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BUILDING CAPACITIES IN THE  
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# ***The Effect of Rural Road Access on Rural Households livelihood Improvement; Evidence from Selected Weredas in Amhara Regional State, Ethiopia***, by Abeje Ewunetu<sup>1</sup>

## **Abstract**

*The development of appropriate road infrastructure is fundamental to economic growth and poverty reduction. Rural roads, especially, are especially important for economic development in rural areas. Against this background, this study aims at investigating the effect of rural road access on rural households' livelihood improvement. Concerning the methodology, mixed research approach involving descriptive and explanatory designs was used. This study compares (using propensity score matching techniques) households located in Kebele's with road access to suitable controls. The descriptive analysis reveals that rural roads provide enhanced access to markets for inputs such as fertilisers and improved seeds, enable households to sell their produce to nearby markets, and allow to achieve additional non-farm employment opportunities, leading to a rise in income and reduce poverty. The results from econometric analysis shows that road access positively and significantly improved the livelihood of households as measured by the livelihoods asset capital index. On the basis of their propensity score, the mean difference in the livelihood assets index between households located in Kebele's with road access and non-accessible household's ranges up to 6% after matching. The results also indicated that women who are employed during road construction, on average, have 25% to 37% higher empowerment level than those who are not employed. This strengthens the argument for making efforts towards gender mainstreaming during rural road construction and greater engagement of women in road planning and implementation.*

*Key words: Effect, Rural Road Access, Livelihood, Empowerment*

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## **Introduction**

Physical infrastructure is often indicated as a key input to economic growth both in developed and developing countries (Roberts et al, 2006). Rural road investment is one of the main priorities of governments in Africa as a mechanism towards reducing poverty. It is also an important aspect considered by the development community in the poverty alleviation process and the provision of more equitable opportunities for rural citizens (P Lombard and L. Coetzer, 2016). A study by Abedi (2008), revealed that Sub-Saharan African countries roads are the most useful way of transport which accounts for over 75% of passenger and freight traffic, and the road network in the region plays a significant role in their socio-economic development. In many developing countries especially in Sub Saharan African transport sector and infrastructure fall far behind that of developed countries (Lulit A, 2012).

Road transport in Ethiopia is the dominant form of transport in the country accounting for well above 90 per cent of motorized inter-urban-rural freight and passenger movements (ERA, 2013). In addition, as indicated in a document produced by CSA and ERA (2013), given the fact that about 83 percent of the population lives in rural areas being engaged in agriculture (which employees 80 percent of the labor force) using road transport (which accounts 90 percent of rural transport), the role rural road transport plays in the country in the role rural road transport and agricultural growth is expected to be tremendous. Recognizing the importance of roads, the government of Ethiopia has embarked on massive investment on road construction by formulating the Comprehensive Road Sector Development Program (RSDP) in 1997. Since then, the RSDP has been implemented in four separate phases, and as part of the fourth RSDP,

a Universal Rural Roads Access Program (URRAP) envisaged to connect rural kebeles by standard rural roads has been set out and implemented (Fredu and Edris, 2016). A recent report (World Bank 2018) shows that connectivity and accessibility of rural Ethiopians have improved since 2010, the average travel time to the nearest town decreased by nearly 30 minutes between 2010 and 2016. An additional 6 percent of rural Ethiopians were connected to rural roads during the same period, as the rural accessibility index (RAI) increased from 46 in 2010 to 52 in 2016. As a result, market accessibility improved except for some lagging regions. Therefore, the issue of rural road construction deserves special attention. Hence, this study was concerned on the effect of rural road access on rural households' livelihood improvement. The remainder of paper has been divided into the following sections: statement of the problem followed by methodology applied. Next, result and discussion from this empirical analysis is followed by last section of the paper, conclusion, and recommendation.

## **Statement of the Problem**

The development of appropriate road infrastructure is fundamental to economic growth and poverty reduction. Previous empirical works, Calderon and Serven, (2014), ADB (2012), Fredu and Edris (2016), show that rural roads infrastructure development reduced poverty and improved the quality of life, especially for the poor and narrowed down the income gap between citizens. However, in Ethiopia, significant limitations of growth and development of rural communities have been experienced in the past and are also being experienced today.

Poverty is very often far worse in rural areas than in urban centers, because of lack of integration with urban centers due to lack of adequate accessibility and mobility (Fredu and Edris, 2016). Poor rural accessibility and poverty are extremely linked; when people are isolated, they are unable to harness the economic and social opportunities within a wider geographic region. Poor accessibility also makes diffusion of modern technologies difficult, contributes to high transaction and production costs, and limits access to health, education, and other social infrastructure (Hajj and Pendakur, 2000).

Similarly, the transportation sector in Amhara region is found at its rudimentary stage. Most of the people and goods move by use of human and/or animal muscles (Tsetadigachew, 2016). In Amhara region, most roads are dry-weather roads and hence access is difficult during rainy seasons. Moreover, the road network connecting the region with zones and Woreda's was extremely poor. Poverty is pervasive in the Amhara region and the rate is higher than the national average. In 2011, the Amhara region had a child poverty rate of 34 per cent. Based on the 2016 household income and consumption expenditure survey (HICES), about 26.1percent of the population in the region were below the nationally defined poverty line compared to 23.5percent for the entire country (UNICEF, 2018). The road density of the region is one of the lowest in the Ethiopian territory. Areas of the region is highly neglected and remained isolated for an extended period of time. Prohibitive cost of transport and weak competition exerted strange influence on the development and patterns of transport in that region. The low level of transport development results in the lack of territorial interdependence and weak linkage among productive centers (Tsetadigachew, 2016).

