Chapter 14

TEFF CONSUMPTION IN URBAN ETHIOPIA

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The proportion of households regularly consuming teff constitutes 66 percent of the whole Ethiopian population (Berhane, Paulos, and Tafere 2011).[1] The figure reaches as high as 89 percent in Ethiopia's major urban areas (EUSS 2009). Teff appears in different colors (superwhite, white, mixed, and red), and these are used as indicators of quality and hence market value by producers, traders, and consumers (Minten et al. 2013). As discussed in this chapter, despite the rapid food price inflation Ethiopia experienced during 2004 through 2009, the quantity of teff consumed by households in urban Ethiopia changed very little, suggesting that price inelasticity of demand exists for teff.

Although teff is consumed by a large proportion of urban Ethiopian households, little is known about teff consumption patterns, the nutritional contribution that it provides in the diet of urban Ethiopians, and the socioeconomic characteristics of urban households that consume teff. This chapter uses unique household-level data—the Ethiopian Urban Socio-economic Survey (EUSS)—collected in 2000, 2004, and 2009 to explore the trends and correlates of teff consumption in urban Ethiopia. The relatively long panel data that is available spans a decade. Consequently, it provides established information to investigate trends in teff consumption over time and to estimate the role of the different correlates relatively accurately. Analysis of the patterns and correlates of teff consumption, covered in this chapter, potentially provide important information to build understanding and knowledge of the food culture of Ethiopia's urban population and to investigate the scope for interventions that aim at reducing food poverty.

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Following a brief description of the EUSS panel on which this analysis is based, this chapter investigates the role of teff in the total household food consumption basket in urban Ethiopia. Further on, the chapter presents a descriptive analysis of the patterns of teff consumption, disaggregating household teff consumption by time, place of residence, and income group. The chapter then continues to analyze the correlates of teff consumption using alternative linear panel data models. The chapter concludes with a discussion about the importance of interventions that could alter the consumption basket of the average urban Ethiopian household to reduce food poverty.

Data and Descriptive Statistics

Data Description

The research covered in this chapter uses three rounds of the EUSS—a panel dataset collected in 2000, 2004, and 2008/2009.[2] The first two rounds were collected by the Department of Economics of Addis Ababa University in collaboration with the Department of Economics, University of Gothenburg, Sweden. Originally, the survey covered seven major cities in Ethiopia—the capital Addis Ababa, Awassa, Bahir Dar, Dessie, Dire Dawa, Jimma, and Mekelle—which were believed to represent the major socioeconomic characteristics of the Ethiopian urban population. The sample of approximately 1,500 households were allocated to each city in proportion to the population size of each specific city. Once the sample size for each city was determined, the allocated sample size was distributed over all woredas (districts) in each city. Households were then selected randomly from half of the kebeles (the lowest administrative units) in each woreda, using the registration for residences available at the urban administrative units.

The final round of the survey was conducted by the authors from a subsample of the original sample covering four cities—Addis Ababa, Awassa, Dessie, and Mekelle—comprising 709 households in late 2008 and early 2009.[3] The cities were selected carefully to represent the country's major urban areas and to link with the original sample. All panel households in the three smaller cities and about 350 in the capital Addis Ababa were surveyed following

2 Data was also collected from these cities in 1994, 1995, and 1997. However, the data required extensive cleaning. As a result, it was decided to use the three rounds from 2000 on. Refer to Bigsten and Shimeles (2008) for details on sampling.

3 Other cities were not included in this round because of resource constraint.

the sampling procedure discussed in the preceding paragraph. Of the 709 households surveyed in the 2009 round, 128 were new households randomly included in the survey to check how representative the panel households were, which were formed back in 1994. Alem and Söderbom (2012) investigated this and did not find a statistically significant difference in welfare among the panel and the new households, which implies that the panel data represents urban Ethiopia reasonably well.

In addition, given the fact that the number of households surveyed in 2009 had to be reduced, having concern about the possibility of attrition bias was entirely feasible. Using attrition probits and BGLW (Becketti, Gould, Lillard, and Welch) tests, Alem (2015) undertakes a thorough investigation of the possible impact of attrition bias.[4] The conclusion of this investigation suggests that the data attrition does not result in a statistically significant bias in the sample. The dataset is comprehensive and documents information on household living conditions, income, expenditure, demographics, health, educational status, occupation, asset ownership, and other variables at the household and individual levels. In addition, the 2009 round includes new sections on shocks and coping mechanisms, government support and institutions. We decided to use these data for this analysis given that these data are of very high quality, that they were the only panel data in urban areas at the time of the writing of this chapter, and that detailed consumption information on teff was contained in the survey instruments.

