Effects of Urbanization on Welfare of Peri-urban Households in Central and North Gondar Zones, Ethiopia

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Abstract

Background: Urban expansion in many developing countries has been taking place through the inclusion of nearby rural villages competing against the major productive assets of the subsistence farm households in these villages. Empirical evidence on the effect of this urbanization process on the welfare of peri-urban households is vital. However, such information is scanty in the study area. Objective: This study was aimed at examining the effects of urban expansion on the welfare of peri-urban households proxied by consumption expenditures per adult equivalent in Central and North Gondar Zones of Ethiopia.

Methodology: The research used cross-sectional data collected from 405 sample respondents. Multi-stage random sampling together with purposive sampling techniques were applied. The data were analyzed using descriptive statistics and impact analysis (propensity score matching) procedure.

Results: The largest monthly expenditure of the sample households was food expenditure which is on average about 1070 Ethiopian Birr per adult equivalent in 2019. Other expenditures included miscellaneous (water, electricity, cloth, transport and communication), education and home furniture in their order of importance. Peri-urban households' consumption expenditure per adult equivalent was 1234.5 ETB while that of rural counterparts was 922.6 ETB. The difference was statistically significant ($P < 0.05$), indicating that urbanization has a positive effect on consumption expenditure. In terms of asset holding, peri-urban samples had a more additional home and other fixed assets such as carts, mills, and rickshaws (Bajaj) compared to rural households.

Conclusion: The average monthly consumption expenditure per adult equivalent of peri-urban households was higher by 33.8% than that of the rural households. The results indicate that increasing compensation for peri-urban households can better improve household consumption thereby their welfare.

Keywords: Asset holding; Consumption; Expenditure; Propensity score matching

1. Introduction

Urbanization is an inevitable phenomenon in the world. Small cities and towns are playing a central role in the urbanization process in that they are changing to large cities rapidly (Simon, 2008). Developing countries are leading the world in the current urban expansion process, and they are the key contributors to the rise of the world urban population (UN-Habitat, 2010a). For instance, the proportion of urban population in low-income countries is expected to increase by 18% from 2018 to 2050, whereas in high-income countries, the increase is expected only to be 7% for the same period (UN DESA, 2019). Africa is achieving steady economic growth and is in a state of rapid urbanization. By 2050, the proportion of the African urban population is projected to be increased to 59.1% from 34% in 2020 (UNCTAD, 2020). But it is hard to claim that urban expansion in Africa is due to substantial industrialization (Simon, 2008) instead it is natural growth, reclassification of settlements from rural to urban and rural-to-urban migration (Hommann and Somik, 2019; UN DESA, 2019).

In fact, in the vast majority of African countries, unplanned and informal settlements and activities persist in most spheres of urban life (UN-Habitat, 2017). Such informal settlements and rapid growth challenges urban life in terms of environmental hazards, food insecurity, and urban poverty (Ezana Amdework, 2008; UN-Habitat, 2017). For instance, on average, 60% of Africa's urban population live in shanty areas compared with 34% seen in other developing countries in the world (United Nations, 2015). Similarly, problems related to infrastructure, waste management, land and water pollution, housing, and employment are widespread in urban Africa. Although urbanization in most developing countries is associated with such multifaceted problems, it can offer numerous opportunities in terms of an improved standard of living, higher life expectancy, and higher literacy levels among others (Tacoli, 2012).

Ethiopia is one of the sub-Saharan countries with a population of more than 100 million (USAID, 2017) next to Nigeria in Africa. The country's urban population share is one of the lowest in the world

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estimated at only 21.2% in 2019 well below the sub-Saharan Africa average of 40.7% (UN DESA, 2019). However, the urban population of Ethiopia are expanding rapidly (WB Group, 2015). For instance, the annual urban population growth rate was between 4.7 to 5.2% from 2008 to 2020 which was above the sub-Saharan African urban growth rate of 3.98 to 4.26% during the same period (World Bank, 2021). The share of the population living in cities has also increased from 16.5% in 2008 to 22% in 2020 (World Bank, 2021) and is expected to reach 39% by 2050 (UN DESA, 2019). The trend in the growth of urban populations in Ethiopia is likely to continue more than expected given the shift in emphasis from agricultural to industrial-led development policy of the country. Moreover, public investments undertaken in the construction of industrial parks, airports, railways, dry ports, and roads in many places of the country is contributing to fast urbanization with a higher agglomeration of new people as settlers (SADC, 2017).

