*-xtivreg-* command)	FE IV-2SLS Coeff (control vars and cluster-robust sd err) [c] (*-xtivreg-* command)	FE IV-2SLS Coeff (with control variables and cluster-robust sd err (final model) (*-xtivreg2-* command)

Table 6. *Cont.*

	A [a]	B	C	D [b]
Endogenous explanatory (instrumented) variables				
Rurality (RUR)	−0.261 (0.117) **	−0.270 (0.1266) **	−0.270 (0.1121) **	−0.270 (0.1106) **
Rural entrepreneurial ecosystem (EE)	0.294 (0.165) *	0.456 (0.1724) ***	0.456 (0.1748) **	0.456 (0.1726) ***
Exogenous control variables (included instruments)				
Percent HH utilizing improved crop seed (agricultural technology)	—	0.208 (0.0806) **	0.208 (0.1225) *	0.208 (0.1210) *
Cost of fertilizer (global price)	—	0.000035 (0.00001)	−0.00035 (0.00082)	−0.0003 (0.00008)
TLU total (resources)	—	0.0007 (0.0008)	0.0007 (0.0006)	0.0007 (0.0006)
Farm tools per farm holding (farm capital)	—	−0.001 (0.004) **	−0.001 (0.003) ***	−0.001 (0.003) ***
Land certificate (rural institution)	—	0.096 (0.0638)	0.096 (0.0701)	0.096 (0.0692)
Constant	0.227 ***	0.123 (0.0549) **	0.123 (0.0630) *	—
No. of Obs	390	337	337	252
Prob > F	0.080	0.0029	0.0000	0.0085
Test of overidentifying restrictions (using the *-xtoverid-* command)				(Outright) [d]
Sargan–Hansen statistic	4.406	2.274	2.462	2.462 (J) [e]
Chi-sq(2) *p*-value =	0.1104	0.3208	0.2921	0.2921
First-stage regression results				
Instrumental Variables (Excluded Instruments)	**Dependent Variable**: Rurality (RUR)	**Dependent Variable:** Entrepreneurial Ecosystem (EE)		
	Coefficient (robust standard errors)			
Percent bushland	0.015 (0.0045) ***	−0.03 (0.0047)		
Percent forest land	0.07 (0.0014) ***	0.026 (0.0016)		
Licence payment (non-farm)	−0.01 (0.003) ***	0.015 (0.0029) ***		
Urban distance	0.01 (0.002) ***	−0.017 (0.029) ***		
Tests for the final model reported, FE IV-2SLS.				
Underidentification test (Kleibergen–Paap rk LM statistic) [f]:			9.766	
Chi-sq(3) *p*-val =			0.0207	
Weak identification test (Kleibergen–Paap rk Wald F statistic): [g]			9.904	
Stock–Yogo weak ID test critical values: 5% maximal IV relative bias			11.04	
10% maximal IV relative bias			7.56	
20% maximal IV relative bias			5.57	
30% maximal IV relative bias			4.73	
10% maximal IV size			16.87	
15% maximal IV size			9.93	
20% maximal IV size			7.54	
25% maximal IV size			6.28	

Table 6. *Cont.*

A [a]	B	C	D [b]
NB: Critical values are for Cragg–Donald F statistic and i.i.d. errors.			
Endogeneity test of endogenous regressors:		6.091	
Chi-sq(2) *p*-val [h] =		0.046	

Note: [a] A model without the control variables is good for examining the estimates with respect to the subsequent full model. However, one cannot stop there as it suffers from omitted variables bias that may mislead interpretation, [b] Final coefficient estimates in column D are reported using the user's command of *-xtivreg2-* (Schaffer, 2010). Column C is the output using Stata's official command (*-xtivreg-*). No difference in the coefficient estimates except for the absence of a constant in the *-xtivreg2-*. The *-xtivreg2-* command has the advantage of the outright presentation of the various post-estimation checks, [c] Cluster-robust standard errors: robust to heteroscedasticity and correlation of errors within the indicated panel identification (id) clusters and serial correlation, [d] The *-xtivreg2-* user command presents the test result outright, i.e., without the *-xtoverid-* command, [e] Hansen J statistics; Ho: the instruments are valid (i.e., uncorrelated with the error term), [f] Ho: The matrix of reduced form coefficients has rank = K1-1 (underidentified), [g] Ho: The equation is weakly identified, [h] Ho: The specified endogenous regressors are exogenous (using endog option in *-xtivreg2-* command). *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Source: authors' computation.

