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Do Off-farm Work and Remittances affect Food Consumption Patterns? Evidence from Albania

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Abstract

Full-time working within agriculture is now relatively uncommon; many farm households are still active in the off-farm labor markets, in and outside the local economy. This paper examines the impact of a portfolio of off-farm incomes on food consumption patterns using Working-Leser framework, under two-stage budgeting, to isolate the off-farm income effect from the pure expenditure elasticities. This is analyzed for rural farm households in transitional Albania. The results indicate that food at home consumption has a positive and inelastic association with off-farm wage income, whereas, the response food away from home consumption is positive and highly elastic. Remittances generate the opposite effect on food consumption both at home and away from home, leading to reduction of food consumption. A disaggregated analysis reveals that off-farm wage income increases households' consumption of cereal-based foods at home; we find the opposite and significant effect for remittances. These findings should be of interest to policymakers in Albania, especially in designing poverty and nutrition programs.

JEL classifications: D12, D13

Key words: Off-farm work, remittances, income elasticities, nonlinear Engel curves, rural Albania.

Introduction

Empirical evidence unequivocally points to the existence of a large and heterogeneous off-farm[1] sector in rural economies (see e.g., de Janvry and Sadoulet 2001; Lanjouw 1999, 2001 Deininger and Olinto 2001; Escobal 2001).[2] Full-time work in agriculture seems to be relatively uncommon; many farm households are active in the off-farm labor markets. These include employment in the wage labor market, self-employment in the local off-farm sector, and employment as a migrant labor. This phenomenon is recognized in both developed and developing countries.[3] Motivation

[1] Most of these studies use off-farm work interchangeably with nonfarm work.
[2] See Winters et al. (2009), Haggblade, Hazell and Reardon (2010), and Davis et al. (2010) for a recent cross-country analysis of rural income-generating activities.
[3] For example, Mishra and Sandretto (2002) document that total off-farm income has helped to reduce the variability in total farm household income in the US.

for such an attempt to diversify income sources may include reducing household's income risk, financing farm investment, or improving nutrition and food security.

Reallocation of labor off the farm will have implications for household's utility and production decisions. For instance, a farm household with an off-farm income-generating activity may be able to manage food consumption fluctuations better than a farm household without such an activity, especially in rural areas where credit markets are missing or incomplete (Reardon, Matlon, and Delgado 1988; Reardon 1997). Furthermore, off-farm income could relax liquidity and credit constraints, and enable households to make productivity-enhancing investments on the farm. Reallocating household labor off the farm could also negatively affect farm production. For instance, Pfeiffer, López-Feldman and Taylor (2009) find that off-farm labor allocation is negatively related to agricultural production in Mexico. This is particularly true in an incomplete farm labor market, where the farm household is constrained in substituting the lost family labor. A third possible impact of off-farm income is likely on household's food consumption patterns. Off-farm income may increase a household's subsistence food consumption, or may enable farm households to afford a more diversified diet (Ruben and van den Berg 2001). On the other hand, off-farm income may also encourage increasing nonfood consumption expenditures, leaving household's food security status unaffected. Understanding the underlying relationships between income diversification via off-farm income-generating activities and household consumption patterns is crucial for policies aiming at maintaining food security.

This paper examines food consumption patterns and food security implications of off-farm income in rural transitional Albania. Using a nationally representative dataset, we estimate the impact of a portfolio of off-farm incomes on food consumption patterns using Working-Leser framework under two-stage budgeting assumption. We isolate individual effects of each source of

off-farm income on demand for different types of food. In the first stage, we examine the impact of migrant remittances and other off-farm incomes on expenditure shares of food at home (henceforth FAH), food away from home (henceforth FAFH), and total nonfood (henceforth TNF). Since evidence from transitional economies point to larger and increasing percentages of FAFH expenditures in the household budget (e.g., see Ma et al. 2006; Liu et al. 2015; Andrej, Jan and Marian 2015), separating FAFH expenditures from FAH expenditures makes sense from a policy perspective. Whether rural Albania farm households use the income they earn off the farm to consume relatively more food away from home has implications for nutrition outcomes and policy measures regarding food security. In the second stage of the two-stage budgeting, we analyze the impact of remittances and other off-farm incomes on six FAH groups: cereals, meat and fish, milk and dairy, fruits and vegetables (FV), fats and oil, and other miscellaneous FAH items (denoted "other FAH".) We hypothesize that different sources of off-farm incomes likely alter food consumption patterns in different ways, and that diversifying household income through off-farm employment may improve nutrition security in Albania by allowing rural households access to a more diversified and nutritious diet at home.