In the long term, urban expansion can generate economic growth and structural transformation whereas, over the short term, increasing investment in cities and towns does not show a significant reduction in national poverty (Dorosh and Thurlow, 2012). In countries like Ethiopia where urban poverty is a deep-rooted problem due to rapid population growth, rampant unemployment, and poor urban governance (Bikila Hurissa, 2011; Tsega Gebrekirstos, 2021), urbanization, if not managed proactively, may aggravate poverty and pose a strong challenge for the use of urban infrastructures and services. If well managed, urbanization could be an important catalyst to promote economic growth, create jobs, and connect Ethiopians to prosperity (WB Group, 2015).

The rate of urbanization varies depending on the size of the towns. Berhanu Keno *et al.* (2019) found that the cities with a larger initial urbanized size were associated with lower expansion rates than those with lower initial size that could draw new attention to the expansion of small towns. Small towns in Central and North Gondar Zones (the study area) are expanding by including the pre-existing rural villages in peri-urban areas (PUAs). To satisfy the demand for urban land, inhabitants of the peri-urban villages are dispossessed of their farmlands. As a result, many farm households have been forced to become urban residents by receiving paltry financial compensations for the farmland (property) they are dispossessed of. These farmers cannot buy any other plots of land to continue farming activities because of policy constraints (FDRE, 2005). Ultimately, these households are expected to shift their rural life to urban life. Even though many farm households have been affected by the urban expansion process, little is known about its consequences on their welfare in Ethiopia in general and Central and North Gondar Zones in particular.

Evidence indicates that consumption in urban households is higher than in rural households signifying better welfare in urban areas. For example, the World Bank (2020) found that in Ethiopia, due to fast GDP growth (more than 9% annually) between 2011 and 2016, consumption of urban households grew at 6% per year, while consumption for rural households was less than one percent. The question here is how the economic welfare, measured in terms of consumption expenditure, and asset holding of households included under urban administration due to the urbanization process be affected compared to the rural life before the inclusion. Therefore, the objectives of this study were to examine the effects of urban expansion on economic welfare and asset holding of the farm households included under urban administration.

2. Methodology

2.1. Description of the Study Area

The study focused on Central and North Gondar zones, Amhara National Regional State of Ethiopia. The Zones are located on the northwestern part of the country. The boundaries of the Zones adjoin Tigray region in the North, Lake Tana, Awi and West Gojam Zones in the South, Waghimra zone in the East, South Gondar zone in south East, and West Gondar zone in the West. Central Gondar Zone covers fifteen *districts*, and North Gondar zone covers six *Districts*. According to population projection of Ethiopian Statistics Service (ESS) (2020), the Central Gondar zone had a total population of 2,690,052 as of July 2021 of which 28.5% were urban dwellers, and North Gondar zone had a total population of 911,718 as of the same year with 13% of urban residents. The same source indicated that Central Gondar zone urban population increased by 4.3% from 2016 to 2021 whereas North Gondar zone increased by 2.3% in the same period. The study was focused on four towns; Debark, Koladiba, Enfranze and Arbaya. Debark is the capital town of North Gondar zone with a population of 44,521 of which 20,843 were male and 23,698 were female on 2021 (ESS, 2020). Koladiba, Enfranze and Arbaya are towns of East Dembia, Gondar zuria and West Belesa *districts* in Central Gondar zone. The location is depicted in Figure 1.

