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Determinants of Rural-Urban linkage in Oromia, Ethiopia: The case of Sebeta and its periphery

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Abstract

Urban development without rural development is unsustainable. Focusing solely on either rural or urban areas fails to create equal opportunities for both. The most effective approach is to prioritise a balanced and mutually beneficial development strategy that integrates the economies of both urban and rural areas. To achieve this, it is essential to understand the determinants of rural-urban linkages. The objective of this study is to analyse the factors that determine rural-urban linkages in Oromia, Ethiopia, specifically Sebeta Sub-city and its periphery. Data for the study were collected through survey questionnaires, key informant interviews, and focus group discussions. The sample comprised 368 households from both rural and urban areas, selected using a combination of random and purposive sampling methods. An ordinal logistic regression model was employed to analyse the data. The results revealed that education, annual income, land holding, and job availability have significant positive effects on rural-urban linkages. Conversely, distance and age of the household were found to have significant negative effects on these linkages. To strengthen Rural-Urban linkage in the study area, efforts focus on improving access to education, creating job opportunities, increasing household income, and supporting land productivity. Additionally, infrastructure development should aim to reduce travel distance, and inclusive programs should consider the needs of older households to enhance their participation.

Keywords: Determinants, Rural-urban linkages, Ordinal logistic

1. Introduction

There is no single universal definition of rural-urban linkage, but it generally refers to the interconnectedness and interdependence between rural and urban areas. These linkages involve the movement of people, information, capital, and goods and services between rural and urban areas [1], [2], [3].

Tacoli (1998) proposed a categorization of urban-rural linkages, dividing them into two main types: spatial and sectoral linkages. Spatial linkages involve the movement of resources such as products, people, money, and information between urban and rural areas. For instance, the flow of marketed grain can serve as an indicator of the connection between rural and urban regions. Sectoral linkages, on the other hand, are based on the presence of non-farm activities in rural areas and farm activities in urban areas [4]. Traditionally, rural areas were seen as focused on agriculture, while urban areas concentrated on manufacturing and services.

However, studies have shown that urban households are increasingly involved in agriculture, while rural households are diversifying their income through non-agricultural activities [1].

Building on this framework, [4] expanded the concept of rural-urban linkages to include several key flows: people, information, capital, and goods and services. Flows of people refer to migration and commuting, typically from rural to urban areas. This movement is often driven by the need for improved income and a better quality of life, particularly in developing countries where migration serves as an adaptive strategy for impoverished rural households. Flows of information involve the exchange of various types of information between rural and urban areas, such as market prices, employment opportunities, and resource data. Advances in internet connectivity and mobile phone coverage play a crucial role in facilitating these information exchanges. Flows of capital include remittances sent by migrants to their families, investments made by urban-based entities in rural areas, and credit provided by urban financial institutions. Finally, flows of goods and services refer to the trade and exchange of commodities between rural and urban areas, which underscores the economic interdependence and market relationships that link these regions. Collectively, these flows highlight the complex and dynamic connections between rural and urban areas, contributing to a deeper understanding of their interdependent relationship. To gain a deeper understanding of rural-urban linkages, let's start by examining the foundational theories that shape our theoretical understanding of resource flows between urban and rural areas.

These Several theories (Alfred Weber's Industrial Location Theories, Walter Christaller's Central Place Theory, Friedman’s Core-Periphery Theory, and Krugman’s New Economic Geography) provide insights into the linkage between rural and urban areas.
Alfred Weber's Industrial Location Theories (1909) highlight how urban demand influences the distribution of economic activities, factoring in production costs and potential profits. Walter Christaller's Central Place Theory (1933) explains the organisation of economic activities in towns, cities, and villages, emphasising the role of cities in providing both low-order services (e.g., food) and high-order services (e.g., healthcare) to surrounding rural areas.

Friedman’s Core-Periphery Theory (1966) addresses the imbalance of power and resources between core urban areas and peripheral rural areas. It suggests that core areas offer high-order services, leading to development disparities. Krugman’s New Economic Geography (1990) highlighted that interconnected industry clusters, reliable infrastructure, market accessibility, and high production returns contribute to the development of core-periphery economies. While all these models address rural-urban linkages, the Core-Periphery Linkage model provides a comprehensive framework to explain economic and social relationships, making it a key guide in understanding the factors that determine rural-urban linkages.

In the late 1950s, a new way of thinking about regional planning emerged. It focused on core and spatial polarisation models, which noticed that in developing countries, economic growth was mainly happening in a few big cities. Unfortunately, this came at the expense of rural areas. The models believed that the benefits gained by cities were causing rural areas to be neglected. Rural regions did not receive enough attention for things like building roads, providing essential services, and creating investment opportunities. This made it difficult for rural areas to succeed economically [5]. However, later, the concept of rural-urban linkage gained renewed attention, emphasising the close connection and mutual influence between rural and urban areas on each other's economy, society, and environment [3].