Food security status has been improving in Albania. Overall, stunting and wasting rates in children, and the percentage of underweight children has decreased in the last few years. However, this progress is not uniform across Albania with rural and peri-urban areas continuing to experience food insecurity. Major standard indicators of child malnutrition in rural Albania continue to exceed World Health Organization (WHO) thresholds (INSTAT and IPH 2012). Much of the underdevelopment in rural Albania can be traced to the dissolution of the Soviet Union in 1990, which triggered structural changes in the agro-industrial sectors of Central and Eastern European Countries (CEECs). When the state-subsidized farms and agricultural enterprises were

abolished, agricultural land in Albania was distributed among rural households, creating approximately half a million family farms averaging 1.1 hectares of farmland per household (Cungu and Swinnen 1999; Childress 2003).[4] Shifting from state ownership to private ownership of farmland was expected to lead to the emergence of more efficient commercial agriculture which would drive the rural economy. After over two decades of economic transformation, the outcome has been substantially different than expected (Ellman 2003).

Because most of the rural agricultural production in Albania remains subsistent and does not help rural farm households escape poverty, many farm households seek alternative income sources by diversifying into a portfolio of off-farm income-generating activities, including migration of household members to other places in and/or outside Albania[5] (Carletto et al. 2006; Kilic et al. 2009; McCarthy et al. 2009; Miluka et al. 2010). Therefore, it is not surprising that most national surveys, in Albania, point to cash-based sources of income as one of the main factors influencing food security in rural and peri-urban areas in Albania (e.g., see INSTAT and IPH 2012).[6] For Albania, we identify these off-farm income sources as wage income and self-employment income, named as *local* off-farm income, and private remittances, named as *migratory* off-farm income.[7] While private remittances can be classified as an off-farm income, it has some characteristics which differentiate it from those sourced from within the local rural economy—off-farm wage and self-employment income (Barret et al. 2001). Differentiating among

[4] In other CEECs, large-scale cooperatives, joint-stock companies, and limited liability companies still occupy an important share of farm lands (Cungu and Swinnen 1999).
[5] The dominant form of geographic migration in rural Albania is international migration primarily to Greece and Italy.
[6] On the supply side, Albania does not suffer from food supply problems as there are considerable food imports to supplement domestic production. The supply of many food groups, particularly dairy products and eggs, and fruit and vegetables, has been on an upward swing since the 1990s. As a result, most Albanians have access to a more diversified diet, especially in the urban areas. At the national level, the dietary energy supply is largely sufficient to meet the population's energy requirements (FAO, 2005).
[7] We use this classification system following Barret et al. (2001). Elsewhere local and nonlocal off-farm income has been used (see Seidu and Onel 2016).

the off-farm incomes, and analyzing their individual impacts is relevant for policy making. For instance, such a differentiated analysis permits one to judge how dependent the household is on the local economy and its vicissitudes in maintaining food and nutrition security. As a result, the key empirical question this paper seeks to answer is: do farm households' access to *local* and *migratory* off-farm incomes have different behavioral impacts on their food consumption patterns? Do they eat more at home or away from home? Conditional on at-home food expenditures, which nutritional food group is impacted the most? Answers to these questions should be of interest to policymakers in Albania, especially in designing poverty and nutrition programs. While much has been written on the production and productivity effects of off-farm income sources in Albania, very few studies have analyzed their impacts on food consumption behavior. Here, we provide a rigorous analysis of the impact of portfolio of off-farm incomes on food consumption patterns in rural Albania.