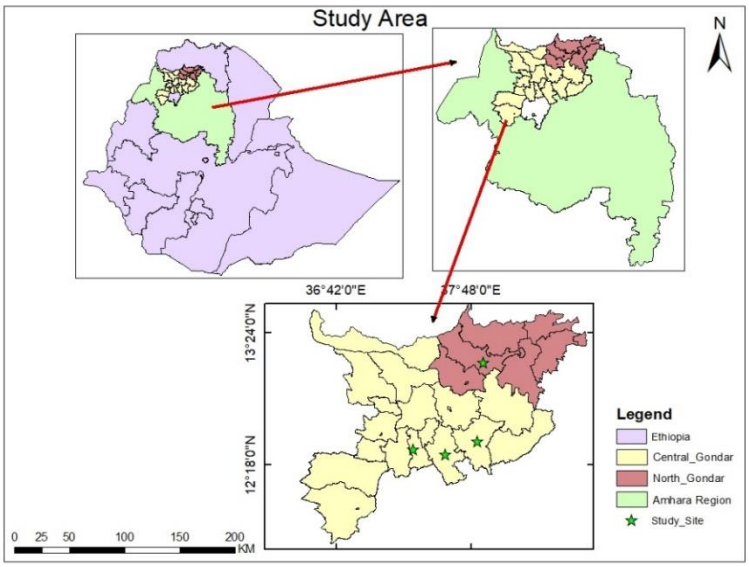

Figure 1. Map of the study area.

2.2. Sample Size Determination and Sampling Procedure

Multi-stage cluster sampling framework was applied to identify the sample farm households for the survey. The first stage is selecting *district* towns from the two zones proportionately. Three towns; Infranze, Arbaya, and Koladiba from the Central Gondar zone covering 15 *districts*, and one town, Debark, from the North Gondar zone covering only 6 *districts* were selected randomly. After selecting the towns, in the second stage, two peri-urban *farmer associations* and two rural *farmer associations* from the adjacent *districts* of the respective towns were selected except Infranze where only one peri-urban *farmer association* was available for our purpose. The level and direction of expansion of the respective towns were taken as the main criteria to select the *farmer associations* in peri-urban and adjacent rural *district* administrations. This is because a suitable comparison group is needed to quantify the effects of an intervention on the targeted population. Hence, rural households adjacent to peri-urban households were selected as the control group because i) both groups could have been in similar situations without urbanization and ii) households in the control group are inhabitants of *farmer associations* that could be possible targets of intervention with the implementation of the next town expansion plan.

The peri-urban households were pre-existing rural *farmer associations* but became under urban administration officially because of urban expansion. These households can be fully or partially dispossessed of their farmlands due to urban-driven investments. The households in the control group are from *farmer associations* under the rural administration but are located within 15kms from the edge of the town, the boundary of the peri-urban area. In the last stage, 214 households from rural *farmer associations* and 191 households from peri-urban *farmer associations* were randomly selected from the list provided by the respective *farmer association* administration units considering the extent of expansion of the respective town (Table 1).

Table 1. Sample distribution in zones, and towns.

Zones	Towns	Rural samples (control)	Peri-urban samples (treated)	Total
Central Gondar	Koladiba	50	50	100
	Arbaya	50	50	100
	Infranze	59	25	84
North Gondar	Debark	55	66	121
Total		214	191	405

2.3. Data Sources and Methods of Data Collection

The data were collected from both primary and secondary sources. Primary data were collected from household head through interviews, Focus Group Discussion (FGD), and key informant interviews. Secondary data were collected from government annual reports, zonal and *district* urban house construction and development offices, research office annual reports, and research results undertaken in different areas.

2.4. Methods of Data Analysis

Descriptive analysis was used to analyze demographic and socio-economic characteristics of both treated and controlled household groups. Independent sample t-test, chi-square tests, and ANOVA were also used to make comparisons between the groups with respect to key variables specified. These analyses were used as inputs for the econometric analysis in the subsequent sections. Propensity score matching (PSM) methods were employed to investigate the welfare effect of urbanization on peri-urban households in the Central and North Gondar zones. The details of this method were presented in the next subsections.

Measuring household welfare and propensity score matching (PSM) procedure: Real household consumption per capita is a measure routinely employed as a welfare indicator though it has often been criticized not to account for publicly provided services (Lanjouw and Hentschel, 1999; Jorgenson and Schreyer, 2017). In cases where real consumption expenditure per capita is used as the individual welfare measure, individual goods are obviously measured at the same price across households. Hence, for this study, consumption expenditure per adult equivalent was employed and prices of different expenditure categories were measured at the same price across households. For non-marketed commodities, particularly for homemade food consumption, the same opportunity cost was considered across households. This approach was employed disregarding a long-term welfare measure.