This shift in thinking led to a focus on developing both urban and rural areas together instead of keeping them separate. The goal was to promote collaboration and recognise the benefits of working together. Over time, the idea of rural-urban linkage has grown in importance and is now emphasized in the 2030 Agenda for Sustainable Development and the new Urban Agenda. To effectively reduce poverty in developing nations, strengthening rural-urban

connections is the best option [6]. Unfortunately, these connections are often overlooked in national economic and trade policies, particularly in African countries, including Ethiopia.
Indeed, while many studies examine the nature, role, and effects of rural-urban linkages, there are limited investigations into the factors that determine these linkages [7].
Rural-urban linkages in Ethiopia are hindered by several interrelated factors, including inadequate promotion of rural and urban development, limited trade connections, lack of tenancy security, disruptions to the national economy, and insufficient infrastructure [8].
These challenges are further compounded by limited market access, resulting in inadequate transportation options, high transaction costs, and a lack of market information, all of which make it difficult for rural producers to access urban markets and obtain fair prices for their products [9].

Moreover, environmental factors such as climate change, resource availability, and ecological conditions also impact rural-urban linkages [10]. For example, environmental degradation or resource scarcity in rural areas may drive migration to urban areas in search of alternative livelihood opportunities [11]. Land tenure systems and property rights play a crucial role in this dynamic, as secure access to land can influence migration patterns, investment decisions, and livelihood choices for rural households [11]. Also, government policies and governance structures are instrumental in shaping these linkages; effective infrastructure development, targeted investment in rural areas, and inclusive urban planning can create significant opportunities for both rural and urban populations.

Although scholars have highlighted challenges related to rural-urban linkages, they have not fully addressed key variables such as demographic, economic, and social determinants that influence these connections. Moreover, many studies lack a detailed exploration of how these factors interact dynamically over time. Furthermore, there is limited research specifically examining the factors that determine rural-urban linkage in Ethiopia [7], particularly in Sheger City, and more specifically in Sebeta Sub-City and its surrounding rural areas.
Therefore, this study focuses on the factors determining rural-urban linkages, with specific emphasis on Sebeta Sub-City and its neighbouring rural areas.

2. Study Area

Sheger City, located in central Ethiopia within the Oromia National Regional State, surrounds Addis Ababa, the capital city of Ethiopia. Established on 22 October 2022, the city is made up of 12 sub-cities: Sululta, Eka Tafo, Kura Jida, Koye, Gelan, Gelan Guda, Furi, Sebeta, Gefersa Guje, Melka Nono, Burayu, and Mana Abichu. The city's topography, shaped by geological processes from the Cenozoic Era, includes plateaus, mountains, and river gorges. Elevations within Sheger City range from 1,973 meters to 3,385 meters above sea level. Due to its rugged terrain and significant altitude variations, the region experiences a range of microclimates. More than 77% of Sheger City lies at elevations above 2,000 Metres (Oromia Spatial Planning Team, 2022).

According to data obtained from the municipality of Sebeta sub-city, formerly known as Sebeta Town, which emerged before the Italian invasion in 1935 and obtained municipal status in 1954.
However, records from the Sebeta sub-city municipality indicate that the town was officially granted its status in 2005, even though it was previously under the administration of Sebeta Awas district in the Southwest Showa Zone. Ato Teshome Wakenne, an elder from the local community, was one of my informants who provided me with information about the origin of the town's name, Sebeta. Derived from the Afan Oromo language, the name Sebeta means a scarf-like textile primarily used by women for waist binding, with ribbons at both ends. According to the informant, the name Sebeta was first given to him by King Abba Jifar during his journey from Jimma to Addis Ababa. As he and his followers traveled, they named several towns along the way. When they arrived at Sebeta Town and noticed that the followers were

tired from the long journey, King Abba Jifar was taken to uplift their spirits and convey a message.
He encouraged them by saying, "*Sabbata keessaan jabbeeffadhaa*," which translates to "strengthen your backbone," referring to the traditional belt known as "*Sabbataa*." The local people embraced this name, and gradually the area became known as Sebeta, which continues to be the preferred common name for the formerly known Sebeta town.

Currently, Sebeta Sub-city is one of the sub-cities of Sheger City, located 25 km from Addis Ababa, Ethiopia, and 20 km from the Centre of Sheger City. It currently comprises three woredas: Mogle, Caffe, and Metta. The sub-city is bordered by Gefersa Guje to the north, Waliso to the northwest, Tefki to the southwest, and Gelan Guda to the east and southeast. Astronomically, Sebeta Sub-city is situated at approximately 8°53'38.50"N to 8°59'58.17"N latitude and 38°35'11.91"E to 38°39'33.75"E longitude, with an elevation of 2,369 metres above sea level.
According to data from the Sebeta Sub-city Municipal Administration Office (2024), the total population has reached 124,466, comprising 75,075 males and 49,391 females. The distribution by the three woredas is as follows: Mogle Woreda has a population of 21,264 males and 18,736 females, Metta Woreda consists of 17,530 males and 18,000 females, and Caffe Woreda contains 36,281 males and 12,655 females (Sebeta Sub-city Municipal Administration Office, 2024).