Literature on off-farm income and food consumption

The first, and direct, effect of off-farm work on food security status and nutrition of rural households is through income earned from off-farm work. Reardon, Matlon, and Delgado (1992) document that increased off-farm income in the Sahelian and the Sudanian villages of Burkina Faso insulate food consumption by rural households from broad swings. Ruben and van den Berg (2001) find that *local* off-farm income has significant and positive effect on the food adequacy of farm households in rural Honduras.[8] They report that a 10% increase in nonfarm income leads to a 0.3% in food adequacy. Similarly, Babatunde and Qiam (2010) find that *local* off-farm income

[8] The food adequacy used by the authors is an index, computed by dividing household food consumption by the daily calorie and protein requirement for the entire household. When the index is greater than one, food security is guaranteed.

has a positive net effect on nutrition in Nigeria.[9] Further, they find that prevalence of child stunting, underweight, and wasting is lower in households with off-farm income than in those without one.

A second effect of off-farm work on food security is potentially through its labor reallocation effects. Chang and Mishra (2008) find mixed results on how *local* off-farm work decisions of U.S. farm operators and their spouses affect their household's food consumption expenditures. Specifically, they find that while the operator's off-farm work decision is positively and significantly related to food consumption expenditure, the spouse's decision is negatively and significantly associated with food consumption expenditures. In Taiwan, Chang and Yen (2011) find that off-farm employment by a farm operator significantly increases expenditures on food consumed away from home, but decreases at-home food expenditures. In contrast, full-time employment of the spouse off the farm decreases FAFH expenditures. The spouse's part-time work off the farm is not found to have any significant effect on food consumption expenditures, both at and away from home. Further, Owusu, Abdulai and Abdul-Rahman (2011) report that participation in *local* off-farm activities is negatively associated with food stock decline during critical periods of food shortages for farm households in northern Ghana.[10] They argue that off-farm income might help households shore up food stocks during shortages. In addition, Mishra, Mottaleb and Mohanty (2015) report that off-farm income exerts positive and significant impact on food consumption expenditures among rural Bangladehsi households for all income quantiles, except, the 25th quantile where it is positive but insignificant. Seng (2015) finds that engagement in nonfarm

[9] The authors used amount of calorie supply per adult equivalent, in addition to other household anthropometric measurements.

[10] They used two food security proxy variables. One is a binary indicator that takes the value of one, if the household does not mortgage its standing field crops for current consumption during the farming season, and zero otherwise. The other food security proxy was measured as an indicator that takes the value of one, if the household's harvested food stock declines during critical periods of food shortages during the survey period, and zero otherwise.

income-generating activities exerts positive effects on food consumption per capita among rural Cambodian farm households.

As discussed above, migration is another source for off-farm income. There are a myriad of channels through which migration and remittances could affect household food and nutrition security (see Zezza et al. (2011) for an overview). Most studies differentiate the source of the remittances, i.e. whether they are sent by internal or international migrants. Castaldo and Reilly (2007) find that, in Albania, as international remittances increase, the budget allocated to food decreases.[11] Adams and Cuecuecha (2010) find that Guatemalan households receiving international remittances spend less at the margin on food than households receiving internal remittances compared to what they would have spent without any remittances. Karamba, Quiñones and Winters (2011) document that migration (both internal and international migration) does not affect overall per capita food consumption expenditures in Ghana, but has minimal positive effect on less nutritious food categories, such as, sugar and beverages, and food consumed away from home. On the other hand, in Tajikistan, international migration positively affects child growth through increased calorie intake (Azzarri and Zezza, 2011). Differentiating between duration of stay, Nguyen and Winters (2011) find that short-term internal migration has a positive effect on overall per capita food expenditures, per capita calorie intake, and food diversity compared to long-term internal migration among households in Vietnam.

Few studies have directly investigated the impact of off-farm work (including migration) and resultant income from these different activities on food consumption patterns of farm households. This paper contributes to the empirical literature by examining the food security

[11] They acknowledge, but do not address possible endogeneity of remittances variable.