Descriptive Statistics

This section presents some key descriptive statistics related to teff consumption in urban Ethiopia. The EUSS collected comprehensive information on both food and nonfood purchases and consumption in a monthly and weekly basis. Food items were purchased both in standard units and local units. Fortunately, about 98 percent of teff in urban Ethiopia was purchased in standard units (kilograms and quintals). Quantities of other food items (such as vegetables and spices, which were purchased in local units) were converted into standard units using carefully constructed conversion units. In order to be able to compare monetary values over time and across cities, all nominal expenditures were converted into real values using reliable price indexes constructed from the survey. The values of consumption of the different food items were thus adjusted for both spatial and temporal price differences using

4 Attrition bias in this context is possibly the result of the reduction in the sample size of the number of households surveyed in 2009.

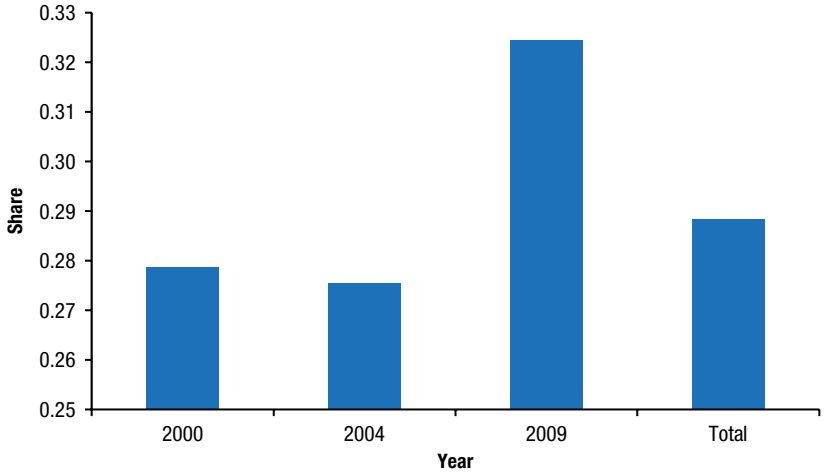
1994 prices of the capital Addis Ababa as the base year price. To compute average values per household, the household size was taken into account for economies of scale and of differences in needs. These computations used adult equivalent units (AEU) based on Dercon and Krishnan (1998).[5]

Figures 14.1 and 14.2 show the share of real per capita expenditure for teff and other food items respectively. The importance of teff in the average urban Ethiopian food basket is clearly evident from both figures. On average, teff constituted 29 percent of total household food expenditure over the period under analysis. When compared to rural households, this figure is only 6 percent (Berhane, Paulos, and Tafere 2011). The budget share of teff in urban Ethiopia actually remained the same during 2000 and 2004; however, the figure increased to about 32 percent in 2009—the period in which Ethiopia experienced rapid but inflationary economic growth. Figure 14.2 further displays the budget share of other food items. The figure also confirms the importance of teff as the dominant cereal and food item for the average urban Ethiopian household. The budget share of all food items shows that there is little change over the 2000–2009 period. Wheat follows teff by comprising about 6 percent of the budget share of food, while maize represents only about 2 percent. Households spend about 33 percent of their food budget on other food items, such as spices, sugar, and edible oil; 13 percent on animal products, such as butter and meat products; 10 percent on fruits and vegetables; and 8 percent on pulses, such as lentils, beans, and chickpeas. Urban Ethiopian households on average spend about 71 percent of their total budget on food. This illustrates how low the level of standard of living is within urban Ethiopia.

The actual amount of teff purchase by year on a per capita basis is presented in Figure 14.3. Teff purchase remained much the same over the decade under analysis. Households purchased about 9.2 kilograms of teff in per adult equivalent terms per month in both 2000 and 2009. According to the results shown in Figure 14.4, the nominal price of teff nearly tripled between 2000 and 2009. The real price of teff remained unchanged during 2000 through 2004, but it increased by about 24 percent between 2004 and 2009 (from 2.42 per kilogram to 3.18 per kilogram). This provides *(text continues on page 359)*