Although literature identifies properly many of the areas where the positive impacts of such investments are foreseen (i.e., agricultural production, employment, income, health, or education), there are only few studies that have made progress in establishing a clear causal link between road infrastructure provision and any wealth indicator. Most research studies conducted so far were done based on panel data with national coverage. In addition, there is

extraordinarily little information on the status and the role rural roads play in economic development. This is due to the absence of well-conducted research work and lack of disaggregated data. So, the provision of disaggregated information on the effect of road infrastructure helps local government to formulate appropriate policy. This study is, therefore, unique in that it has specific coverage with primary data making it important for local government. Hence the fundamental research question is.

- How does rural road access affect rural household's livelihood improvement?

Specifically, the study aims to:

1. Analyse the contribution of road development in the study area.
2. Identify the effect of rural roads access on livelihood assets (wealth) status of affected households.
3. Examine the effect of rural roads access on women empowerment in study area.

## Materials and Methods

To respond to the research questions effectively and properly, mixed research approach involving descriptive and explanatory (quasi – experimental) research designs were employed. The researcher employed descriptive research design to examine effect of road development on poverty reduction of the study area since such design helps the researcher to describe magnitude and practices and processes of rural road access. An explanatory research design was employed to study the effect of rural road access (intervention variable) on the various outcome variables such as livelihood assets and women empowerment by propensity score matching method. This study employed cross-sectional research, due to the absence of longitudinal data on the issues under study.

In the context of this study, treatment group involves those households who reside in the *kebeles* hosted the investment and directly affected by road access (affected group) whereas the comparison group is the households that reside in the *kebeles* where road access is absent and so not affected by the event of investment (non-affected group). Both quantitative and qualitative types of data were collected from primary and secondary sources.

Furthermore, data analysis was conducted using descriptive and inferential statistics such as Propensity Score matching model by using STATA version 14. The matching will be based on a distinctive variable, that is, the propensity score. Outcome variables are variables which resulted from access to rural roads. Livelihood index of households were used as an outcome variable to measure livelihood assets status of households. The study constructed indexes to measure women's empowerment which is conceptualized along two dimensions: cognitive (self-worth) and decision making. These standardized indexes thus used as outcome variables in the PSM model. The methodology is essentially based on studies by Rosenbaum and Rubin (1983).

### Sample Size

Two *kebele* households having access to road (treated) and the other two *kebeles* with households near to poor road access (control) were selected based on their similarity in social, economic, and agro-climatic characteristics. The sample size was determined using the formula;  $n = N/1+Ne^2$ . A total of 395 sample farm households of the study were selected using simple random sampling technique from the four-sample *kebele*'s in a proportional to size of each *kebele*. The table below shows the distribution of sample households by *kebele*. A total of 395 sample farm households of the study were selected using simple random sampling

technique from the four-sample *kebeles* in a proportional to size of each *kebele*. The table below shows the distribution of sample households by *kebele*.

Affected Kebele	No. of Households	Sample Size	Non-Affected Kebele	No. of Households	Sample Size	Total No. of Households	Total Sample Size
Weyinye	5,838	80	Ledi	7,671	105	13509	185
Dima	8,653	119	Debir Kidusan	6,679	91	15332	210
Total	14,491	199	Total	14,350	196	28,841	395

Source: own computation based on CSA 2007 data, 2021

## Method of Data Analysis

For this study both quantitative and qualitative methods were employed to undertake the process of data analysis. In analysing the data, the researcher used both inferential and descriptive statistical tools. Propensity Score matching model was employed to determine the relationship that existed between dependent and independent variables.

**Impact indicators:** the impact/ livelihood indicators used in this study were: Household livelihoods Assets index (financial, physical, human, and social capital): Households were asked detailed questions about current ownership of different productive assets, schooling enrolment of families in the households, monthly income and saving, and participation in formal and informal group.

This impact indicator was assumed that road access improves household's livelihood asset capital.

## Ethical Consideration

The study followed all ethical standards for carrying out research.

## Results

### Descriptive Analysis

#### Extent of Rural Road Access

As evident from Table 1, out of the total respondents 59.1% replied that the type of road is gravel road (all weather roads) and the remaining 40.9 % responded that the type of road in their area is dry weather road.

Table1: Major Type of Road Used by Respondents

Type of road	Frequency	Percent
Asphalt	0	0
Gravel	233	59.1
Dry weather	161	40.9
Total	394	100%

Source: Survey data, March 2022

On the other hand, travel patterns by distance from road presented in table 4:2. Accordingly, out of the total respondents 43.3% are within 5km from the main road, 34.7% between 6-10km

distance from the main road and the remaining 22% with a distance of more than 10km from the road.