5.5. Effect of Rurality on Rural Development

This section presents the test result of the hypothesis that rurality (RUR) has a statistically significant effect on RD. It was found that a 1-unit decrease in RUR results in a statistically significant increase of 0.27 units in RD ($p < 0.05$), holding all other variables constant (Table 6). The result confirmed the inverse relationship exhibited between RD and RUR in Section 5.2. The result agrees with findings from Europe (Castillo et al., 2023) and China (Li et al., 2015) where areas with higher rurality—such as remote rural areas—experience lower levels of economic development. By viewing RUR as a multidimensional, place-specific factor affecting development, this study agrees with Goltzsche (2022) and Chigbu (2013). Although these studies approached the issue differently, they highlight the need to recognize rurality (or rural typology) in development discussions. The evidence from China further confirms the link between rurality and RD (Li et al., 2015). Additionally, the findings go along with studies by Kruseman et al. (2006) in Northern Ethiopia and Hausmann et al. (2021) in Mexico.

Distinguishing the differences and similarities with the earlier studies helps understand place-specific factors. Kruseman et al. (2006) identified traditional factors like market access, agricultural potential, and population density to affect production systems and development in Northern Ethiopia. They emphasize that realizing traditional place-specific factors is important in understanding heterogeneity and policy targeting. However, applying several traditional indicators may confine policy targeting. The present study, instead, presents an innovative approach by integrating the various individual place-specific indicators into a single index which agrees with the findings by Hausmann et al. (2021). The latter is a recent study by Hausmann et al. (2021) in Chiapas, Mexico's poorest region. It underscores the importance of multidimensional, place-specific features in development. Their findings show that the *Economic Complexity Index*[14], the multidimensional place-specific factor they examined, significantly affected wage and employment growth at the municipal level. The inclusion into the model of this variable increased the explanatory power of the model by far greater than that of individual factors like education and traditional place-specific factors such as road infrastructure and credit markets.

The use of such multidimensional factors is more manageable than trying to address the many individual place-specific factors. Their effects are notably stronger in rural areas as these economies rely heavily on natural resources and climate (Goltzsche, 2022). Places are specific geographic locations. The finding on RUR would imply the effect of geography. Geography shapes economic development through factors like agricultural productivity, resource availability, and climate (Boldeanu & Constantinescu, 2015). However, this study

goes beyond traditional understanding to provide compelling evidence that a single, multifaceted characteristic—such as rurality—holds significant explanatory power. This reveals the deep connections between spatial entities, human dynamics, and institutions. Rurality entails more than a simple geographic entity. Beyond this, it is marked by unique material and social capital shaped through interactions between people and a place forming dynamic, place-specific features. Such understanding compels acknowledging rural areas as vibrant centres of economic activity and social advancement in a way that enhances both rural development and in situ urbanization.