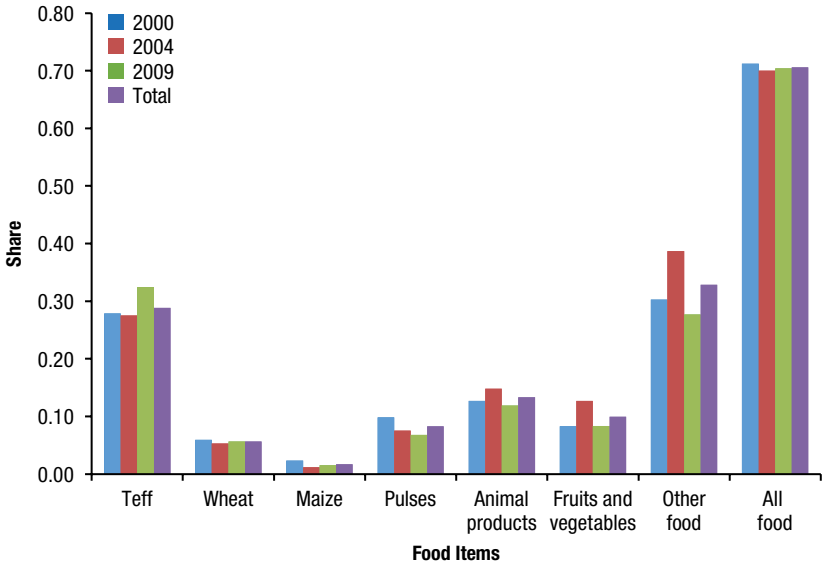
5 It is to be noted that injera purchases were not accounted for in this teff consumption analysis. Although caution in interpretation is warranted, we believe that this was the most appropriate way for our analysis for two reasons. First, teff is still mostly bought in grain form and while the situation is quickly changing (Minten et al. 2016), injera markets at the time of the surveys were still relatively less important. Second, as it is not clear how much teff went into injera (given the mixing with different cereals), converting the purchased injera to teff is not straightforward and therefore prone to measurement error.

FIGURE 14.1 Budget share of teff in total food expenditure, 2000–2009



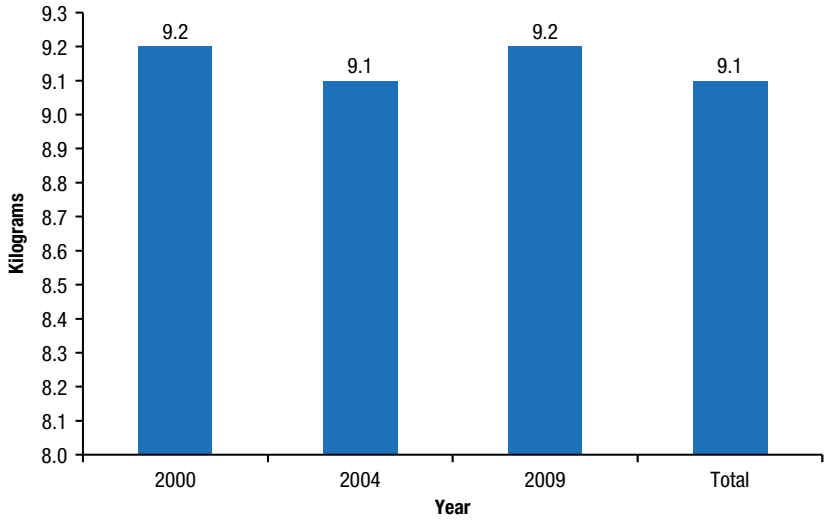
Source: Authors' calculations from EUSS 2000–2009.

FIGURE 14.2 Budget share of different food items in total food expenditure, 2000–2009



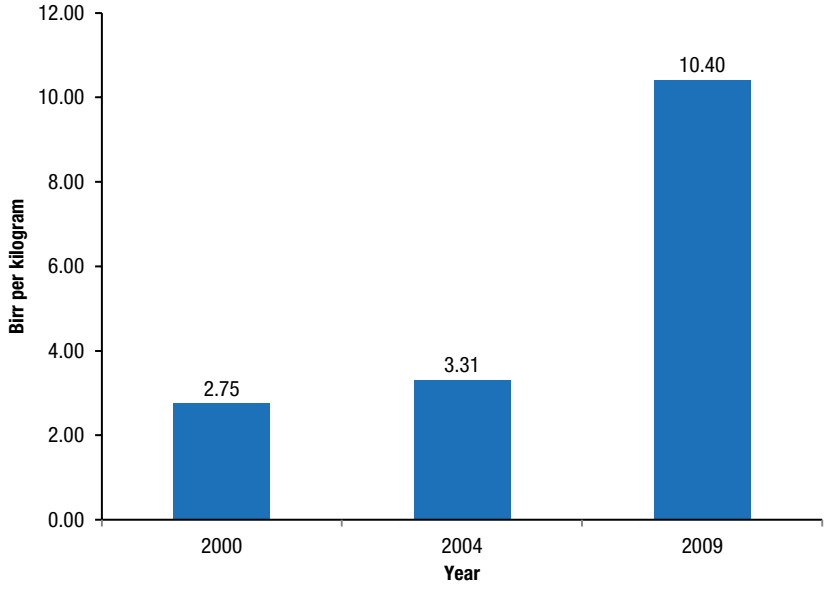
Source: Authors' calculations from EUSS 2000–2009.