In determining the impact of an intervention, an impact assessment must estimate the counterfactual; that is, what would have happened had the intervention or program never taken place or what otherwise would have been (Caliendo and Kopeinig, 2008). To determine the counterfactual, it is essential to net out the effect of the intervention from other factors. This is accomplished through the use of control groups. The choice of a good counterfactual is therefore crucial in impact assessment.

Propensity score matching is an alternative method to estimate the effect of receiving treatment when the random assignment of treatments to subjects is not feasible. The method compares the outcome of a treated observation with the outcomes of comparable non-treated observations. To match the treated with the non-treated, there is a need to choose a matching algorithm (Baser, 2006). Hence, the success of PSM hinges critically on the data available, as well as the variables used for matching (Diaz and Handa, 2004). The estimated propensity score (PS), for subject e(X_i), (i = 1… N) is the conditional probability of being assigned to a particular treatment given a vector of observed covariates X_i (Rosenbaum and Rubin, 1983):

$$e(X_i) = P_r(Z_i = 1 \mid X_i) \quad (1)$$

$$P_r(Z_i, \dots, X_1, \dots, X_n) = \sum_{i=1}^{n} e(X_i^{z_i})(1 - e(X_i)^{1-z_i}) \quad (2)$$

Where, $Z_i = 1$ for treatment; $Z_i = 0$ for control; and X_i = the vector of observed covariates for the i^{th} subject.

The PSM is a probability, and it ranges in values from 0 to 1. PSM values are dependent on a vector of observed covariates that are associated with the receipt of treatment. In this study, PSM was used to evaluate the impact of urbanization on the consumption and asset of the peripheral farming community. If Y_1 denotes the potential outcome conditional on participation and Y_0 denotes the potential outcome conditional on non-participation; the impact of the program is given by;

$$\Delta = Y_1 - Y_0 \quad (3)$$

i. Estimating the propensity score (PS)

The PS is defined as the conditional probability of receiving a treatment given pre-treatment characteristics (Rosenbaum and Rubin, 1983). The PSs will be computed using binary logit regression models given as

$$P(X) = P_r(D = 1 \mid X) = E(D \mid X) \quad (4)$$

Where, D = (0,1) is the indicator of exposure to treatment characteristics (dependent variable). That is D = 1 if exposed to treatment and D = 0 if not and X is the multidimensional vector of observed characteristics (explanatory variables).

ii. Matching the unit using the propensity score

After the PS is estimated and the score computed for each unit, the next step is actual matching. In this study, we use kernel matching scores of similar individuals in the treated and control groups to construct the counterfactual subject. So, the kernel matching method was used to match in this study. One of this approach is the lower variance which is achieved because more information is used as compared to others (Caliendo and Kopeinig, 2008). The matching estimator is given as

$$\tau^m = \sum iET\{Y_i^T - \sum iETW_{ij}Y_j^I\} = {}^1/_{N^T}\{\sum iETY^T - \sum iET \sum iET \quad (5)$$

Where, i; E; T; Y_j^c denote the numbers of controls matched with observation and define the weights $W_{ij} = \frac{1}{N_i}$ and $W_{ij} = 0$, otherwise. M stands for the kernel matching, and the number of units in the treated group is denoted by N^T. One of the major advantages of this method is that the absolute difference between the estimated PSs for the control and treatment groups is minimized.

iii. Estimating the impact (average treatment effect on the treated)

The matched sample is used to compute the average treatment effect for the treated (impact). It is estimated as follows:

$$ATTE(\Delta | D = 1, X) = E(Y_1 - Y_0 \mid D = 1, X) = E(Y_1 \mid D = 1, X) - E(Y_0 \mid D = 1, X) \quad (6)$$

Where, D = 1 denotes households in the peri-urban area (participants) and X is a set of conditioning variables on which the subjects will be matched. Equation 6 cannot be easily estimated because of E (Y0 | D = 1, X). This part of the equation is the mean of the counterfactual and denotes what the outcome for the participants would have been had they not participated in the program (not-urbanized). Given that the conditional independence assumption and the common support assumption hold, they can estimate the effect of the treatment through the mean.

$$ATT = \frac{1}{N_1}\sum_{i=1}^{N_1} y_{1i} - \sum_{j=1}^{N_0} W_{ij}\, y_{0j} \quad (7)$$

A weighted average of all participants' outcome variables is subtracted from every non-participant outcome variable.