5.6. Effect of Entrepreneurial Ecosystem on Rural Development

This section presents the test results of the hypothesis that the entrepreneurial ecosystem (EE) has a statistically significant effect on RD. It is important to note that the EE analysis is limited by the availability of data for local-level indicators for certain enterprise variables. For instance, information is usually unavailable on high-tech firms that help gain deeper insights into EE. Data inadequacy in measuring and analyzing entrepreneurial ecosystems is not uncommon (see Li et al., 2023; Spigel et al., 2020). While national-level information better exists, data for local and regional analyses are often inadequate (Stam, 2017). The issue is particularly evident in Sub-Saharan African countries like Ethiopia where most firms face technological constraints (Cirera et al., 2023). The study, however, effectively utilized data from extra-local sources on large-scale enterprises. Approaching such local data limitations is also not uncommon (see Mainlevel Consulting, 2024). This is because entrepreneurial ecosystems are usually formed with the interaction between local and extra-local stakeholders' actions where there are chances for large and high-tech firms to interact (Li et al., 2023). Thus, this study carefully constructed proxy indicators for such missing variables (see Table S2). Accordingly, the results presented in Figure 3 and Table 6 show a direct correlation between RD and EE, and Figure 4 illustrates regional inequalities in EE. A unit increase in EE was associated with a statistically significant 0.46-unit increase in the RD ($p < 0.01$), holding all other variables constant. Entrepreneurship is often seen as an individual endeavour, but it is deeply affected by the surrounding spatial context. The connections between entrepreneurs, enterprises, and stakeholders—including the market and enabling environment—are crucial (Korsgaard & Tanvig, 2015). A rural area is beyond a physical location shaped by dynamic socio-cultural interactions between people and place. This understanding acknowledges the view of "rural" as an essential "spatial dimension" in the development process in general and entrepreneurship in particular. Entrepreneurship is a key driver of innovation and economic growth. Deeper than ever, RD has a strong and strategic association with entrepreneurship (Kulkarni & Narkhede, 2016). With the current socioeconomic landscape featuring high rural fertility and significant rural-to-urban migration in the country, urban areas face high unemployment rates, largely due to this migration and limited farmland in rural regions (OECD/PSI, 2020). The uneven entrepreneurial levels across the country (see Figure 4) exacerbate these challenges. In such cases, a place-based vibrant EE has tremendous potential for job creation (Kulkarni & Narkhede, 2016), poverty alleviation (Naminse et al., 2019), and transformative solutions for employment and resource management (Priya & Mohanasundari, 2024).

5.7. Post-Estimation Checks

5.7.1. Weak Instruments and Overidentification Tests

Two instruments for each endogenous regressor were examined to ensure robust findings. Percentages of land covered by bush and forest in a community are pivotal for assessing rurality (RUR). Additionally, annual licencing fees paid by non-farm enterprises, which serve as a proxy for the regulatory framework, and the distance to the nearest major

urban centre inform the entrepreneurial ecosystem (EE). Rurality can be defined by primary economic activities like farming and forestry (FAO, 2018), making land cover an essential feature. The proportions of bush and forest land coverages not only characterize the rural areas but are strongly correlated with rurality. Likewise, the development of rural regions is influenced further by local institutional factors (WBG, 2016) and extra-local factors such as nearby urban agglomerations (Cattaneo et al., 2022) or distance from the nearest urban centres (Lavesson, 2018). Non-farm licencing fees and distance to urban centres promote the entrepreneurial ecosystem by impacting business start-up opportunities (WBG, 2016). The first-stage regression output (2SLS) confirms the relevance of these instruments, showing a significant statistical relationship with their respective endogenous regressors ($p < 0.0000$), as presented in Table 6[15].

5.7.2. Robustness Check

In validating the estimates, the endogeneity test requires more than statistical checks for robustness (Clarke & Matta, 2018). The examinations across various scenarios showed consistent and robust coefficient estimates, supporting their reliability. First, they were checked using a different sample, removing the pastoral representatives. The pastoral system, covering 61% of the country's territory, reflects distinct livelihoods and cultures (Gebeye, 2016). From pastoral samples (regions and zones), 127 Enumeration Areas (EAs) were excluded, focusing solely on the highland sample. The results showed consistent estimates for the key coefficients (see Table S7). Also, the control variables were examined in various ways to assess their effect on RD. By excluding all control variables, and reintroducing them one at a time—an approach supported in the literature (see Kafka, 2024)—the key coefficients remained consistent in sign and magnitude (see Table 6, column A). More importantly, the plausible exogeneity test was assessed based on Conley et al. (2012) to challenge the exclusion restriction of the instrumental variable assumption. Such a procedure is not uncommon practice (Nguyen-Phung & Le, 2024; Zheng et al., 2023). The results indicate that when instruments are not strictly exogenous, the socio-spatial determinants still significantly affect RD (Figure 5).