implications of different off-farm incomes among farm households in rural Albania. This study differs from other related work on off-farm labor supply/food consumption linkages on two fronts. First, none of the studies reviewed above consider remittances as a off-farm income and evaluate impact of *local* and *migratory* off-farm income simultaneously. They are often analyzed separately in the literature on food security. The exception is Seidu and Onel (2016) who examine the impact of total *local* off-farm income and private remittances (internal and international remittances combined) on at-home food expenditures in Albania. This paper extends the empirical analysis in Seidu and Onel (2016) by disaggregating total *local* off-farm income into income from wage employment and income from self-employment to isolate their individual effects on food consumption patterns. We believe that expenditure shares of different food groups may be affected differently depending on the source of the income; thus, an aggregated income variable may conceal their relative significance in farm households' food security status. The empirical analysis includes expenditures on food consumed away from home, and disaggregated groups of food consumed at home. The level of disaggregation employed in the analysis is relevant for design of nutrition programs in rural Albania. Second, unlike most studies reviewed above, we use a continuous off-farm income variable rather than a binary variable indicating whether the household has a non-farm income. This allows us to more precisely capture the magnitudes of the impacts of different off-farm incomes on household food consumption expenditures.

Data and descriptive statistics

The data are from the widely used 2005 Albanian Living Standard Management Survey (ALSMS05), conducted by the Albania Institute of Statistics (INSTAT) with the World Bank. A total of 3840 representative households, covering 455 census enumeration areas were sampled

using stratified two-stage cluster sampling. The ALSMS05 included survey instruments with detailed information on household demographics, education, consumption expenditures, agricultural production, off-farm income-generating activities, and community-level characteristics. The *local* and *migratory* off-farm income variables, used here, are obtained from the Rural Income-Generating Activities (RIGA) database.[12] Both RIGA and ALSMS05 maintain unique household ID, which makes cross-referencing possible. Consistent with the RIGA dataset, we identify two main *local* off-farm income sources: (1) wage income, and (2) self-employment income. Wage income comes from mainly supplying household labor to wage-employment activities outside the family farm. Self-employment income, on the other hand, emanates from microenterprises, and other mobile or road-side activities owned by a member of the farm household. The *migratory* off-farm incomes are primarily private transfers from the households' migrants in and outside Albania. Other nonlabor income sources such as public transfers (mainly pension payments, social transfers, and nonfarm rental income) are also identified in the RIGA dataset.

For the expenditure data, we have focused on household budgetary allocation on a particular set of nondurable consumer goods and services. These household nondurable goods and services are divided between food and nonfood expenditures (see Figure 1). The food consumption data were collected by means of a 14-day diary. The diary contained information on four household food consumption patterns: purchased food items, non-purchased food items (own produced and received as gift), bulk purchases before the reference period, and food eaten outside. The first three items are classified as FAH, and the latter as FAFH for the first-stage budgeting analysis. We

[12] This is a joint collaborative effort by the Food and Agriculture Organization (FAO), the World Bank, and American University that combines data on sources of income from a variety of surveys, including ALSMS05. It covers nineteen countries in Eastern Europe, Asia, Africa, and Latin America. For details on the methodology of creating income aggregates for the RIGA database, see Quiñones et al. (2009).

disaggregate the *FAH* expenditures into six main nutrient groups—cereals, meat and fish, milk and dairy products, fruits and vegetables, fats and oil, and "other FAH"—for the second-stage budgeting analysis.[13] The nonfood expenditure category comprises household expenses on items such as personal care and services, alcohol, tobacco, clothing and footwear, education, and so on. After deleting observations with missing values, data on 1383 rural farm households are used for the empirical analysis.

To explore the relevance of off-farm income in household food consumption budget, Table 1 displays weighted off-farm participation rates and incomes across total food expenditure (in adult equivalent) quintiles.[14] The upper panel of Table 1 reports the participation rates. Overall, off-farm income-generating activities form an integral part of the Albanian rural economy, evidenced by the proportion of farm households with at least one off-farm income source (66%), and the participation rate increases across all total food expenditure quintiles. However, when we disaggregate off-farm participation rates into *local* and *migratory*, the pattern generally breaks down (upper panel Table 1), especially for wage employment. The lower panel of Table 1 displays average off-farm incomes, also, across the food expenditure quintiles. The distribution of total off-farm income across the food expenditure quintiles closely follows that of the participation rate. Disaggregating off-farm income into its different sources reveal an interesting pattern; incomes do not increase across all the food expenditure quintiles. Given the above, it begs the question: do the observed off-farm incomes lead the farm household to allocate greater share of household budget

[13] We follow the recommendation on healthy nutrition in Albania guidelines, published in 2008, and available at http://www.fao.org/3/a-as658e.pdf

[14] We use the modified OECD equivalence scales, which is available at http://www.oecd.org/eco/growth/OECD-Note-EquivalenceScales.pdf

to food expenditures? If so, which off-farm income matters most and which category of the household food budget is impacted most, as shown in Table 2?