Where, $\sum_{j=1}^{N_0} W_{ij} = 1$, N_1 = number of participants; N_0 = number of non-participants; i = index of participant; j = index of non-participant; and W_{ij} = weights. The list of variables used in the estimation of propensity scores is listed in Table 2.

Table 2. Hypothesis and definition of the explanatory variables (co-varieties) in PSM model.

Variable	Definition	Measurement	Hypothesis
Head-age	Age of household heads	Years	Insignificant
Head-sex	Sex of household head	1 = male, 0 = otherwise	Significant
Head-educ	Literacy level of household heads	1 = if literate, 0 = otherwise	Significant
Family	Family size in adult equivalent	Number	Insignificant
Nonfarm	Participation in non-farm activity	1 = yes, 0 = otherwise	Significant
Livestock	Livestock in tropical units (TLU)	Number	Significant
Credit	Credit user	1 = user, 0 = non-user	Significant
Copp	Memberships in cooperatives	1 = yes, 0 = otherwise	Significant

Note: *Significant and insignificant refer to significant and insignificant variations between control and treated samples.*

3. Results and Discussion

3.1. Socio-economic Characteristic of Respondents

Of the total respondents, 16.5% were female and 83.95% were male household heads (Table 3). The result shows a statistically significant ($P < 0.01$) variation in sex composition between rural and peri-urban respondents. The implication may be the presence of better job opportunities in peri-urban areas that enable females to lead a household in the absence of male whereas in rural areas the available job is farming which is full of drudgery that requires to find male spouse to lead the household.

The average age of the sample household head was 50.36 years with a maximum of 90 and a minimum of 21 years. There was no significant average age variation between rural and peri-urban sample households. In terms of education level, about 43%of the samples were found to be non-literate (illiterate). At the country level, the non-literacy rate is 48.2 in 2017 (UNESCO, 2021). The trend of non-literacy has been declining. For example, CSA and ICF (2016) indicated that the percentage of women with no education decreased from 77% in 2000 to 49% in 2016, while the percentage of men with no education declined from 62% in 2000 to 35% in 2016. In this study, there was no significant variation in education status between rural and peri-urban respondents. At the country level, the story is quite different. The illiteracy rate in urban areas is about 22% against 60.5% in rural areas (CSA, 2012). Similar status in education between rural and peri-urban in this study is because the rural samples are located near towns that could have similar access to education.

The mean household size of the sample respondents in terms of adult equivalent was 5.46 with a minimum of one and a maximum of 11.35. The result also shows that there was no statistically significant difference in household size between rural and peri-urban sample respondents. The number of dependent household members might have an important implication on the welfare of a given household. Hence, in terms of household dependency ratio, rural households had more dependency ratio (age <15 years) meaning more children than the peri-urban samples and it was statistically significant indicating that there could be more burden on rural than peri-urban households' welfare. In terms of the dependency ratio greater than the age of 65 years, no variation was found between rural and peri-urban samples.

Credit, whether it is in kind or cash, is one of the important services that enable respondents to improve the performance of the existing activities or involve in alternative business activities for better welfare. The survey result in Table 3 shows that 46.67% of the sample households obtained credit. About 44% of the sample households received credit during the last five years. Cash credit users on average received 14,679 Ethiopian Birr (ETB) with a minimum of 300 and a maximum of 130,000 ETB. No significant difference was observed in credit use between rural and peri-urban households.

Membership in cooperatives, either producers' or consumers' cooperatives are also important for respondents to be benefited from the services. The result shows that greater than half (55.6%) of the sample household heads were members of cooperatives. There was significant ($P < 0.01$) variation in cooperative membership between rural and peri-urban respondents. This may be because cooperatives in the study area may focus more on providing production inputs mainly for rural people.

Table 3. Profile of both rural and peri-urban respondents.