Agriculture is the predominant economic activity among the rural population in the surrounding woredas of Sebeta Sub-city. The farming system in these areas involves a Mixed agriculture combining both crop production and animal husbandry. Key crops cultivated include teff, wheat, and chickpeas, while animal rearing involves raising sheep, goats, cows, hens, and pigs. This diverse agricultural practice not only supports the local economy but also contributes to food security and community livelihoods.

Sebeta Sub-City is equipped with a diverse range of infrastructure components, including roads, transportation systems, utilities, and public facilities. These public amenities cater to various needs, offering schools, healthcare centres, markets, and recreational areas. Notably, Sebeta Sub-City is home to a central railway station located near Dima, which forms a vital part of a well-known route connecting Sheger and Dire Dawa. This railway serves as an important transportation link, facilitating the movement of people and goods between these significant cities. Sebeta Sub-City has gained recognition for its industrial development, hosting numerous manufacturing industries, including textile and garment factories, food processing plants, beverage production facilities, and units for various consumer goods. These industries contribute to the dynamic economic landscape of the area. Another noteworthy aspect of Sebeta Sub-City is its abundant mineral water resources. The town is home to several mineral water companies that extract and bottle natural mineral water from underground sources.

In addition to its infrastructure and industrial activities, Sebeta has an attractive natural landscape. One of its prominent attractions is Mogle Mountain, located in Mogle Woreda in the western part of the town. Mogle Mountain offers breathtaking views to both residents and visitors and is beautifully surrounded by the renowned Suba Forest. The combination of Mogle Mountain and Suba Forest has fostered a long and significant history for Sebeta. The breathtaking views, along with the mountain's historical significance, make it an important landmark in Sebeta Sub-City, earning admiration and appreciation from all who experience it.

3. Materials and Methods

Probability sampling methods involve randomly selecting participants from a defined population, guaranteeing that every individual has a known and equal chance of being included in the sample. This random selection reduces bias and improves the sample's accuracy, allowing for valid generalisations to be made about the broader population (Kothari, 2004). Sebeta Sub-City consists of three woredas: Mogle, Metta, and Caffe. Following recent administrative changes, the former kebeles within these woredas have been renamed to Goxii, a term in Amharic now used to refer to the administrative units.

For this study, the researcher chose one woreda for urban representation and two woredas consisting of four rural Goxii for rural household representation. Mogle Woreda was specifically chosen because it serves as the centre of Sebeta Sub-City and hosts a large market that caters to both rural and urban communities.

To ensure representation from rural areas, the researcher selected Goxii that are both closest to and furthest from the sub-city. Therefore, four rural Goxii will be chosen from two purposively selected woredas: Mogle and Metta, as both contain rural Goxii within their boundaries.

Determining the sample size is a crucial aspect of research, as it involves estimating the number of participants needed to achieve statistically significant results. In this study, the researcher used [12], a sample size determination method for several reasons.
Firstly, Yamane's formula is favoured for its simplicity, as it involves straightforward mathematical calculations, making it easy to understand and apply. Researchers can quickly determine the required sample size using this method. Secondly, Yamane's formula is particularly suitable when the population size is known or can be reasonably estimated. Additionally, considering cost and time is crucial in research, especially when resources are limited. Yamane's method is advantageous in these situations due to its efficiency and ease of use. Based on data obtained from the Sebeta Sub-City Municipality Administration, the total number of households in the selected area was 4,620. Using the total population from the selected woredas and Goxii, the sample size was calculated

as follows:

$$\frac{N}{1+N(e)^2} = \frac{4620}{1+4620(0.05)^2} = 368$$

Where:
n = Sample size to be studied
N = Population size (the total number of households in the four rural Goxii and one urban Woreda)
e = Margin of error or confidence interval (5%)
To ensure equal representation, samples were taken from all Goxi. Table 1 summarises the distribution of sample household heads across each Woreda and Goxii.

Table 1 easily shows how the sample sizes are distributed across different Woredas and *Goxi,* covering proportional representation of all areas. It also emphasises the donation of each Woreda and Goxii to the overall sample.
By presenting the data in this manner, it guarantees that each region is duly represented in the study, leading to a more thorough and accurate understanding of the population. Also, the table illustrates the size of each sample relative to the total number of homes in the Woredas and *Goxi.*

Table 1 Distribution of sample households. Source Authors' computations based on field Data,2024

Sample from Urban	Woreda	Total Household	Sample size	Percentage
Mogle Woreda	Mogle	2310	184	50
Sample from Rural	Wored	Total Household	Sample	Percentage
Tullu Mogle Goxii	Mogle	655	52	14

Malka Shure Goxii	Mogle	580	46	13
Haro Jila Goxii	Metta	488	39	11
Manyo Goxii	Metta	587	47	13
Total		4620	368	100

The researcher considers rural-urban linkage (RUL) as the dependent variable, measured through the flows of people, information, capital, goods, and services between urban and rural areas. After collecting data on each attribute using Likert scale questions ranging from "Strongly Disagree" to "Strongly Agree," the researcher applied the row minimum method using STATA software to generate a single dependent variable, denoted as row minimum (rmin).