Table 2 reports weighted means for the overall households, and mean difference test of food and nonfood expenditure shares for households with, and without any off-farm income sources. These are the dependent variables used for the empirical analysis. Comparatively, households with at least one off-farm income source allocate a smaller share of their total budget to total food expenditures than their counterparts with no off-farm income source (0.71 vs. 0.76). This is driven primarily by lower FAH expenditure share (0.68 vs. 0.75).[15] However, as expected, off-farm activity participation is associated with greater households' FAFH expenditure share (0.03 vs. 0.01). Similarly, households with at least one off-farm income source allocate greater share of their budget to nonfood expenditures (0.29 vs. 0.24). These differences are all statistically significant at the 1% level (see upper panel Table 2). Conditional on FAH expenditures, households with at least one off-farm income source allocate greater share of their expenditure to meat and fish, fruits and vegetables, and "other FAH" items. On the other hand, their counterparts without any off-farm income source allocate greater share of their FAH expenditure to cereals, milk and dairy, and fats and oil consumption. These differences are all statistically significant at the 1% level (see lower panel Table 2). This reveals the different nutritional affordability of the household, probably, depending on their position in the income distribution, which obviously has implications for households' nutrition security.

Table 3 shows the weighted means of the explanatory variables used for the empirical analysis. Evidently, farm households with off-farm income sources differ significantly from their

[15] This observation is consistent with Engel's law; as households' income increases, due to off-farm activity participation, budget share on food tends to decrease.

counterparts with no off-farm income sources. With regards to human capital, household heads participating in off-farm labor are significantly more educated (8.4 vs. 7.7 years). Education influences household choices of off-farm income activities (Taylor and Yunez-Naude 2000; Winters et al. 2009). Also, they have less household size, especially the number of children and elderly adults. Differences in household composition are likely to play a nontrivial role in the household food budgeting. Larger households are likely to enjoy economies of scale associated with meal preparation at home, and cost savings associated with larger package sizes. In terms of agricultural assets, farm households with off-farm income sources have less number of livestock unit than their counterparts without off-farm income sources. This is clearly reflected in their farm income earnings; households without off-farm income sources earn significantly more from farming (cropping and/or animal rearing) than their other counterparts (Table 3). These descriptive statistics inform the empirical framework employed below.

Econometric and estimation methodology

Empirical Framework

A simple household agricultural modeling framework is developed in this section as a basis for our empirical estimation.[16] Consider a farm household h that maximizes a one-period well-behaved, and twice differentiable utility function,

$$U = EU\left(C, \ell : \tau\right), \tag{1}$$

[16] This empirical framework is consistent with extant literature on income diversification (e.g., see Dercon and Krishnan, 1996; Reardon et al. 2000; Abdulai and CroleRees 2001; Wouterse and Taylor 1998), and the related literature on activity choice (e.g., see Just and Zilberman, 1983).

where E is the expectation operator, C is a vector of consumption goods, ℓ is household leisure (home time), τ is a vector of household and community-level characteristics influencing utility. The problem facing the household is to maximize (1) by choosing C and ℓ subject to a budget constraint,

$$PC = PQ_h + \sum_i Y_{ih} + A_h, \tag{2}$$

where P represents the prices of consumption goods, which are assumed, for no loss of generality, to be unitary. P_F represents the net price of farm output (Q)—crop and/or livestock—for household h. Y_{ih} represents income from off-farm activity i, for $i =$ wage-employment, self-employment, and migration for household h.[17] A_h is total nonlabor income (e.g. public transfers, social payments, and nonagricultural rental income) for household h. All households in our analysis are involved in agricultural production. Following Just and Pope (1978), Q is produced according to a stochastic production function using land (L_h) and farm labor $\left(l_{Fh}\right)$,