Variable	Rural (N=214)	Peri-Urban (N=191)	Total (N=405)	t/χ^2-test
	Mean/percent	Mean/percent	Mean/percent	
Sex: (1=female)	10.75	21.99	16.05	9.47***
Age	50.18 (13.86)	50.56 (11.58)	50.36 (12.82)	0.296
Education: (1=literate)	56.07	57.59	56.79	0.095
Household size	5.47 (1.91)	5.45 (1.81)	5.46 (1.87)	.073
Dependency ratio: <15	0.38 (0.012)	0.31 (0.014)	0.35 (0.009)	3.81***
>65 age	0.031 (0.006)	0.036 (0.007)	0.033 (0.005)	0.56
Credit use: (1= users)	44.39	49.21	46.67	0.94
Amount cash credit	12013.57	17255.56	14679.00	2.025**
Cooperative: (1=yes)	76.64	31.94	55.56	81.66***
Non-farm activity: (1=yes)	31.78	43.98	37.53	6.41**

Note: *Figures in parenthesis are standard deviation; and *, **, and *** refer to statistical significance at 0.1, 0.05, and 0.01probability level, respectively.*

Compared to rural households, peri-urban households are expected to involve more in non-farm activities. As expected, more peri-urban households (43.98%) were involved in non-farm activities which had a statistically significant difference ($P < 0.05$) with rural households' non-farm participation (31.78%). Among non-farm activities daily laborer, trading, civil servant, and carpentry are among important activities in their order of importance (Table 3).

3.2. Expenditure and Asset Holding of Households

Rural and peri-urban households' welfare was measured in terms of monthly consumption expenditure per adult equivalent, and asset holding. Consumption expenditure was categorized under food, home furniture, education, and miscellaneous including cloth, electricity, water, communication, and transport expenditure. The average monthly consumption expenditure per adult equivalent was found to be 1236 ETB (Table 4). No significant variation was observed in total expenditure between rural and peri-urban respondents. However, disaggregated consumption expenditure can better explain whether there was variation in expenditure between rural and peri-urban households. On average, sample respondents spent about 1070, 7, 95, and 64 ETB per adult equivalent for food, home furniture, miscellaneous, and education per month, respectively. There was no variation in monthly food consumption expenditure between rural and peri-urban households. Expenditure for home furniture and miscellaneous were significantly ($P < 0.01$) higher for peri-urban

respondents than rural counterparts. The result was as expected that urban dwellers spent more on home furniture, water, and electricity which are important implications for better welfare.

Education expenditure had contrary results to the expectation. Rural households spent more on education, more than double of their peri-urban counterparts. The result may be attributed to the fact that students of rural households follow their education in schools found in urban areas, especially high school and above, far from their parents which requires them to stay away from their family which in turn needs a high cost of living including house rent and food expenditure. Unlike the rural students, students of peri-urban households attend their education with their family which does not require additional cost. Hence, education expenditure, in this case, cannot be considered as a welfare measure. Because high expenditure for education does not imply better welfare. Therefore, total expenditure less education expenditure was used as a measure of welfare for sample households in this study.

Table 4. Expenditure difference between peri-urban and rural households.

Type of expenditure	Monthly mean expenditure per adult equivalent (ETB)			t-value
	Rural	Peri-Urban	Total	
Food	1043.2 (845.2)	1099.6 (626.9)	1069.8 (748.8)	0.76
Home furniture	2.16 (19.3)	11.8 (26.37)	6.71 (23.38)	4.23***
Miscellaneous (Cloth, electricity)	72.53 (37.8)	120.94 (93.6)	95.36 (73.89)	6.96***
Education	82.19 (145.68)	43.16 (105.8)	63.78 (129.86)	3.05***
Total expenditure	1200 (856.78)	1275.5 (694.66)	1235.63 (784.5)	0.97
Total expenditure less education	1117.87 (854)	1232.33(666.1)	1171.85 (772.3)	1.49

Note: *Figures in parenthesis are standard deviation; and *** refers to statistical significance at 0.01 probability level. Average exchange rate of 1USD = 29.5 Ethiopian Birr in 2019.*

Holding of assets, relatively fixed or long-lasting, was considered as one of the welfare measures in this study because they are helpful for continuous earnings. Of those assets, urban homes other than households living in, livestock, land holding and other fixed assets such as Bajaj, cart, and mill were taken as an important measure of the welfare of the household. About 22% of sample households had at least one urban home excluding the home households are living in (Table 5). Peri-urban samples had a more additional home (28.7%) than the rural samples (16.36%). This considerable figure was found perhaps rural households residing near urban areas would be motivated to build home in an urban area with future expectations of inclusion to be urban dwellers. About 25% of peri-urban respondents had other fixed assets such as carts, mills, and Bajaj whereas rural households had very low such assets, less than one percent.