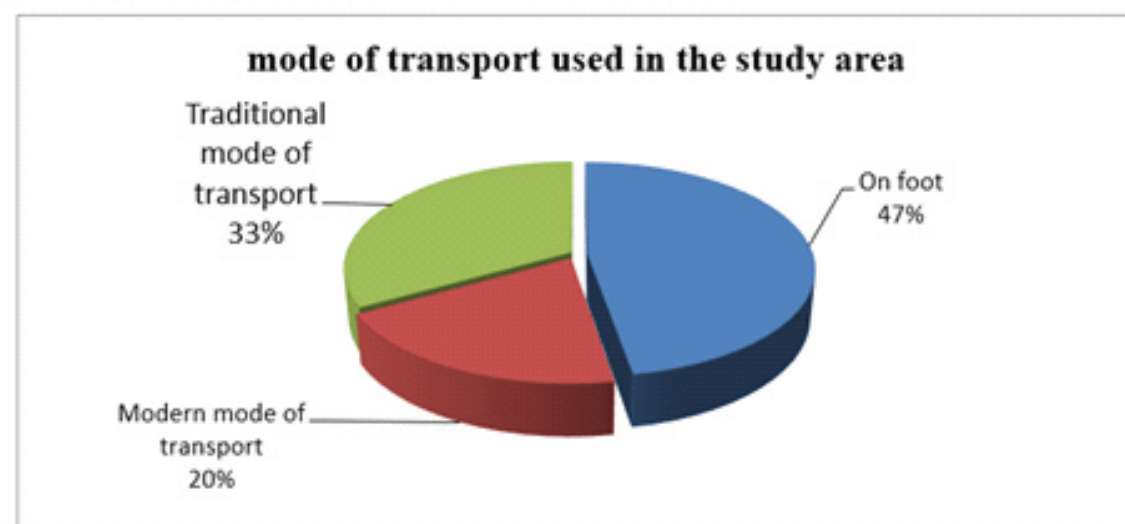
Table 2: Level of Accessibility in the Study Area

	Distance from All-Weather Road	Frequency	Percent
Road accessibility	Up to 5 km	171	43.3
	6 -10 km	137	34.7
	>10 km	86	22
	Total	394	100%

Source: Survey data, March 2022

As rural communities with less access to modern modes of transportation, we observe that the frequent mode of transportation is walking. The overall distribution of the major mode of transport used is presented in Chart 1. The distribution of mode of transport in chart 1 shows that while 47% of them have used foot and 33% traditional mode of transport. The rest 20% have used modern mode of transport (Chart 1).

Chart1: Type of Mode of Transport Used in the Study Area



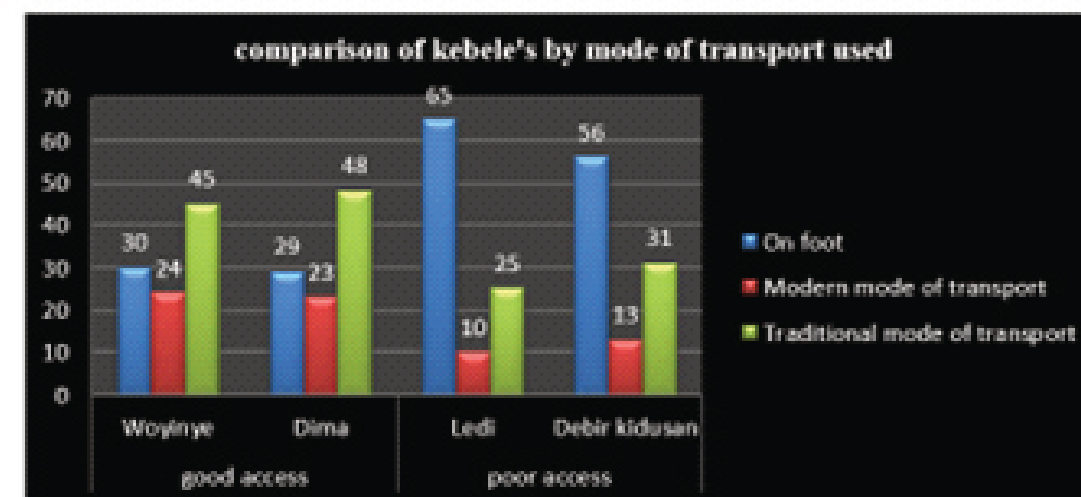
Source: Survey data, March 2022

The comparison of mode of transport used between households in villages with good access and households in villages with poor access is presented in chart 2 below. The result shows that the proportion of households in villages with poor and good access tends to use on foot and traditional mode of transport facilitate, respectively. In non-affected *kebeles*, the dominant mode of transport is foot. Chart 2 also shows that traditional mode of transport was the most used facility for affected *kebele* households while on foot transport was the second most used mode of transport.

### The Contribution of Road Development for Improvement of Social Services Road Access and Agriculture

Agriculture is the major sector for the study area households. Farmers produce diverse types of crops both for consumption and sell. However, marketing of agricultural products is affected by

Chart 2: Comparison of Households Based on Mode of Transport Used by Kebeles



Source: Survey, March 2022

lack of road infrastructure. Thus, farmers carry saleable agricultural products to distant markets using human portage and pack animal. As indicated in table 3 below, out of the total respondent 79% responded that a road has high contribution on use of agricultural inputs. The table also shows that from the total respondents about 82% of them responded that there are variations in prices of agricultural products between places accessible to road and those with less access. The table below shows respondents agreement.

Table 3: Use of Road Access for Agricultural Inputs

Item	Criteria	Frequency	Percent
Use of agricultural inputs was different for areas accessible to road and poor access to road.	Strongly Agree	117	29.7
	Agree	195	49.55
	Disagree	57	14.43
	Strongly disagree	25	6.32
	Total	394	100%
Prices of agricultural products for areas with road access are higher than inaccessible areas	Strongly Agree	122	30.95
	Agree	201	51
	Disagree	27	6.85
	Strongly disagree	44	11.2
	Total	394	100%

Source: Survey data, March 2022

The table below shows application of modern inputs by distance from road. The table indicates that the rate of fertilizer application by rural households relates to distance from road. Households close to the road apply on average more than two times than households located more than 11 km from the road.