The independent variables include gender, age, education level, annual income, landholding (in hectares), distance from urban or rural areas, market accessibility, availability of job opportunities, and rural-urban migration. Based on the nature of dependent variables, the researcher has opted to use an ordinal regression model, which is widely Utilised when the dependent variable has an ordered nature [13], [14] and [15].

Ordinal regression can be conceptualised as a series of successive binomial logistic regressions. When the dependent variable has k categories, it is divided into (k−1) cumulative binomial (dichotomous) variables. The first binomial variable distinguishes cases in the first category of the dependent variable (1) from all other categories (2, 3, ..., k). The second binomial variable separates cases in the first two categories (1, 2) from the remaining ones (3, 4, ..., k). Similarly, the last binomial variable (k-1) separates cases in the first k-1 categories (1, 2, 3, ..., k-1) from the final category (k).
Consequently, the jth binomial variable separates cases in the first j categories of the dependent variable (1, 2, 3, ..., j) from the remaining categories (j+1, j+2, j+3, ..., k). Applying this concept to the measurement of the dependent variable, which assesses the level of agreement on rural-urban linkages using a five-point Likert scale (strongly disagree, disagree, neutral, agree, strongly agree), the algorithm will generate four dichotomous variables based on the following criteria: The first variable separates 'strongly disagree' (1) from the other categories (2, 3, 4, and 5). The second variable distinguishes 'strongly disagree' and 'disagree' (1, 2) from the remaining categories (3, 4, and 5). The third variable separates 'strongly disagree,' 'disagree,' and 'neutral' (1, 2, 3) from the remaining categories (4 and 5). The fourth variable differentiates 'strongly disagree,' 'disagree,' 'neutral,' and 'agree' (1, 2, 3, 4) from the remaining category (5). Therefore, for each binomial variable j, the binomial regression model can be represented as follows:

$$\ln\left(\frac{p_j}{1-p_j}\right) = \beta_0 + \beta_1 x_{1j} + \beta_2 x_{2j} + \beta_3 x_{3j} + \ldots + \beta_k x_{xk} \qquad \text{Eq. 1}$$

Where: p_j represents the probability of success for variable j, and the β coefficients denote the regression coefficients. Consequently, a set of (k−1) equations will be derived, following the pattern described above.
In the ordinal regression model for rural-urban linkage, the dependent variable is represented by $\ln\left(\frac{p_j}{1-p_j}\right)$, and the independent variables include gender (gen), age, education level (educ), annual income (inc), landholding (lnd), distance from urban or rural areas (dist), market accessibility (mkt), availability of job opportunities (job), and rural-urban migration (mig). Based on this information, the ordinal regression model can be expressed as follows:

$$\ln(\frac{p_j}{1-p_j}) = \beta_0 + \beta_1 gen_j + \beta_2 age_j + \beta_3 educ_j + \beta_4 inc_j + \beta_5 \ln d_j + \beta_6 dist + \beta_7 mkt_j + \beta_8 job_j + \beta_9 mig_j + e_j \qquad \text{Eq.2}$$

Where,

P_j, Represents the probability of falling into or below category j of the rural-urban linkage variable.

$\beta_0 ... \beta_9$, are the regression coefficients associated with interception, gender, age, education level, annual income, landholding (in hectares), distance from urban or rural areas, market accessibility, availability of job opportunities, and rural-urban migration, respectively, for the j-th category of the dependent variable.

e_j, Represents the error term, capturing the unexplained variation in the dependent variable for the j-th category.

4. Results

Table 2 reports the descriptive statistics for continuous variables. As shown in Table 2, the average age of the respondents is 38.29 years, with a range from 19 to 67 years, indicating that the population primarily comprises adults, including both younger and older individuals. The average education level is 9.33 years, suggesting that most respondents have at least an elementary education, with a range from 0 to 16 years, reflecting a diverse range of educational backgrounds.

Additionally, the average household income is 78,475.54 ETB per year, with a range from 5,000 ETB to 100,000 ETB. Lastly, the average landholding per household is 0.7 hectares, with a range from landless to 2 hectares.