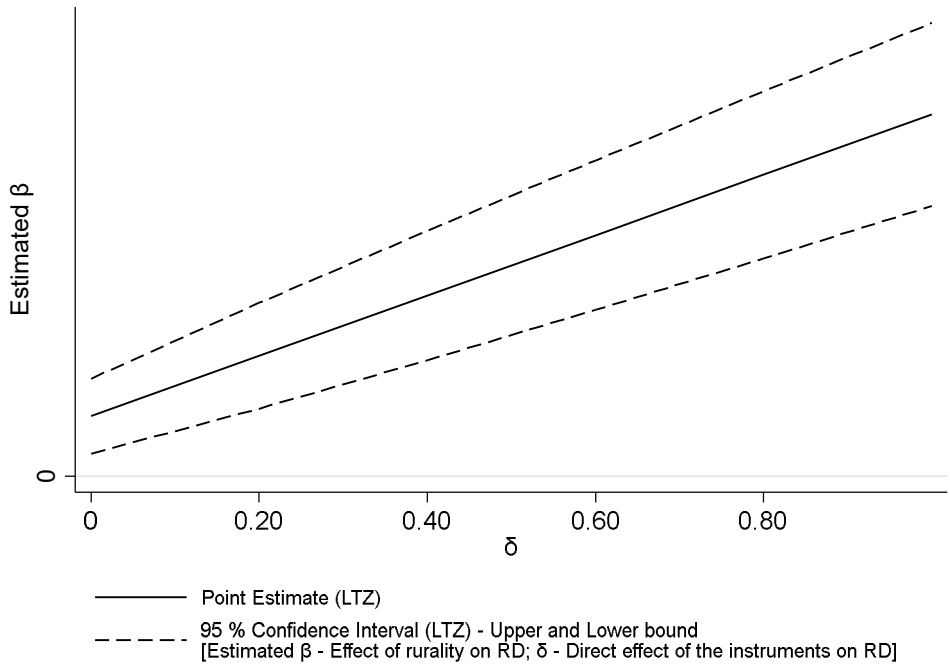

Figure 5. The 95% confidence intervals for the effect of rurality on rural development using the local-to-zero (LTZ) method of the plausible exogeneity assumption. Source: authors' representation.

6. Conclusions and Implications

This study aims to understand the complex socio-spatial nature of RD and its relationship with key multidimensional, place-specific determinants, namely rurality and the entrepreneurial ecosystem. Using a place-based framework, it structured the socio-spatial factors of rural localities to underscore the explanatory power of socio-spatial determinants. It applied instrumental variables estimation to deal with the endogeneity problem associated with these place-specific determinants. The estimation results using the fixed effects model with instrumental variables showed statistically significant effects of both rurality (negative) and the entrepreneurial ecosystem (positive) on RD. Rurality is a distinct socioeconomic characteristic of a place. The present finding depicts that rural areas are beyond first-nature geography and they have unequal development levels. Thus, their embedded unique features are composed of several local factors such as geography, institutions, and governance, which interact primarily with local and extra-local features, to shape their unique development, and in turn, drive each in a different development trajectory. Likewise, a unique entrepreneurial ecosystem emerges within the rural context. While entrepreneurial activity entails individual or group efforts, it is shaped by the rural context that leads to a unique entrepreneurial ecosystem in a rural locality or region. This ecosystem nurtures enterprise opportunities and addresses rural needs in a way that significantly impacts RD.

This study also found a statistically significant effect of farm capital and technology on RD. This implies the important role agricultural development plays in successful RD. However, the study goes beyond sectoral outlook to socio-spatial concerns. It underpins a considerable significance of the inherent and blended formation of natural and human factors in a rural place. The finding thus emphasizes the fundamental influence of the second-nature geography (human and institutional effect) on the first nature, supporting a need to address the multidimensional place-specific factors as a unique explanatory power. Ethiopia is a predominantly rural and heterogeneous country facing pressing challenges such as regional inequalities. Yet, it has implemented a policy biased towards homogeneity and urban way, i.e., designing RD in a way that promotes an "urbanely" approach. This urban dominance risks high rural-to-urban migration that outpaces job creation in urban centres, resulting in urbanization without growth. Thus, with these socio-spatially interwoven rural challenges, the findings in this study boil down to adopting a place-based rural approach to development (PBRD) that necessitates targeting a place, and the unique place features thereof. It also helps further leverage extra-local gains to improve the welfare of the people. A PBRD promotes an approach that acknowledges the rural lifestyle, maximizing the benefit of a *sense of place*. This consequently enhances development, reducing the cost of migration and allowing a simultaneous nurturing of farm and non-farm activities. Such an approach aligns with the Sustainable Development Goals, which promote RD without subsuming it within urban development, leading to inclusive and sustainable growth. Neglecting place-specific factors in policymaking could thus lead to failure in sustainable development.