Table 4: Fertilizer and Seed Application by Distance from Road

Item	Distance from road		
	Up to 5 km	6 to 10 km	>11km
Fertilizer and seed use	55% (217)	25% (99)	(20%)78

Source: Survey data, March 2022

Households were further asked what would have happened to their purchase of fertilizers and seeds if the road was not constructed. Table 5 below summarizes the response.

*Table 5: Purchase of Fertilizers and Seeds Without a Road*

Purchase of fertilizers without a road	Frequency	Percent
Cannot purchase inputs	64	16.24
Purchase smaller amount	246	62.43
Purchase same amount	84	21.33
Total	394	100%

Source: Survey Data, March 2022

Results indicate that majority (62%) of respondents said they would have responded by purchasing smaller number of inputs. On the other hand, 16% of the respondents said that they would not have purchased inputs if roads were not constructed. The rest 21.33% said they would continue to purchase the same number of inputs they are purchasing now.

#### **Road and Market Access**

Rural roads are believed to facilitate access to market. With construction of rural roads and possible expansion of rural transportation system, rural communities can increasingly interact in close and far off markets. In this survey, questions on sales of agricultural products and how marketing of agricultural products has been changed due to road construction have been asked. Table 6 below summarizes the result. As the communities in the study sites are predominantly rural highly dependent on rainfall agriculture, most households sell cereals. The number of households engaged in vegetables and fruits market is quite small, less than 23% of the rural communities.

*Table 6: Participation of Households in Sales of Products*

Product type	Frequency	Percent
Cereals	224	56.9
Vegetables	51	12.94
Fruits	43	10.86
Other Products	76	19.3
Total	394	100%

Source: Survey Data, March 2022

To relate to construction of roads, survey respondents were asked how their sales of the agricultural products have changed after construction of the road and to what extent the changes are attributable to the road. Table 7 below indicates that most respondents engaged in sales of agricultural products believe that sales of their products have increased after construction of the road.

Most of the changes are reflected in agricultural products primarily produced for the market such as vegetables, fruits, and other products, where more than 74 percent of the respondents said that their sales of these products has increased after the construction of the road. However, the increase in sales may or may not be attributed to the construction of roads. The last two

columns indicate how respondents attribute the changes to the roads. More than 30% of the respondents believe that all the changes are attributed fully to the construction of roads. Without the road, such changes would not have been possible. Most, however, believe the changes are partly attributed to road and partly to other factors. In general, it can be observed that construction of the rural roads has enhanced marketing of agricultural products.

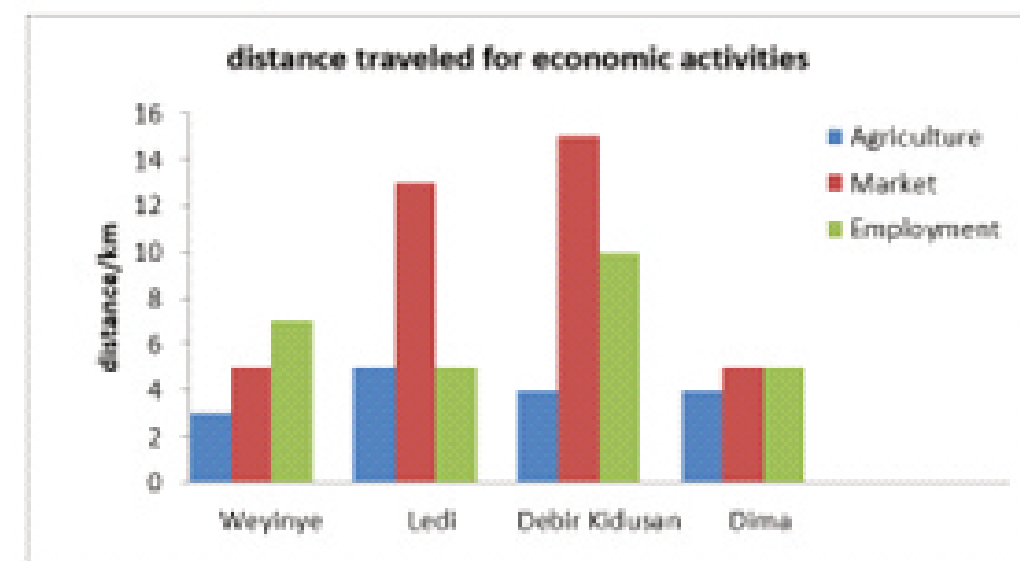
*Table 7: Changes in Sales of Agricultural Products*

Product Type	Change of Sales			Change of Sales Attributed to Road	
	Increase	Decrease	No Change	All of the Change	Part of the Change
Cereals	67	-	33	31	69
Vegetables	74.5	-	26.5	37	63
Fruits	79	7	14	36	64

Source: Survey Data, March 2022

The next figure examines the components of the purposes of travel. Market travel is the major form of economic travel revealed in three villages. However, market travel displays significant variation from village to village. The average distance per capita for market travel in Debir Kidusan is more than 15 km which is three times that of the market distance travel in Weyinye. Next to Debir Kidusan, market travel time is high in Ledi. One possible explanation for such a difference in market travel is due to the fact that there are relatively functional markets at kebele level in both Weyinye and Dima, whereas such markets are absent in Debir Kidusan and Ledi.