FIGURE 14.3 Quantity of teff purchase per month in adult equivalent units (AEU), 2000–2009 (kilograms)



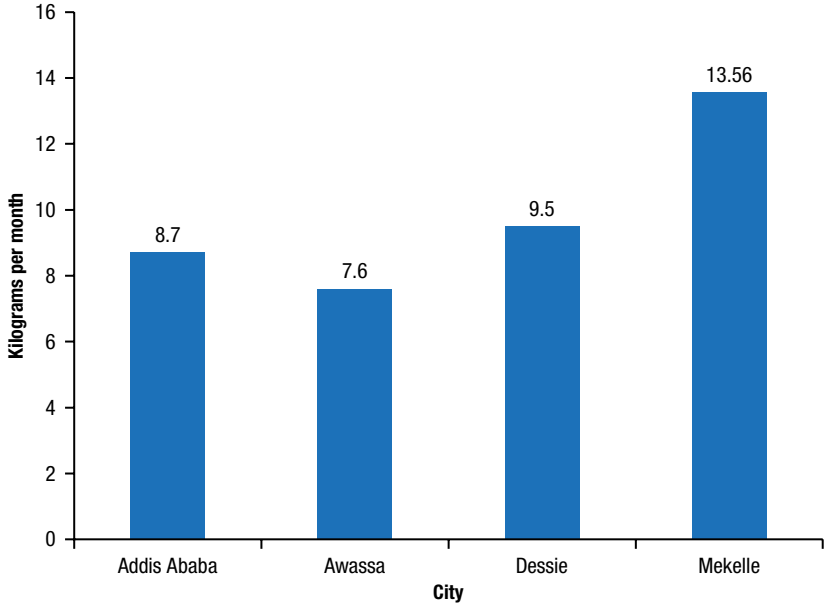
Source: Authors' calculations from EUSS 2000–2009.

FIGURE 14.4 Average price of teff, 2000–2009 (birr per kilogram)



Source: Authors' calculations from EUSS 2000–2009.

FIGURE 14.5 Quantity of teff purchased per month in kilograms by city, in adult equivalent units (AEU)

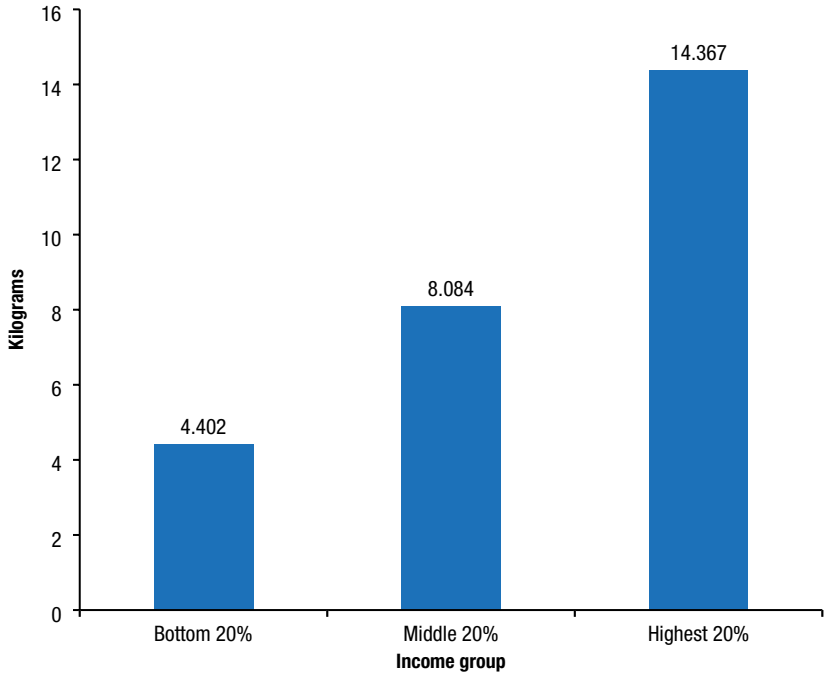


Source: Authors' calculations from EUSS 2000–2009.