Table 2 Descriptive statistics for continuous variables. Source Computed from field data,2024

Variable	Obs	Mean	Std. Dev.	Min	Max
age	368	38.29	8.03	19.00	67.00
educ	368	9.33	3.84	0.00	16.00
lninc	368	78475.54	21850.61	5000.00	100000.00
lnd	368	0.69	0.84	0.00	2.00

In Table 3, the importance of chi-squared analysis for examining categorical variables is highlighted. This statistical test is essential for assessing whether there is a statistically significant association or relationship between variables. It is particularly useful for analysing the distribution of categorical data across different groups or categories. By comparing observed and expected frequencies, the chi-squared test helps determine if the differences are significant, thereby testing the assumption of no association between the variables [16].

As shown in Table 3, the chi-squared value of 2.8982 and the p-value of 0.575 indicate no statistically significant association between rural-urban linkage and gender of the household head. This suggests that perceptions of being male or female do not meaningfully influence attitudes toward rural-urban linkage. The chi-squared value of 40.3287 and a p-value of 0.000 reveal a statistically significant association between rural-urban linkage and distance from urban or rural centres.

This finding suggests that individuals' perceptions of distance significantly influence their views on rural-urban connections. Further, the chi-squared value of 4.1106 and a p-value of 0.391 indicate no statistically significant association between rural-urban linkage and market accessibility. This implies that perceptions of market accessibility do not meaningfully alter attitudes toward rural-urban linkage, highlighting a disconnect in how market access impacts these views. Moreover, the chi-squared value of 63.7820 and a p-value of 0.000 demonstrate a strong statistically significant association between rural-urban linkage and perceptions of job availability. This indicates that responses are heavily influenced by individuals' views on job opportunities in urban areas, underscoring the crucial role of employment in enhancing rural-urban connections.

Lastly, the chi-squared value of 15.2304 and a p-value of 0.004 show a statistically significant association between rural-urban linkage and rural-urban migration perceptions. This suggests that individuals' views on rural-urban dynamics significantly shape their perspectives on migration, emphasising the interconnectedness of these concepts.

Table 3 Chi-squared analysis of categorical variables. Source computed from field data, 2024

			Rmin		
gen	Strongly disagree	Dis-Agree	Neutral	Agree	Strongly Agree
Male	0.00	32.10	34.57	33.33	0.00
Female	1.74	27.87	32.75	36.59	1.05
Total	1.36	28.80	33.15	35.87	0.82
			Pearson chi2(4) =2.8982		Pr = 0.575
dist	Strongly disagree	Dis-Agree	Neutral	Agree	Strongly Agree
Yes	0.75	11.28	33.83	52.63	1.50
No	1.70	38.72	32.77	26.38	0.43
Total	1.36	28.80	33.15	35.87	0.82
			Pearson chi2(4) =40.3287		Pr = 0.000
mkt	Strongly disagree	Dis-Agree	Neutral	Agree	Strongly Agree
Yes	2.60	25.97	35.06	35.71	0.65
No	0.47	30.84	31.78	35.98	0.93
Total	1.36	28.80	33.15	35.87	0.82
			Pearson chi2(4) =4.1106		Pr = 0.391
job	Strongly disagree	Dis-Agree	Neutral	Agree	Strongly Agree
Yes	1.31	42.36	31.88	24.02	0.44
No	1.44	6.47	35.25	55.40	1.44
Total	1.36	28.80	33.15	35.87	0.82
			Pearson chi2(4) =63.7820		Pr = 0.000
mig	Strongly disagree	Dis-Agree	Neutral	Agree	Strongly Agree
Yes	1.31	35.81	29.69	32.75	0.44
No	1.44	17.27	38.85	41.01	1.44
Total	1.36	28.80	33.15	35.87	0.82
			Pearson chi2(4) =15.2304		Pr = 0.004

Before analyzing the econometric results and reporting, the researcher attempted to verify the model evaluation statistics, model diagnostics, and assumptions of the ordinary least squares regression model [13], [17]. Verifying these assumptions and conducting model diagnostics ensures that the econometric model is both robust and valid.
The researcher checked the reliability test for the dependent Likert scale, model fitting information, goodness of fit, Pseudo-R-squared, and assumptions of the ordinal logistic regression model.

As mentioned in Section 3, the dependent variable is ordered in nature. Because of this, ordinal regression was selected, as it is commonly used when the dependent variable has an ordered structure [13] and [15]. Therefore, an ordinal logistic regression model was used to analyse the dependent variable, which was measured using a five-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." Before running the ordinal regression model, the researcher tested all the basic assumptions of ordinal logistic regression. The results of the regression analysis revealed that, of the nine explanatory variables considered, six were statistically significant.

5. Discussion

Table 4 presents a log likelihood of the fitted model at -372.33221, accompanied by a Likelihood Ratio Chi-Square test statistic of χ^2 (9) = 131.11 and a p-value of 0.0000, indicating that our model is statistically significant compared to the null model and allowing us to reject the null hypothesis. The table further details the coefficients, standard errors, z-values, p-values, and the 95% confidence intervals for each coefficient, revealing that the variables age, education (educ), income (lninc), landholding (lnd), distance (dist), and job availability (job) are all statistically significant at the 5% level.