*Chart 3: Distance Traveled for Economic Activities*



Source: Survey Data, March 2022

#### **Effect of Rural Roads Access on Wealth Status of Affected Households**

In the survey, rural households were asked whether they engage in commercial activities and type of commercial activities they undertake. Among survey respondents, only sixty households (15.23%) were engaged in commercial activities. Table 8 below summarizes the type of commercial activities. The most common type of commercial activity in the rural areas

is to engage in trading of live animals, grain, and other agricultural products. Close to 50% of the commercial activities is constituted by trading of livestock and other agricultural products, followed by small shops which constitute close to 25% of the business activities. The third dominant form of business activity is selling local drinks called *areqei, tela* etc.

Table 8: Type of Commercial Activities

Activities	Frequency	Percent
Trading of livestock and other agricultural products	30	50
Small shops	15	25
Selling local drinks, food, tea, and coffee	9	15
Barber	6	10
<b>Total</b>	<b>60</b>	<b>100%</b>

Source: Survey, March 2022

To relate the commercial activities to construction of rural roads, survey respondents were asked whether they started to engage in the business activities after/before construction of the rural roads. As indicated on table 4.9 below, most of the commercial activities were opened only after construction of the road (65%). If we add to this those that were operating before construction of the road but were closed for some time and reopened after the construction of the road, 77% of the business activities were opened or reopened due to the construction of the rural roads.

Table 9: Operation of Commercial Activities

Item	Frequency	Percent
Operating before construction of road	12	20
Reopened after construction of road	15	25
Opened after construction of road	33	55
<b>Total</b>	<b>60</b>	<b>100%</b>

Source: Survey, March 2022

### The Effect of Rural Roads Access on Women Empowerment

Respondents were asked their level of participation in different decision-making areas. As can be seen from chart below, majority of decision regarding road planning, construction and participation in skilled labor is made by males. For example, only 13%, 55 %, and 9% of female headed households said ‘yes’ for their level of participation in road planning, construction, and skilled labor respectively.

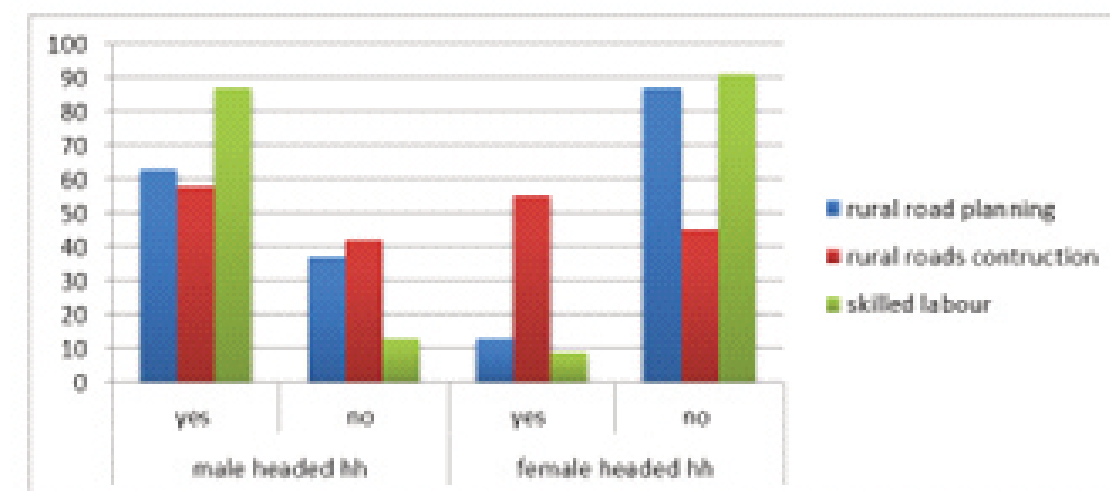
### Result from the Econometric Analysis

#### Evaluating the Impact of Rural Road Access on Household Livelihood

The balancing property was selected in estimating propensity scores. The use of the balancing property ensures that a comparison group is constructed with observable characteristics distributed equivalently across quintiles in both the treatment and comparison groups (Smith and Todd, 2005).

In constructing the matching estimates, the widespread support was imposed. Four matching methods, radius matching, the nearest neighbor and Kernel matching methods were used to

Chart 4: Respondents Level of Participation in Decision Making



Source: Survey, March 2022

estimate the impact. Comparing results across different matching methods can reveal whether the estimated project effect is robust (Khandker et al., 2010). Road access, the dependent variables in the impact assessment analysis, takes the value of 1 if a household have road access and 0 otherwise.

### Summary of Variables Used in the Impact Analysis

Descriptive statistics of different variables used in the analysis measured in terms of some demographic and other wealth indicators. The average household size and age of the household head of the total sample were 1.87 and 18-45 years, respectively. 50.13 percent of the survey households are female headed and the remaining 49.87% is male headed.