In line with the PBRD, this study contributes to the theory and practices of RD in two essential ways. First, it provides a vivid depiction of the complex socio-spatial context of areas for policy targeting and implementation. The multidimensional features presented are context-applicable so that RD policymakers and practitioners working in governmental and non-governmental sectors can catch hold of and courageously utilize them in designing and implementing a targeted PBRD. Second, the analytical framework enables the effective identification and measurement of multidimensional place-specific features in a complex socio-spatial interplay. This greatly helps the growing conceptualization of a place-based approach in refining the role of place in local and regional development. Adopting a

PBRD and integrating it into the broader national and sub-national strategies thus will help address the unique rural challenges and enhance policy effectiveness in Ethiopia and beyond. The study is constrained by obtaining local-level indicators of some variables, particularly for enterprise analysis such as data on high-tech firms. The latter is the nature of the firms in the country, where the technology is limited. However, the study included data from the extra-local levels on large-scale enterprises by constructing possible proxies, thus enabling analysis of the complex support services and business interactions.

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/economies13030061/s1. Table S1. Domains and indicators employed in the index construction of rurality; Table S2. Domains and indicators employed in constructing the EE index (entrepreneurial ecosystem); Table S3. Initial component extraction of rurality; Table S4. Component loadings for rurality; Table S5. Initial component extraction of the entrepreneurial ecosystem; Table S6. Component loadings for the entrepreneurial ecosystem; Table S7. Sample size and the estimation output for an alternative sample.

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Notes

1 Egypt, Ethiopia, Ghana, Kenya, Mali, Mozambique, Nigeria, Tanzania, Uganda and Zambia.
2 TLU: tropical livestock unit.
3 Allows us to keep those components with eigenvalues greater than unity (>1).
4 Tables S1–S7 are Supplementary Materials.
5 H0: No heterogeneity: all Ui = 0.
6 H0: The random effects model is preferred; H1: the fixed effects model is preferred.
7 Ho: The specified endogenous regressors are exogenous.
8 The panel data used in this study are unbalanced.
9 ESPS (Ethiopian Socio-Economic Panel Survey, 2018/19 and 2021/2022) is the main data used in the present study.
10 Each measured on a continuous scale of a minimum of 0 and maximum of 1.
11 Due to prevailing conflict in the country, data for the Tigray region were unavailable in the latest follow-up survey. Also, the recently formed four regions were considered together with their former parent region (SNNP) per the study data.
12 The final model specification (column D, Table 6) excludes a time dummy (year-fixed effects) due to the limited nature of the panel data, which cover only two periods, and the use of several local, regional, and global variables. The numerous local and extra-local variables resulted in collinearity with the time dummy, making the core variables difficult to identify. However, incorporating global and regional indicators offered more advantages. As the time dummy assumes uniform effects across heterogeneous rural communities, it is less suited for the micro-level analysis. Internal conflicts in Ethiopia, especially since 3 November 2020, have intensified, particularly in the Tigray region, which is excluded from the survey data. The Amhara region is also experiencing active conflict but remained largely stable during data collection, aside from a brief incident. Figure 3 also clearly shows that the dependent variable (RD) has consistently increased since 2016 and remained stable during the survey period (2018/19–2021/22). Statistical tests for year dummies, using the -testparm- command, indicate their joint insignificance ($p > 0.5$) in the model, further supporting the decisions made in our specification.

[13] vce(cluster panel_id) and cluster(panel_id) options with Stata's official *xtiverg* and user's *xtivreg2* command, respectively.
[14] Economic Complexity Index: used as a proxy for the unique productive capacity of a place (Hausmann et al., 2021).
[15] See Table 6 for the underidentification test (Kleibergen–Paap rk LM statistic), weak identification test (Kleibergen–Paap rk Wald F statistic) and Hansen J statistic (overidentification test of all instruments).

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