Table 5. Difference in asset holding between peri-urban and rural households.

Type of asset	Rural	Peri-Urban	Total	t-value
Owning additional urban home (% of HHs)	16.36	28.27	22.19	8.36***
Other Assets (Bajaj, cart, mill) (% of HH)	0.93	25.13	12.35	54.60***
Number of livestock owned (mean)	6.30 (3.73)	5.60 (3.31)	5.90 (3.55)	1.90*
Land holding in hectare (mean)	1.40 (0.05)	1.10 (0.04)	1.26 (0.03)	3.60***

Note: *Figures in parenthesis are standard deviation; and * and *** refer to statistical significance at 0.1 and 0.01 probability level, respectively.*

Livestock provides both rural and peri-urban households food (meat, milk, and milk products), manure, traction, means of transport, fuel energy, prestige (enhance social capital), and cash income used mainly for the purchase of agricultural inputs, consumable crops and other goods. As indicated in Table 5, sample households' average livestock holdings measured in Tropical Livestock Unit (TLU) was about six. Rural and peri-urban sample households significantly ($P < 0.1$) varied in livestock holding indicating that most of the peri-urban households are still involved in farming. The result is consistent with the findings of a study by Leulsegged Kassa *et al.* (2011) that 83% of peri-urban dwellers around Addis Ababa depends on agriculture as a source of livelihood strategies. Similarly, Demisie Gebremichael *et al.* (2014)

indicated that peri-urban agriculture in Addis Ababa contributes a lot in ensuring diverse diets for city residents.

With regard to land holding, rural households possessed more land, on average 1.4 hectares than peri-urban households which possessed on average 1.1 hectares. The difference was statistically significant ($P < 0.01$). However, the land size of the peri-urban households was quite considerable perhaps because some peri-urban areas may not be yet under settlement. Hence, peri-urban households may have an opportunity to engage in agricultural production and urban product market which has an implication on their welfare.

3.3. Impact of Urbanization on Welfare of Households

3.3.1. Estimation of propensity score

The first step in impact analysis using PSM is to estimate the propensity score, which is the probability of households to be included as peri-urban or rural dwellers conditional on observable variables. To generate the propensity scores for the matching process, the logit model was used. The estimated propensity scores (PS) varied between 0.0645 and 0.926 (with a mean of 0.35) for rural households and between 0.102 and 0.948 (with a mean of 0.61) for peri-urban (treated) households. The common support region would then lie between 0.102 and 0.926. In other words, households whose estimated PSs are less than 0.102 and larger than 0.926 are not considered for the matching exercise. In addition, the highest density of the PS for peri-urban samples is located between 0.6 to 0.8 whereas, a much dense observation for rural households lies around 0.2 indicating the presence of large variation in propensity score between rural and peri-urban samples (Figure 2). This observation ensures the need for matching covariates to obtain similar ground of treated and non-treated observations.

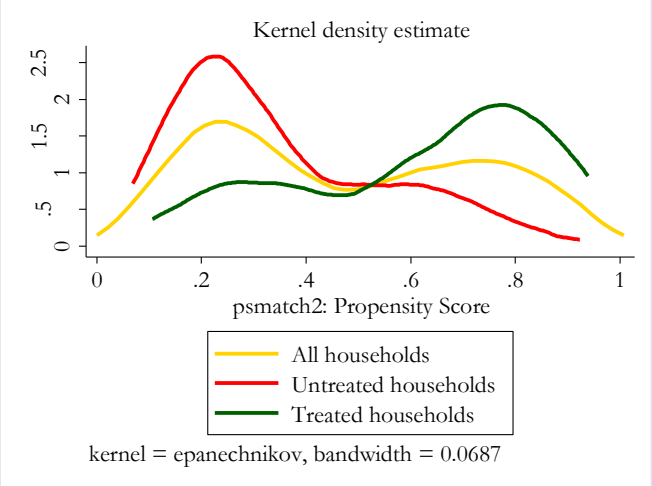

Figure 2. Distribution of propensity scores before matching.