$$Q_h = f\left(L_h, l_{Fh} : \tau\right) + \vartheta, \tag{3}$$

where τ is a vector of household and community-level characteristics influencing agricultural production, and $\vartheta \sim N\left(0, \sigma_\vartheta^2\right)$ represents the stochasticity in agricultural production due to agro-climatic and other shocks. We assume further that $f'\left(l_{Fh}\right) > 0$ and $f''\left(l_{Fh}\right) < 0$. Equation (3) assumes that farm income is variable. If insurance markets do not exist, risk-averse farm households manage farm income variability through reallocation of the family's resources, including labor, from stochastic farm production to alternative income-generating activities, which

[17] Our modelling of migration, here, is grounded in the new economics of labor migration (NELM) theory (Stark and Bloom 1985). NELM argues that migration decisions are often made jointly by the migrant and by some group of nonmigrants. Hence, migration is not an individual decision, but rather a family decision.

are not perfectly correlated with farm income. Therefore, the farm household is assumed to have access to off-farm income-generating activities within and outside the local rural economy. Each off-farm activity generates a (net) income according to the following mapping,

$$Y_{ih} = \left[g\left(l_{ih} : \tau \right) \right] | \, \Omega_{ih} \, , \qquad \text{for all } i \tag{4}$$

where l_{ih} is household h's labor engaged in off-farm activity, *i*. Participation is conditional upon household h being able to overcome entry constraints, Ω_i, for activity i. Ω_i consists of household and activity-specific constraints, and may include factors such as capital to set up microenterprises or to finance a migratory episode, specific educational skills, and so on.[18] Therefore, farm households who have access to Ω_i can allocate part of their labor to activity i to earn a return, Y_i in addition to return from agricultural production. The absence of a near-perfect rural labor markets in transition economies imposes a labor constraint on the farm household,

$$T_h \geq \ell_h + l_{Fh} + \sum_i l_{ih} \, , \quad \text{for all } i \tag{5}$$

where T_h is the total labor available to household h. The constraint above suggests a potential trade-off between household agricultural production and off-farm activities. From the first-order conditions of the household's utility maximization problem, we derive

$$E_{Fh}\left[U_C P_F f_{l_F}\left(.\right) \right] \leq E_{ih}\left[U_C g_{l_i}\left(.\right) \right] | \, \Omega_{ih} \, , \qquad \text{for all } i \tag{6}$$

[18] Here, Ω_i is modelled as a function of the household's assets. The maximum assets available to the farm household may include migratory assets—remittances sent back home by migrants (Wousterse and Taylor 2008). Therefore, remittances, itself, can have a nontrivial impact on *local* off-farm activity choice and incomes. There is a growing body of works in the literature focusing on such linkages (e.g., see Funkhouser 1992, Taylor, Rozelle and de Brauw 2003, Amuendo-Dorrantes and Pozo 2006). For our data, and specifically in Albania, Seidu and Gulcan (2015), using the same dataset, find that remittances (from international migrants only) does not have any significant impact on *local* off-farm incomes. As a result, we proceed to assume that there is no simultaneity bias between the *local* and *migratory* off-farm incomes.

where $E_F[.]$ denotes expected marginal utility of farm income; $E_i[.]$ is the expected marginal utility of income derived from off-farm activity i, and everything is as defined before. Therefore, labor allocation of the farm household is optimized when equation (6) holds with equality for all i (s) chosen by the household. At the equilibrium, some households would have a portfolio of off-farm income-generating activities. The first-order conditions, at the equilibrium, can be solved to derive reduced-form equations, which relate the outcome (income) of participation in off-farm activity i to a set of household variables, entry constraints, and nonlabor income. This can be written as,

$$Y_{ih} = g(\tau, \Omega_i, A_h)\,, \qquad \text{for all } i \tag{7}$$

Substituting equation (7) into the cash constraint, equation (2), directly relates household consumption expenditures to household's farm and off-farm incomes, nonlabor income, and household and community-level variables. This can be expressed formally as:[19]

$$C = \varphi(Y_F, Y_i, A : \tau)\,, \qquad \text{for all } i \tag{8}$$

Two-stage budgeting and choice of functional form

We employ two-stage budgeting to estimate the impact of off-farm incomes on food consumption expenditures, where an *a priori* assumption of weak separability is imposed on the household's preference structure (see Figure 1).[20] The two-stage budgeting system enables us to reduce the dimension of the numerous number of commodities in the household expenditure basket, to a manageable number so as to save computation time and degrees of freedom. Applying two-stage