suggestive evidence that teff is a price-inelastic food item with little change in quantity consumed even when price increases significantly. The teff consumption pattern appears to differ by city as well, as Figure 14.5 illustrates. Households in Mekelle on average purchased (consumed) 13.56 kilograms of teff per month in terms of per adult equivalent units. This represents, for example, 55 percent more consumption than households in Addis Ababa, and 78 percent more than households in Awassa. This probably indicates the diversity of food items consumed by households in Addis Ababa and Awassa.

Finally, as seen in Figures 14.6 and 14.7, teff purchase notably varies across income groups measured by per capita consumption expenditures. Figure 14.6 shows that the poorest 20 percent of households on average consume about 4.4 kilograms of teff per capita per month, while the households in the top 20 percent of the income distribution consume about 14.37 kilograms per capita per month. This provides some evidence that teff is an economically superior staple whose demand increases with income. The high price of teff, which on average is more than twice the price of maize (the cheapest cereal), partly explains the lower consumption by the poorest section of the urban

FIGURE 14.6 Teff purchase per adult equivalent units (AEU) by income group (kilograms)



Source: Authors' calculations from EUSS 2000–2009.

community (Minten, Stifel, and Tamru 2012). It is, however, evident from Figure 14.7 that although the top 20 percent of households consume more than three times those of the bottom 20 percent, the proportion of food budget that is allocated to teff is far lower than the bottom 20 percent. This is probably due to the fact that the richest 20 percent of households consume other food items and nonfood items more proportionately.

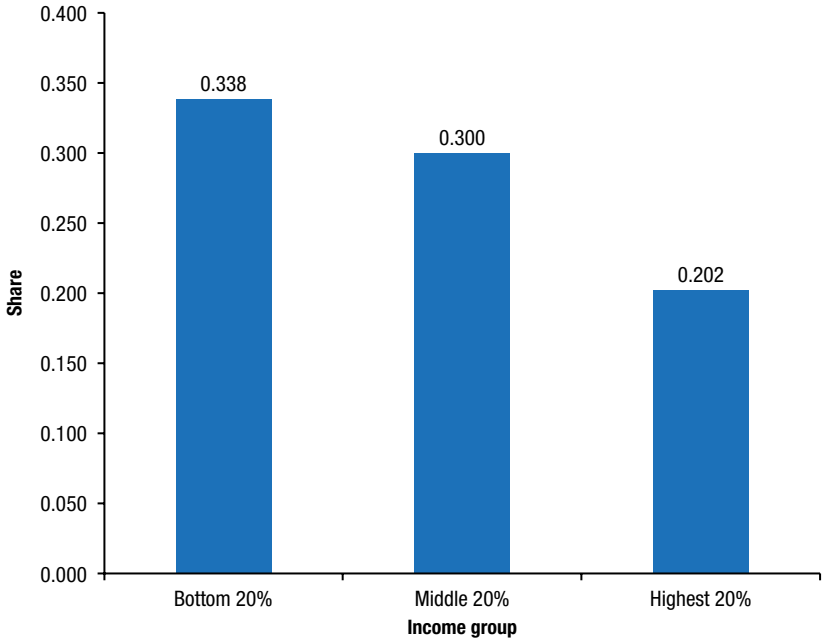
Econometric Results

To investigate the different correlates of teff consumption during the period under analysis, a linear model of per capita teff consumption is run, specified as

$$f_{it} = x_{it}\beta + c_i + u_{it} \qquad (1)$$

where f_{it} is monthly per capita teff consumption in kilograms; x_{it} is a vector of explanatory variables; c_i is a term capturing unobserved household

FIGURE 14.7 Teff budget shares by income group (%)



Source: Authors' calculations from EUSS 2000–2009.