#### Road = Accessible

Variable	Obs	Mean	Std. Dev.
Family size	174	1.710983	.8336984
Physical capital	174	5.063218	1.747508
Average monthly income	174	6595.402	1983.86
Average monthly saving	174	806.6092	826.756

#### ULGDP = non-Accessible

Variable	Obs	Mean	Std. Dev.
Family size	220	2	.9215829
Physical capital	220	3.436364	1.970222
Average monthly income	220	3738.409	1846.635
Average monthly saving	220	269.9091	446.7058

Source: Survey 2023

There are some differences between accessible and non-accessible households (road). Overall, demographic characteristics suggest that households in accessible areas are better than those in

non-accessible kebeles. This is confirmed by answers on asset ownership. Not only are demographic characteristics quite different between project and comparison areas, but responses on financial, social and human capita are also consistently better in project areas. Regarding monthly saving, on average, accessible kebele households save 806 Birrs. And those households in non-accessible kebeles on average save 270 Birrs.

#### ATT Estimation Results

This section presents and discusses the estimation results of matching estimators of household livelihood assets and all estimations are bootstrapped standard errors. The researcher used “ATT and t- value” columns to evaluate the impact indicators. In order to estimate the causal effect of the project on areas that received it, I used kebeles that did not have road access as counterfactuals. Under the assumption that these areas are valid counterfactuals (i.e., they would have followed similar trajectories in the absence of the road access), assessing whether the road access had an effect on the outcomes of interest is equivalent to examining whether areas that have the road access had a differential change in outcomes, when compared to the comparison areas.

The balancing property was selected in estimating propensity scores. The use of the balancing property ensures that a comparison group is constructed with observable characteristics distributed equivalently across quintiles in both the treatment and comparison groups (Smith and Todd, 2005). In constructing the matching estimates, the widespread support was imposed. Four matching methods, radius matching, the nearest neighbor and Kernel matching methods were used to estimate the impact. Comparing results across different matching methods can reveal whether the estimated project effect is robust (Khandker et al., 2010).

The PSM results presented in table 4.10 below support the conclusion that access to roads does improve household livelihood index, indicating that the difference in asset capital index between households in *kebeles* with road access and without road access ranged from 1% to 6% depending on the matching method used.

It was hypothesized that, road access improves household wellbeing and asset ownership. By and large, these results do support the hypothesis that road access increase household’s physical capital index in *kebeles* that have road access. ATT based on all matching estimators were positive and significant (at 10% level of significance). Taking into account the significant estimators, the mean difference in physical asset ownership index between households in accessible and non-accessible *kebele* household’s ranges from 1 to 3%. This result is a clear indication that households with road access are benefiting thereby improving their livelihood asset ownership.

The matching estimators show that the average differences in household human capital (schooling) across *kebele* households with and without road access do not appear to be statistically significant. This might be as a result of the free educational services provided in Ethiopia generally and in the study areas in particular.

It was hypothesized that, road access improves household wellbeing and asset ownership. These results do support the hypothesis that road access increase household’s physical capital index in kebeles that have road access. ATT based on all matching estimators were positive and significant (at 10% level of significance). Considering the significant estimators, the mean difference in physical asset ownership index between households in accessible and non-accessible kebele household’s ranges from 1 to 3%. This result is a clear indication that households with road access are benefiting thereby improving their livelihood asset ownership.

Table 10: Impact of Access to Roads on Household Livelihood: PSM Results

Indicator	Matching Method	Treatment	Control	ATT	Standard error	T-test
<b>Phy-Cap Index</b>	SS matching	195	188	0.017	0.024	0.717
	NN matching	195	169	0.030	0.029	1.032*
	Kernel matching	195	188	0.015	0.024	0.643
	Radius matching	195	188	0.011	0.021	0.522
<b>Soc-Cap Index</b>	SS matching	195	188	0.030	0.037	0.800
	NN matching	195	169	0.024	0.047	0.513
	Kernel matching	195	188	0.032	0.038	0.844
	Radius matching	195	188	0.063	0.039	1.627*
<b>Fin-Cap Index</b>	SS matching	195	188	0.051	0.018	2.845**
	NN matching	195	169	0.058	0.022	2.665**
	Kernel matching	195	188	0.048	0.020	2.460**
	Radius matching	195	188	0.039	0.023	1.718*

Source: Survey, March 2022

\* Significant at 10% level; \*\* =significant at 5% level.

It was also hypothesized that road access has positive impact on social capital. The result also showed the existence of positive impact between social capital and road access. The matching estimator shows that the mean differences in household’s social capital (participation in formal and informal groups) between accessible households and non-accessible households were statistically significant (at 10% level of significance). Considering the significant estimators, the mean difference in social capital index between households with road access and non-accessible *kebele* household’s ranges from 3 to 6%.

Hypothesis for financial capital stated that road access has a positive impact on amount of household income. As expected, the researcher found that, the mean difference in financial capital index between households with road access and non-accessible *kebele* household’s ranges from 3 to 5%. This effect was statistically significant at 5% significance level.

#### Evaluating the Impact of Rural Road Access on Women Empowerment

The researcher used propensity score matching (PSM) model to correctly estimate the actual impact of employment on the women empowerment. I estimate the average treatment effect on the treated (ATT) - the average difference between empowerment level of employed (treated) and non-employed (comparison) women by using PSM matching like nearest neighbour (NN), radius, kernel, and stratification (SS).