3.3.2. Choice of matching algorithm

Alternative matching estimators were tried in matching the treatment and control households to obtain the best matching algorithms. These alternative matching algorithms were among the nearest neighbor, caliper, and kernel methods. The final choice of the best matching estimator was guided by different criteria such as equal means test referred to as the balancing test as stated in Dehejia and Wahba (2002), pseudo-R^2, and matched sample size. Specifically, a matching estimator, which balances all explanatory variables (results of insignificant mean differences between the two groups), bears a low pseudo-R^2 value, and results in a large matched sample size, is preferable. After looking into the results, it had been found that kernel with bandwidth 0.1 is the best estimator for the data at hand because the result of this estimator yields low pseudo-R^2, better balancing test result (after matching all variables were statistically insignificant), and large matched sample size.

3.3.3. Propensity score and covariate balancing

After choosing the best performing matching algorithm, the next task in the PSM method is balance checking after matching to ensure similar distribution of covariates among treated and non-treated samples

to get the effect of treatment on the outcome variable. The balancing power of the estimations is ascertained by considering different test methods such as the reduction in the mean standardized bias between the matched and unmatched households, equality of means using *t*-test, and chi-square test, Pseudo R^2, and reduction in mean bias for joint significance for the variables used.

The power of the covariate balance test can be observed from the results of joint significant of variables indicated in Table 6. The results compare different balancing parameters before and after matched samples. As indicated in Table 6, after matching, a lower mean bias, smaller Pseudo R^2, and insignificant LR Chi^2 (jointly insignificance difference among peri-urban and rural households about selected covariates) were observed. Thus, the results clearly show that the matching procedure can balance the characteristics in the peri-urban and rural household groups. This allowed us to compare observed outcomes, welfare in terms of expenditure per adult equivalent, for peri-urban dwellers with those of a comparison group sharing common support.

Table 6. Balancing test result for overall variables.

Tests	Expenditure	
	Unmatched	Matched
Pseudo R^2	0.202	0.003
LR Chi^2	112.87	1.49
P>Chi^2	0.000	0.983
Mean bias	25.0	3.30

3.3.4. Average treatment effect on the treated (ATT)

Here, after the matching algorithm was selected and the balance among covariates was confirmed, the next task was to evaluate the urbanization impact on household's welfare (consumption expenditure). The result of ATT in Table 7 shows that urbanization had a significant effect on the welfare of urbanized households with significant t-statistics at a 5% significant level. The average monthly consumption expenditure per adult equivalent of peri-urban households was higher by 33.8% compared with the average consumption expenditure of rural households. A similar finding was found by Kibrom Abay *et al.* (2019) which concluded that urban growth, mainly expansion of small rural towns in Ethiopia, is associated with significant welfare improvement.

Table 7. Average treatment effects on the treated (ATT).

Outcome variable	Treated	Controls	Difference	SE	T-value
Total expenditure per adult equivalent (ETB)	1234.47	922.57	311.90	116.71	2.67**

Note: ** *refers to statistical significance at 0.05 probability level. SE = Standard error.*

4. Conclusion

The results of this study have demonstrated that, consumption expenditure on home furniture and miscellaneous items were significantly ($P < 0.01$) higher for peri-urban respondents than rural counterparts. It means that peri-urban dwellers had better income to purchase furniture for their home and better access to quality water, electricity and transport services while the low expenditures for rural households indicate no or low access for such services to purchase it. In addition, no variation was observed in food consumption expenditure between rural and peri-urban households. This similarity may be the relative income inelastic nature of food items. The PSM result also shows that average monthly consumption expenditure per adult equivalent of peri-urban households was higher by 33.8% compared with rural households. Peri-urban respondents had also more fixed assets than rural households that would imply earning better income. All these results indicate that peri-urban households expend more for goods and services that are important implications for better welfare. Hence, urbanization improved economic welfare of urbanized farm households. Therefore, it is recommendable to continue urban expansion laterally through the inclusion of rural *farmer associations* found at the periphery of urban areas. Finally, some future research that can capture benefits from public services, psychological and cultural effects could broaden the effect of urbanization on newly urbanized households.

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