heterogeneity; and u_{it} is a normally and independently distributed mean 0 error term. The subscripts $_i$ and $_t$ refer to households and time periods, respectively. The fundamental problem that one faces in estimating equation (1) using Ordinary Least Square (OLS) is the possible correlation between x_{it} and c_i. If such a correlation does not exist, that is, if $E(x_{it}c_i) = 0$, OLS would be consistent. However, with this assumption fulfilled, the random effects model, which works in a Generalized Least Square (GLS) framework and which exploits the correlation of $\varepsilon_{it} = c_i + u_{it}$ over time, would yield a more efficient estimator of the parameters in β. If, however, x_{it} and c_i are correlated, which is often the case in applied research, one could use the fixed effects model, which enables estimation through a "within" transformation. One limitation of this estimator, however, is that the coefficients of the time-invariant observable variables cannot be identified, as they are dropped through the "within" transformation. The model provides the most robust parameter estimates if the interest is on the time-varying variables (Wooldridge 2010). If one needs to identify the coefficients of the time-invariant variables, the most appropriate

estimator would be the Hausman-Taylor two-stage estimator. The model is specified as

$$f_{it} = x'_{1it}\beta_1 + x'_{2it}\beta_2 + w'_{1i}\gamma_1 + w'_{2i}\gamma_2 + c_i + u_{it} \qquad (2)$$

where the x variables are time-varying and the w variables are time-invariant. The variables with index 1 are assumed to be uncorrelated to both the unobserved household heterogeneity term c_i and the random error term u_{it}, while the ones with index 2 are correlated with c_i but not with u_{it}. Hausman and Taylor show that equation (2) can be estimated by instrumental variables using the variables in the model itself. x'_{1it} and w'_{1i} instrument themselves, x'_{2it} will be instrumented by $x'_{2it} - x'_{2i}$ that is, by its deviations from the individual means, and w'_{2i} will be instrumented by x'_{1i}. Identification requires that the number of variables in x'_{1it} is at least as large as that in w'_{2i} (Wooldridge 2010).

Teff consumption by households in urban Ethiopia is assumed to depend on a number of household-level variables such as income (proxied by consumption expenditure), household head characteristics, and other household members' characteristics.[6] The consumption measure that is used comprises both food and nonfood components. The nonfood part of consumption includes expenditures on items such as clothing, footwear, energy, personal care, utilities, health, and education. Total household consumption expenditure has also been adjusted for spatial and temporal price differences using carefully constructed price indexes from the survey. To take account of differences in needs and economies of scale in consumption, the aggregate consumption by standard adult equivalent units was divided.[7] Finally, because three rounds of panel data from four cities were used, the household fixed effects (time-invariant unobservables), city, and time fixed effects were controlled.[8] The specific variables used in the regressions are presented in Table 14.1.

Table 14.2 presents estimation results for teff consumption regressions from alternative linear panel data models for households in urban Ethiopia. To test for the robustness of the different correlates of teff consumption, the regression using four alternative econometric specifications are estimated: pooled Ordinary Least Squares (OLS), random *(text continues on page 365)*

6 Consumption is very often used as a proxy for income in the context of developing countries. This is mainly because income is often underreported and in many cases volatile and difficult to remember, while consumption is relatively stable and is smoothed using various consumption smoothing mechanisms. See Deaton (1997) and Deaton and Grosh (2000) for further discussion.

7 See Alem and Söderbom (2012) for details on computation of consumption.

8 It is to be noted that when households changed cities, they were not part of the panel anymore.

TABLE 14.1 Descriptive statistics of variables

Variable	Mean	Standard deviation
Monthly teff per capita in kilograms	9.14	7.94
Real monthly teff expenditure per adult equivalent unit (AEU)	24.05	21.96
Real monthly food consumption expenditure per AEU	97.62	102.89
Real monthly total consumption expenditure per AEU	154.52	183.07
Share of food in total consumption expenditure	0.71	0.14
Age of head	50.95	14.00
Head, male	0.54	0.50
Head, primary schooling complete	0.30	0.46
Head, secondary schooling complete	0.37	0.48
Head, tertiary schooling complete	0.08	0.27
Head, employer/own-account worker	0.24	0.42
Head, civil sector worker	0.13	0.34
Head, public sector worker	0.05	0.21
Head, private sector worker	0.10	0.30
Head, casual worker	0.10	0.30
Number of own-account members	0.18	0.50
Number of civil sector worker members	0.14	0.43
Number of public sector worker members	0.08	0.31
Number of private sector worker members	0.41	0.77
Number of casual worker members	0.16	0.52
Number of unemployed members	0.56	0.98
Number of out-of-labor-force members	1.55	1.40
Number of children members	1.50	1.45
Number of elderly members	0.05	0.23
Addis Ababa	0.71	0.45
Awassa	0.10	0.30
Dessie	0.09	0.29
Mekelle	0.10	0.29
Number of observations	2,979	

Source: Authors' compilation from EUSS 2004–2009.