Specifically, for age, each additional year results in a decrease of 0.038 in the log-odds of being in a higher rural-urban linkage (rmin) category, holding all other variables constant. This effect is statistically significant (z = -2.68, p = 0.007). In simpler terms, each additional year of age slightly reduces the likelihood of having strong rural-urban connections.
This result suggests that older individuals may be less likely to engage with or benefit from these connections compared to younger individuals. This finding is consistent with the researcher [18], who stated that physical constraints, such as age or infirmity, can limit individuals' mobility, particularly between rural and urban areas. This implies that younger individuals are generally more mobile than older individuals.

Regarding education, an increase of one year correlates with a 0.0785 unit increase in the log-odds of being in a higher rmin category, assuming that other variables remain constant. This finding is also statistically significant (z = 2.71, p = 0.007) and indicates that more education is linked to stronger rural-urban connections.
This aligns with [19], who discovered that more educated individuals have better access to urban resources and job opportunities, which enhances their quality of life. In contrast, less educated individuals tend to remain in rural areas, leading to weaker connections to urban opportunities. Additionally, as education increases, so do opportunities for migration, employment, and access to urban resources, facilitating a flow of knowledge and skills between rural and urban areas [20].

Moreover, a one-unit increase in income leads to a 0.5559 unit increase in the log-odds of being in a higher rural-urban linkage (rmin) category, holding other factors constant; this result is statistically significant (z = 1.99, p = 0.047). In simpler terms, this finding indicates that higher income is positively associated with a greater probability of stronger rural-urban linkages.

This result is consistent with the study by [6], which found that strengthening rural-urban linkages can significantly enhance economic opportunities, leading to increased income and employment in both rural and urban areas. Similarly, each additional hectare of land corresponds to a 0.6873 unit increase in the log-odds of being in a higher rural-urban linkage (rmin) category, with all other variables controlled, indicating a highly significant finding (z = 5.08, p = 0.000). This result highlights that greater land ownership is associated with stronger rural-urban linkages. Increased land availability enables higher agricultural output, fostering economic stability and greater integration between rural and urban areas. This finding is consistent with [21], who state that 'Addressing land issues can strengthen rural economies, reduce out-migration to cities, and enhance rural-urban connections.

Moreover, for the distance variable, each unit increase in the distance from urban or rural areas results in a decrease of 0.6502 in the log-odds of being in a higher rural-urban linkage (rmin) category, assuming other variables remain constant. This finding is statistically significant (z = -2.82, p = 0.005). This suggests that as distance increases, the likelihood of exhibiting stronger rural-urban linkages significantly diminishes. This result is consistent with the study by [22], which found that people living closer to cities have stronger rural-urban

linkages, as proximity facilitates easier and more frequent exchanges in trade, job opportunities, knowledge, and cultural exchange.
Finally, a one-unit increase in job availability correlates with a 0.8219 unit increase in the log-odds of being in a higher rural-urban linkage (rmin) category, with other factors held constant; this estimate is statistically significant (z = 3.38, p = 0.001). In simpler terms, more job opportunities are linked to a higher likelihood of stronger rural-urban connections.
This study aligns with [23],examination of how job prospects in urban areas impact migration patterns from rural regions. Additionally, it echoes findings from [24] ,which discuss the role of rural-urban linkages in promoting growth, employment, and poverty reduction.

Table 4 also reports four cut points that differentiate the levels of the rural-urban linkage (rmin) variable: Cut 1 at 1.1689, Cut 2 at -5.0362, Cut 3 at 6.9130, and Cut 4 at 11.6067. These cut points classify responses as follows: values less than -5.0362 are categorised as "Strongly Disagree"; values between -5.0362 and 1.1689 are classified as "Disagree"; values between 1.1689 and 6.9130 are considered "Neutral"; values between 6.9130 and 11.6067 are labelled as "Agree"; and values greater than 11.6067 are classified as "Strongly Agree."

Table 4 Ordered logistic regression estimates**.** Source computed from field data,2024

				Number of obs	=	368
				LR chi2(9)	=	131.110
				Prob > chi2	=	0.000
Log likelihood = -372.332				Pseudo R2	=	0.1497
rmin	Coef.	Std. Err.	Z	P>|z|	[95% Conf.	Interval]
gen	0.316	0.243	1.300	0.193	-0.160	0.793
age	-0.038	0.014	-2.680	0.007	-0.066	-0.010
educ	0.079	0.029	2.710	0.007	0.022	0.135
lninc	0.556	0.280	1.990	0.047	0.008	1.104
lnd	0.687	0.135	5.080	0.000	0.422	0.952
dist	-0.650	0.231	-2.820	0.005	-1.103	-0.198
mkt	0.014	0.207	0.070	0.947	-0.392	0.419
job	0.822	0.243	3.380	0.001	0.345	1.299
mig	-0.039	0.221	-0.180	0.861	-0.472	0.395
/cut1	1.169	3.230			-5.163	7.500
/cut2	5.036	3.248			-1.330	11.402
/cut3	6.913	3.257			0.529	13.297
/cut4	11.607	3.305			5.129	18.084