[19] We have omitted the household index h to avoid notation clutter.
[20] The usual way of aggregating commodities into groups is to combine related commodities.

budgeting to the consumption bundle C (from equation 8), implies that our representative household allocates total C expenditures among the three commodities written as

$$C_j = \varphi(Y_F, Y_i, A : \tau), \qquad j = FAH, FAFH, TNF \tag{9}$$

such that $C = \sum_j C_j$. In the second stage, our representative household then allocates C_{FAH} among k elementary FAH commodities—cereals, meat and fish, milk and dairy products, FV, fats and oil, and "other FAH". This formally be expressed as

$$S_k = \psi(Y_F, Y_i, A : \tau), \qquad \text{for all } k \tag{10}$$

such that $C_{FAH} = \sum_k S_k$. We next choose an appropriate form for the functions $\varphi(.)$ and $\psi(.)$ in equations (9) and (10), respectively. Engel curve function is chosen as the underlying functional form to the estimate the impact of off-farm incomes on the food consumption expenditures. Engel curve relates the expenditure share of a commodity to total expenditure/income. In examining the impact of income variables on commodity expenditures, the appropriate functional form should allow for variable marginal shares. Since incomes vary considerably across households and budget shares vary across goods, the income effect for households at different points in the income distribution must be fully captured (Banks, Blundell and Lewbel 1997). One specification of Engel curves which satisfies this criterion is the Working-Leser model (see Working 1943; Leser 1963), which relates budget shares of commodities linearly to the log of total expenditure. For equations (9) and (10), respectively, this can formally be specified as

$$w_j = a_j + b_j \log(E_1), \qquad \text{for all } j \tag{11a}$$

$$w_k = a_k + b_k \log(E_2), \qquad \text{for all } k \tag{11b}$$

where $w_j = C_j / C$ is household budget share on commodity j; $E_1 = C = \sum_j C_j$ is the total household expenditures at the first-stage budgeting; a and b are conformable vector of parameters to be estimated for commodities in j. Similarly, $w_k = S_k / C_{FAH}$ is the share of FAH expenditures on commodity k; $E_2 = C_{FAH}$ is the total FAH expenditures. a and b are conformable vector of parameters to be estimated for commodities in k. The adding-up condition implied in Working-Leser model requires $\sum_j a_j = \sum_k a_k = 1$, and $\sum_j b_j = \sum_k b_k = 0$. Usually, in practice, an augmented form of the Working-Leser model is estimated, by including a number of household's socioeconomic, and community characteristics. This is done to account for preference heterogeneity among the households under study. The usual way is to allow these variables affect the expenditure share equations through the intercept terms. We write this as

$$a_t = a_{0t} + \gamma_t X, \qquad t = j, k$$

where a_{0t} is a column of ones in $t = j, k$; $X = \tau$ is a vector of individual, household, and community-level variables; γ is a vector of conformable parameters. A convenient normalization to ensure satisfaction of the additivity condition is $\sum_{t=j,k} a_{0t} = 1$ and $\sum_{t=j,k} \gamma_t = 0$. Given the above, the expenditure share equations in (11a) and (11b) can be re-specified as

$$w_j = a_{0j} + b_j \log(E_1) + \gamma_j X, \qquad \text{for all } j \tag{12a}$$

$$w_k = a_{0k} + b_k \log(E_2) + \gamma_k X, \qquad \text{for all } k \tag{12b}$$

Before estimating equations (12a) and (12b), three main concerns need to be addressed. First is the possible simultaneity bias due to endogeneity of E_1 and E_2, and as a result $\log(E_1)$ and