By using a combination of matching methods, the impact of road access on self-worth level of women ranged from 24% to 25% in terms of improving the level of self-worth. This implies that women who are employed by road investment projects, on average, have 24% to 25% higher level of self-worth than those who are not paid. As far as decision making index is concerned, the impact of employment ranged from 37.5% to 37.7% improvements in the value of the index. In other words, the difference in decision making index between employed and unemployed women due to employment, on average, was 0.376% 0.376% 0.377% and 0.375 % for NN, SS, kernel, and Radius matching.

The finding in this study reveals that road access is an important tool to increase women household’s economic empowerment effort and development process in rural areas. Therefore, assessment of the counterfactual scenario where road is not introduced and the potential economic impact of the road access show strong rationale for the proposed intervention.

Table 11: Impact of Employment on Women Empowerment Level: PSM Results

Indicator	Matching Method	Treatment	Control	ATT	Standard error	T-value
SW index	SS matching	65	67	0.257	0.070	3.647***
	NN matching	68	39	0.258	0.080	3.244***
	Kernel matching	68	64	0.246	0.064	3.834***
	Radius matching	68	64	0.244	0.054	4.530***
DM index	SS matching	65	67	0.376	0.043	8.817***
	NN matching	68	39	0.376	0.043	8.694***
	Kernel matching	68	64	0.377	0.039	9.781***
	Radius matching	68	64	0.375	0.035	10.621***

Source: Survey, March 2022

\* Significant at 10% level; \*\* =significant at 5% level; \*\*\* =significant at 1% level

## Discussion

The study examined the extent of rural road access in the study area. This part deals with the analysis of rural road access based on data gathered from the study area. The benefits of having access to a road network is measured in terms of reductions in monetary costs or time needed by beneficiaries to access output markets or key public social services like agriculture. Consequently, study finds that rural communities in the study area have different level of accessibility and mobility as far as access to all weather roads and use of mode of transport are concerned. There exists low utilisation of modern mode of transport for agricultural related activities and by far foot is still largely dominant mode of transport for agricultural purposes. Even though there is an increase in the level of access to all weather roads still majority of rural farmers uses foot as a major means of transport for agricultural purposes. This result is consistent with what other studies have already found (Naod & Bamlaku, no date, Hika, 2017).

The study compared the modes of transport used by households in kebeles with good access and those with poor access. The research demonstrates that households in kebeles with low and good access tend to employ traditional modes of transportation and walking, respectively. The main means of transportation in *kebeles* without road access is on foot. The findings also indicate that traditional modes of transportation were most frequently employed by accessible kebele households, with foot travel coming in at number two. The implication is that the level of adoption of both modern and traditional mode of transport is low for households in villages with poor access.

Interestingly, the result is also consistent with empirical studies elsewhere. For example, Fredu and Edris (2016) found that Walking constitutes well over 80% of all trips in all the four villages with some minor differences among villages in Tigray. Moreover, Naod & Bamlaku (no date) indicted that real consumption per capita for households using traditional mode of transport would increase by as much as 7 per cent when compared with those using foot as a major mode of transport.

Agriculture is the major sector for the study area households. Farmers produce diverse types of crops both for consumption and sell. However, marketing of agricultural products is affected by

lack of road infrastructure. Thus, farmers carry saleable agricultural products to distant markets using human portage and pack animal. The study revealed that household with good road access has good market access and vice versa. That means better road accessibility could help to get market information, low transportation price and better means of transportation, which help to produce more saleable agricultural products.

Similar patterns are found in most developing and low-income countries (Escobal, 2002). According to the analysis made by Escobal, (2002), reductions in transport costs and transaction costs, triggered by the rehabilitation of rural roads, may increase the supply of agricultural products that are brought into the market or the effective price paid to the farmer, any of which would result in increases of agricultural income. The majority of rural households are vulnerable to poverty due to limited access to transport, health, education and other socio-economic services. It can be argued that the lack of road access undermines provision of these basic services and their efficient utilization by rural communities. Although communities in the study sites are rural which mainly depend on agriculture for their living, with the expansion of infrastructure and rural towns, it is expected that non-farm activities especially small business activities play a role in diversifying income sources and supporting the lives of rural households.

Lastly, the study investigated the effect of rural road access on rural households' livelihood improvement. Matching econometric modelling approach was used to analyse data. In this regard, the results demonstrate that, the road access positively and significantly improved the livelihood of accessible kebele households as measured by the livelihoods asset capital index.

The result from econometric analysis revealed that access to roads does improve household livelihood index, indicating that the mean difference in asset index between households in villages with road construction and poor access ranged from 1% in physical capital to 6% in social capital depending on the matching method used though the result is not statistically significant. Deborah, *et al*, (2008) has found similar findings using survey data from Ethiopia, Zambia, and Vietnam. This article explores how effective such investment is in addressing mobility and social-service accessibility in rural areas. The findings indicate that, in extremely remote areas, road improvements may catalyse the expansion of social-service provision, as evidenced in Ethiopia.

In addition, the study revealed the impact of road access on women empowerment. The first dimension of empowerment is women 's decision making power in a family which is operationalized as the ability of women to make a major decision that affect the life of household members. The second one is self-worth which is conceptualized as women 's awareness about the situation and causes of their subordination at the household level and makes decisions that may stand against patriarchal culture in the society. The econometric analysis revealed that by using a combination of matching methods, the impact of road investment on self-worth level of women ranged from 24% to 25% in terms of improving the level of self-worth and the difference in decision making index between employed and non-paid women due to employment, on average, was 37%.