TABLE 14.2 Teff consumption regressions

	Ordinary Least Squares (OLS)		Fixed effect (FE)		Hausman-Taylor (HT)	
Variables	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
Real consumption/adult equivalent units (log)	0.477***	0.024	0.351***	0.036	0.390***	0.033
Age of head	0.030***	0.007	0.026**	0.009	0.027***	0.007
Age of head squared	–0.023***	0.006	–0.021*	0.009	–0.022***	0.006
Head, male	–0.066*	0.034	0.104	0.071	–0.028	0.037
Head, primary schooling complete	0.073	0.042	–0.012	0.058	–0.001	0.056
Head, secondary schooling complete	0.099*	0.042	–0.022	0.062	0.029	0.059
Head, tertiary schooling complete	–0.096	0.065	–0.105	0.099	–0.018	0.092
Head, employer/own-account worker	–0.100*	0.042	0.043	0.067	–0.076	0.042
Head, civil sector worker	0.171***	0.046	0.057	0.093	0.152**	0.055
Head, public sector worker	0.170**	0.059	0.183	0.117	0.176*	0.075
Head, private sector worker	0.046	0.052	–0.05	0.087	0.017	0.057
Head, casual worker	–0.169**	0.062	–0.021	0.087	–0.164**	0.058
Number of own-account members	–0.085**	0.030	–0.015	0.043	–0.071*	0.029
Number of civil sector worker members	0.043	0.024	–0.014	0.047	0.037	0.035
Number of public sector worker members	0.032	0.043	–0.067	0.066	0.019	0.046
Number of private sector worker members	0.022	0.016	–0.013	0.030	0.023	0.019
Number of casual worker members	–0.089**	0.028	–0.064	0.041	–0.096***	0.029
Number of unemployed members	0.047***	0.013	–0.013	0.025	0.03	0.016
Number of out-of-labor-force members	0.035**	0.012	–0.008	0.018	0.024*	0.012
Number of children members	0.013	0.011	0.01	0.020	0.004	0.012
Number of elderly members	–0.049	0.060	–0.092	0.094	–0.064	0.062
Addis Ababa	–0.342***	0.057	—	—	–0.340***	0.061
Awassa	–0.533***	0.072	—	—	–0.514***	0.080
Dessie	–0.162*	0.066	—	—	–0.179*	0.079
Year 2004	–0.021	0.034	0.032	0.038	–0.022	0.032

	Ordinary Least Squares (OLS)		Fixed effect (FE)		Hausman-Taylor (HT)	
Variables	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
Year 2009	–0.124**	0.042	–0.104*	0.049	–0.138***	0.038
Intercept	–0.843***	0.223	–0.352	0.322	–0.279	0.266
Number of observations	2,921		2,921		2,921	
R-squared	0.24					
Rho			0.51		0.300	

Source: Authors' estimation from EUSS 2000–2009.

Note: OLS = Ordinary Least Square estimator with robust standard errors. FE = linear fixed effects estimator. HT = Hausman-Taylor two-stage estimator. Significance at the 1 percent, 5 percent, 10 percent level is indicated by ***, **, *, respectively; — = data not available.

effects, fixed effects (FE), and Hausman-Taylor (HT) models. The robust Hausman test rejected the random effects estimator and consequently these results are not discussed. However, the fixed effects regression drops time-invariant variables from the regression. The focus is therefore on comparing regression results from the OLS and Hausman-Taylor models.

Consistent with the descriptive statistics presented in Figure 14.6, all the regression results show that economic status, proxied by the log of real per capita consumption expenditure is an important correlate of teff consumption in urban Ethiopia. OLS results suggest that a 1 percent increase in per capita consumption expenditure is associated with 0.48 percent increase in teff consumption. However, the role of consumption expenditure declines when household fixed effects are controlled. According to the fixed effects and Hausman-Taylor models, a 1 percent increase in per capita consumption expenditure is associated with a 0.35 percent and 0.39 percent increase in teff consumption, respectively. This highlights the importance of controlling for household fixed effects and the advantage of having panel data. The results from all the regressions clearly show that teff is a normal food item, whereby consumption increases as income increases.