Table 5 reports the ordered logits estimate of the odds ratio, which can be obtained by taking the exponentials of the ordered logits coefficients presented in Table 4. The estimate indicates the change in the dependent variable level due to a one-unit increase in the considered independent variable, with all other independent variables remaining constant. This result mirrors the findings in Section 5.1, with the key difference being that the odds ratio calculation, derived from the exponentials of the ordered logits coefficients, shows the likelihood of lower categories transitioning to higher ones. Accordingly, the odds ratio estimate for household age reveals that for each additional year of age, the odds of being in the high category compared to the combined lower categories are 0.962 times greater, assuming all other independent variables remain constant.
Similarly, the odds ratio estimate for education (educ) indicates that with each additional year of schooling, the odds of being in the high category compared to the combined lower categories are 1.082 times greater, again assuming that all other independent variables are

held constant. Additionally, the odds ratio estimate for income (lninc) shows that with each increase in annual income, the odds of reaching the high category compared to the combined lower categories are 1.743 times greater, provided that all other independent variables remain constant.

Moreover, the odds ratio estimate for landholding (lnd) in hectares indicates that for each increase in landholding, the odds of reaching the high category compared to the combined lower categories are 0.988 times greater, assuming all other independent variables remain constant. The analysis also reveals that the odds ratio estimate for distance from urban or rural areas indicates that with each increase in distance, the odds of being in the high category compared to the combined lower categories are 0.522 times greater, provided all other independent variables remain constant. Finally, the odds ratio estimate for job availability (job) shows that with each increase in job opportunities, the odds of reaching the high category compared to the combined lower categories are 2.275 times greater, again assuming all other independent variables remain constant.

Table 5 Ordered logistic regression estimates for the odds ratio. Source: Computed from field survey, 2024

Ordered logistic regression				Number of obs	=	368
				Wald chi2(9)	=	131.110
				Prob > chi2	=	0.000
Log pseudolikelihood = -372.332				Pseudo R2	=	0.1497
rmin	Odds Ratio	Robust Std. Err.	Z	P>|z|	[95% Conf.	Interval]
gen	1.372	0.333	1.300	0.193	0.852	2.209
age	0.962	0.014	-2.680	0.007	0.936	0.990
educ	1.082	0.031	2.710	0.007	1.022	1.145
lninc	1.743	0.487	1.990	0.047	1.008	3.015
lnd	0.988	0.269	5.080	0.000	1.525	2.592
dist	0.522	0.121	-2.820	0.005	0.332	0.821
mkt	1.014	0.210	0.070	0.947	0.676	1.521
job	2.275	0.554	3.380	0.001	1.412	3.666
mig	0.962	0.213	0.180	0.861	0.623	1.484
/cut1	1.169	3.230			-5.163	7.500
/cut2	5.036	3.248			-1.330	11.402
/cut3	6.913	3.257			0.529	13.297
/cut4	11.607	3.305			5.129	18.084

6. Conclusion

The primary objective of this study was to analyse the factors that determine rural-urban linkages in the Sebeta sub-city and surrounding rural areas. The econometric analysis conducted in the study identifies the key determinants within the study area.

The results from the ordinal logistic regression model revealed that education level, annual income, landholding (in hectares), and job availability in urban areas have a statistically significant positive influence on rural-urban linkages. Conversely, distance from urban or rural areas and the age of the household head negatively influence rural-urban linkages. Additionally, variables such as market accessibility and gender showed a positive effect on rural-urban linkages, while migration from rural to urban areas had a negative effect; however, these effects were not statistically significant.

Based on the core findings, the following recommendations are suggested:
Implementing community programmes that encourage elderly participation in local economies, such as mentorship roles and flexible employment opportunities tailored to their needs.
Expanding educational programmes such as vocational training and adult education in both rural and urban areas to enhance access to quality education and strengthen these linkages.
To boost income levels, initiatives should focus on promoting small business development and providing access to microfinance, thereby enhancing economic opportunities.
Investing in infrastructure improvements to reduce distance-related barriers is important. Enhancing transportation and communication networks can facilitate better access to markets and services.
Promoting land ownership and tenure security can strengthen rural-urban linkages, improve resource access, and provide stable income and investment opportunities for rural households.
Fostering job creation by supporting local businesses and attracting investments is crucial. Programmes aimed at enhancing job opportunities can further improve economic integration.

Declarations

Ethical statement declaration: The research protocol was approved by the Institutional Review Board (IRB) of the College of Development Studies, Addis Ababa University (Approval No. 066/03/2024), following the college's 2021 standard operating procedures.