## Conclusion

This study examined the effect of rural road access on rural poverty reduction. The data allows us to examine the effect at household level using road access at Woreda level. Access to roads has a decisive impact on the likelihood of poverty among rural households. In line with the empirical evidence I found, roads are imperative for poverty reduction in rural areas. This



study shows households who have better road access accrue more benefit than those with no access. Both the descriptive statistics and the econometric models provide evidence that expanding road networks decrease the likelihood of poverty. The government's focus on road infrastructure has therefore contributed for poverty reduction in the country.

In addition, the study examined the effect of rural roads access on livelihood assets (wealth) status of affected households measured by household livelihood index. Matching econometrics modeling approach was used to analyze data. In this regard, the results demonstrate that access to roads does improve household livelihood index. After matching, the mean difference in livelihood assets index between households in villages with good and poor access is up to 6%. Lastly, the study also finds that, despite the positive sign of the impact values, the engagement of married women in paid work has a significant effect on their empowerment level in terms of both self-worth and decision-making dimensions in the study area. After matching, the difference in self-worth and decision-making index between employed and non-employed women is 24% to 25%.

### Recommendation

The result shows that road investment has negative impact on human capital. This indicates that if the government continuous in the current trend without considering the local context, road construction will affect the local people and make them poorer. Hence it is better to take the local context into consideration and improve the benefit of local people. As the study found, the area is poorly linked with road transport and farmers mostly produce for consumption. Thus, rural *kebele* needs to relate to market centers in order to collect the products during harvesting seasons. This calls for the adoption of more intermediate mode of transport.

### Reference

- Alamirew, B. and Ababa, A. (no date) 'Is Public Investment on Rural Road Transport Sector in Ethiopia Pro-poor? Evidence from the Ethiopian Rural Socio-Economic – Living Standard Measurement Survey Panel data (LSMS)', pp. 1–37.
- Aklilu Terefe, L., & Pellegrini Arjun Bedi, L. (2012). Impact of Road on Rural Poverty Evidence Form Fifteen Rural Villages in Ethiopia.
- Asher, S., & Novosad, P. (2020). Rural roads and local economic development†. *American Economic Review*, 110(3), 797–823. <https://doi.org/10.1257/aer.20180268>
- Ayele, H. N. (2017) 'Road Sector Development and Socio-Economic Growth in Wonbera Woreda, Benshangul Gumuz, Ethiopia', 17(4).
- Bryceson, D. F., Bradbury, A., & Bradbury, T. (2008). Roads to poverty reduction? Exploring rural roads' impact on mobility in Africa and Asia. *Development Policy Review*, 26(4), 459–482. <https://doi.org/10.1111/j.1467-7679.2008.00418.x>
- Escobal, J. (2002) 'The Benefits of Rural Roads: Enhancing Income Opportunities for the Rural Poor'.
- Gebrehiwot, T. and Veen, A. Van Der (2015) 'Estimating the impact of a food security program by propensity-score matching', 7(880758), pp. 38–47. doi: 10.5897/JDAE2014.0585.
- Legesse, T. (2016). Analysis on the Road Transportation Networks of the Amhara Region, Ethiopia. *International Journal for Traffic and Transport Engineering*, 6(2), 212–221.
- Loayza, N. V. and Odawara, R. (2010). Infrastructure and Economic Growth in Egypt. Policy Research Working Paper 5177.

- Li, H. *et al.* (2020) 'A New Livelihood Sustainability Index for Rural Revitalization Assessment — A Modeling Study on Smart Tourism Specialization in China'.
- Nakamura, S., Bundervoet, T., & Nuru, M. (2020). Rural Roads, Poverty, and Resilience: Evidence from Ethiopia. *Journal of Development Studies*, 56(10), 1838–1855. <https://doi.org/10.1080/00220388.2020.1736282>
- Novosad, P. (2018) 'Rural Roads and Local Economic Development', (June).
- Paper, W. (2019) 'Rural Roads, Poverty, and Resilience Evidence from Ethiopia', (April).
- Tegebu, F. N., & Seid, E. H. (2017). Quantifying the Road Influence Zone on Socio-economic Developments in Rural Tigray, Ethiopia. *African Development Review*, 29(4), 601–614. <https://doi.org/10.1111/1467-8268.12299>
- Terefe, L. A. (2012) 'Impact of Road on Rural Poverty Evidence Form Fifteen Rural Villages in Ethiopia Disclaimer: Inquiries: Postal address'.
- T. H. (2016) 'Quantifying the road influence zone on socio-economic development in rural Tigray, Ethiopia', (March).
- Van de Walle, D. (2009). Impact evaluation of rural road projects. *Journal of Development Effectiveness*, 1(1), 15–36. <https://doi.org/10.1080/19439340902727701>
- Walle, D. Van De and Cratty, D. (2002) 'Impact Evaluation of a Rural Road Rehabilitation Project', (January).
- Walo, M. T. (2016) 'Local Institutions and Local Economic Development in Guto Gidda District, Oromia Region, Ethiopia', (December).
- Wondemu, K. A. and Weiss, J. (2012) 'Rural Roads and Development: Evidence from Ethiopia P', 12(12), pp. 417–439.
- Wondemu, K. *et al.* (2015) 'Rural Roads and Development: Evidence from Ethiopia', (October 2012). doi: 10.18757/ejtir.2012.12.4.2977.
- World Bank (2007). Uganda Moving Beyond Recovery: Investment and Behavior Change, For Growth Country and Economic Memorandum.

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