Turning attention to the role of household head variables, it is established that age, gender, and educational and labor market characteristics of heads affect teff consumption. However, only age of head and labor market status have statistically significant associations with teff consumption in the Hausman-Taylor model. Teff consumption is positively correlated with being headed by a civil and public sector worker individual, while it is negatively correlated with being headed by a casual worker individual. The positive

association of being headed by a civil or public sector worker with teff consumption is consistent with the negative association of being headed by these types of individuals with consumption poverty as documented by previous studies (for example, Alem 2015; Bigsten and Shimeles 2008). Household heads working in these sectors have relatively stable income streams and better access to savings and credit that enables a higher consumption, which includes teff, in the household. Teff consumption, however, is negatively correlated with a household headed by a casual worker individual. Casual workers depend on unstable and volatile income, which makes them vulnerable to poverty and shocks (Alem and Söderbom 2012). It is therefore not surprising that these households consume relatively less teff—a high-priced commodity that is consumed by the relatively well-off urban Ethiopian society.

Other characteristics pertaining to household members are also important correlates of teff consumption. Households with more own-account (self-employed) members and casual workers consume less teff, while those with more members out of the labor force consume more teff.[9] Casual workers depend on unstable and volatile sources of income for their livelihood, and about 67 percent of own-account worker household members in urban Ethiopia are engaged in low-paying and unstable jobs, such as petty trading and preparing and selling food and drinks. Given that teff is consumed by the relatively well-off households, it is therefore not surprising that households with members categorized as casual or own-account workers consume less teff. Alem (2015) shows that these types of households are highly likely to be in consumption poverty, but Alem, Köhlin, and Stage (2014) document that these types of households are less likely to feel "poor" although they are more likely to be in consumption poverty.

Finally, the spatial difference in teff consumption displayed in Figure 14.5 is also clearly evident in the regression results reported in Table 14.2. Compared with households residing in Mekelle (the reference group), households in all the three cities consume less teff in per capita terms. This may be because the city of Mekelle is located in the far north of Ethiopia, while the other cities are relatively close to the capital Addis Ababa, which gives them better access to more diversified food products and food culture. The coefficients on the time dummies indicate a slight temporal variation in teff consumption by urban Ethiopian households. Compared to 2000 (the base year),

9 This group constitutes household members such as housewives and pensioners that are not a part of the labor force and earn income from other sources such as international remittances and house rents.

teff consumption in 2009 declined by 13.8 percent. Ethiopia experienced the highest rate of food price inflation in its history in 2008. The average price of food in the summer of 2008 was 92 percent higher than the price of food in the summer of 2007 (Ethiopia, CSA 2008, 2009). The marginal decline in quantity of teff purchased in 2009 is therefore not surprising.[10]

Conclusion

Comprising a third of the total food budget, teff plays a significant role in the average urban Ethiopian household's diet. This chapter used a rich panel dataset—the Ethiopian Urban Socio-economic Survey—spanning the decade 2000–2009 to investigate the trends and correlates of teff consumption. Both descriptive and econometric analysis were used on the three rounds of panel data, then estimated alternative linear panel data models that control for time-invariant unobserved household heterogeneity. The results show that teff is consumed largely by the well-off households and its purchase seems to increase with income. Households headed by individuals with better labor market status seem to consume relatively more teff than those with poor labor market status, such as casual workers.

There seems to be a strong taste for teff among consumers in urban Ethiopia. Teff consumption barely changed during the period under analysis. Descriptive statistics show that urban Ethiopian households on average consumed 9.2 kilograms of teff per month both in 2000 and 2009, the period in which the price of teff increased nearly threefold. This fact indicates that households continued to rely on teff as a main source of carbohydrate in their diet even though the price of teff increased rapidly over this period and that teff consumption appears to be price-inelastic. Teff flour is considered to be nutritionally rich and healthy with similar amounts of protein and fiber as whole wheat flour, yet it provides more nutritional substances such as iron and is gluten-free (Baye 2014). As a result, relying on teff as a main staple may not be necessarily bad. However, given the fact that the proportion of urban households below the absolute poverty line is around 28 percent (Alem 2015), bringing more diversity to the average urban Ethiopian household's staple

10 The 13.8 percent decline in the quantity of per capita teff consumed by households displayed by the coefficient for the 2009 dummy does seem a bit contradictory with the descriptive statistics presented in Figure 14.3, which shows no change in the quantity of teff consumed. The coefficient for the 2009 dummy became significant once this was controlled for real per capita consumption expenditure, which is a measure of the economic status of households. In fact, given the fact that the price of teff increased by almost 280 percent during 2000–2009, the 13.8 percent decline in quantity purchased and consumed does not appear to be substantial.

basket through cheaper cereals would help improve calorific intake and reduce food poverty.

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