Informed Consent to Participate declarations: Participants were informed about the purpose, methods, potential risks, and benefits of the study. Informed consent was obtained from all participants. The study was conducted at the household level, and all participants were over 18 years of age. The researchers respected the dignity, autonomy, culture, customs, and privacy of the participants. Anonymity was ensured to minimize potential risks.

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Data Availability: Data from this research can be disclosed, upon request.

Clinical trial declaration: Not applicable.

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Reference

[1] T. Cecilia, "Rural-urban interactions: a guide to the literature," *Environment & Urbanization,* vol. 10, no. 1, pp. 1-20, 1998.

[2] J. Tracey-White, Rural-urban marketing linkages; An infrastructure identification and survey guide, Rome: FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, 2005.

[3] D. Okpala, "Promoting the Positive Rural-Urban Linkages Approach to Sustainable Development and Employment Creation: The Role of UN-HABITAT1," in *Urban-Rural Interrelationship for Sustainable Development*, Marrakech, Morocco, 2003.

[4] C. Tacoli, "Rural-Urban Linkages and Pro-Poor Agricultural Growth: An Overview," *Scientific Research Publishing,* 2004.

[5] D. Mike, "A Regional Network Strategy for Reciprocal Rural-Urban Linkages: An Agenda for Policy Research concerning Indonesia," *Third World Planning Review,* vol. 20, no. 1, 1998.

[6] S. Akkoyunlu, "The Potential of Rural–Urban Linkages for Sustainable Development and Trade," *International Journal of Sustainable Development & World Policy,* vol. 4, no. 2, pp. 20-40, 2015.

[7] T. G. Egizahher, "Rural-Urban Linkages under Different Farming Systems: The Cases of Coffee and Non-Coffee Growing Regions in Ethiopia," *Organization for Social Science Research in Eastern and Southern Africa,* 2001.

[8] N. Geleta, "Urban-Rural Marketing Linkage Practices and Challenges Evidences from Ambo Town West Shoa Zone, Orimia Regional State, Ethiopia," *Journal of Civil and Environmental Research,* vol. 12, no. 8, 2020.

[9] Aynalem Adugna, Assefa Hailemariam, "Rural–Urban Linkages in Ethiopia: Insuring Rural Livelihoods and Development of Urban Centers," in *The Demographic Transition and Development in Africa*, Sonoma State University, CA, USA, Springer, 2010, pp. 167-186.

[10] Tewelde Gebre, Berhanu Gebremedhin, "The mutual benefits of promoting rural-urban interdependence through linked ecosystem services," *Global Ecology and Conservation,* 2019.

[11] C. Tacoli, Changing rural-urban interactions in sub-Saharan Africa and their impact on livelihoods: a summary, UK: International Institute for Environment and Development (IIED), 2002.

[12] T. Yamane, Statistics: An Introductory Analysis, vol. 10, Harper & Row, 1967.

[13] D. N. Gujarat, Basic Econometrics, 5 ed., A. E. Hilbert, Ed., 2009: Douglas Reiner.

[14] J. M.Wooldridge, Introductory Econometrics: A Modern Approach, 2nd Edition, South-Western College Pub, 2002.

[15] J. S. Long, Regression Models for Categorical and Limited Dependent Variables, vol. 7, Indiana University, USA, Indiana University, Bloomington, USA: Sage College Publishing, 1997.

[16] A. U. Bruce F Walker, "The Chi square test: An introduction," *ResearchGate,* vol. 3, p. 4, 1995.

[17] J. M. Wooldridge, Introductory Econometrics Modern Approach, 5th Edition, Michigan State University: South-Western, Cengage Learning, 2013.

[18] B. Vaitla, "MEETING URBAN CHALLENGE, ADAPTING HUMANITARIAN EFFORTS TO AN URBAN WORLD," in *ALNAP*, 2012.

[19] Julia Weiss, Christin Heinz-Fischer, "The More Rural the Less Educated? An Analysis of National Policy Strategies for Enhancing Young Adults' Participation in Formal and Informal Training in European Rural Areas," *MDPI,* vol. 2, pp. 405-421, 2022.

[20] R. U. Ahmed, "Education and rural urban linkage with special reference to commuting: A case study of Jorhat district in Assam," *International Journal of Applied Research,* vol. 3, no. 5, pp. Pages: 121-124, 2017.

[21] Getnet Alemu Zewdu and Mehrab Malek, "Implications of Land Policies for Rural-urban Linkages and Rural Transformation in Ethiopia," *International Food Policy Research Institute,* 2010.

[22] J. D. Dávila, "Rural-urban linkages: Problems and opportunities," *Espaço & Geografia,* vol. 5, no. 2, pp. 35-64, 2010.

[23] Harris, J.R. and Todaro, M.P., "Migration, Unemployment and Development: A Two-Sector Analysis," *American Economic Review,* vol. 60, pp. 126-142, 1970.

[24] J. von Braun, "Rural-urban linkages for growth, employment, and poverty reduction," in *Fifth International Conference on the Ethiopian Economy*, 2008.