$\log(E_2)$. The main cause of the endogeneity problem here is measurement error in approximating total household consumption expenditures (E_1), and as a result the FAH expenditures (E_2). This means that theoretical concept of "consumption" (from the empirical framework section) differs from its measured counterpart "expenditure" (Blundell et at. 1993). If not corrected, this makes our estimated expenditure elasticities biased and inconsistent. An instrumental variable approach is used to deal with the endogeneity of E_1 and E_2. The respective reduced-form equations are specified as

$$E_1 = \alpha_0 + \alpha_1 X + \alpha_2 Z, \tag{13a}$$

$$E_2 = \beta_0 + \beta_1 X + \beta_2 Z, \tag{13b}$$

where $Z = [Y_F, Y_i, A]$ is a vector of variables that are used to satisfy the usual exclusion restriction required in instrumental variable estimation; α and β are conformable parameter vector to be estimated, and everything is as defined above. Included in the vector Z is our off-farm income variables (Y_i). The maintained assumption, here, is that off-farm incomes (just like any household income) contributes to household expenditures E_1 and E_2, out of which the household, then, allocates a share to the commodities in j and k, respectively. In other words, off-farm income variables affect the expenditure shares w_j and w_k through E_1 and E_2, respectively, and hence qualify to be used as instrument (see Blundell and Robin (1999); Banks et al. (1999), Blundell and Duncan (1998) for similar use of income as an identifying instrument). Additionally, using Y_i as an instrument allows us to isolate its effect on the expenditure shares from the pure expenditure elasticities, which is the main focus of this paper.

The second concern that we address before estimating equation (12a) and (12b) is whether the Working-Leser model in its augmented form properly reflect the underlying behavior of economic agents. Recent studies have pointed out the inadequacy of the linear Working-Leser specification; in certain cases it should be generalized to higher-order terms in $\log(E_1)$ and $\log(E_2)$ to capture possible nonlinearities for certain expenditure share equations (e.g., see Banks, Blundell and Lewbel 1997; Blundell and Duncan 1998; Blundell, Pashardes and Weber 1993; Hausman, Newey and Powell 1995). [21] To see if we need to account for such nonlinearities, following the literature, we perform a nonparametric curve smoothing to determine the underlying relationship between the expenditure shares and log expenditure, at both the first and second-stage budgeting. [22, 23] The results from Figure 2 indicate that a linear form of the augmented Working-Leser is appropriate for FAH expenditure share, whiles a quadratic term of $\log(E_1)$ may be needed in the FAFH and TNF expenditure share equations. Additionally, Figure 3 shows that a quadratic term of $\log(E_2)$ may be needed in all the second-stage budgeting expenditure share equations, except for cereals where a linear specification seems appropriate. We account for these nonlinear terms during estimation.

The last concern we address before estimating equations (12a) and (12b is the issue of zero expenditure shares, especially for FAFH (43%). Applying least squares (OLS) to the FAFH share equation, without addressing this censoring issue, will yield biased and inconsistent estimates of the underlying parameters. To address the censorship of FAFH expenditure shares, a more flexible

[21] It must be pointed out that, nonlinearity, if any, of the log expenditure term directly affects the magnitude of our estimated off-farm income elasticities (see the appendix); hence, capturing this is crucial here.

[22] We accomplish this using the lpoly command in STATA. A Gaussian kernel is used with the bandwidth selection chosen according to a rule of thumb following Fan and Gijbels (1996, pp.66-68).

[23] The log expenditure variables, in adult equivalent, used for the nonparametric curve smoothing are obtained after estimating equations (13a) and (13b). As noted by Banks et al. (1997) and Blundell and Duncan (1998), this, rather than the raw data, provides a more robust relationship with the expenditure shares. For the FAFH expenditure shares, we use a subset of positive expenditure shares for the polynomial regression.

two-step procedure (Shonkwiler and Yen 1999; Perali and Chavas 2000; Su and Yen 2000; Yen, Khan and Su 2002) is employed to provide a better fit of the data generating process. Under the two-step procedure, the decision to eat outside the home and, as a result, how much to spend are assumed to be generated by two different stochastic processes. This can be expressed formally as[24]

$$\begin{array}{lll} w_{FAFH} = & \varpi(E_1, z) + \varepsilon & if \quad D^* = D = 1[\delta X + \upsilon > 0] \\ w_{FAFH} = & 0 & \text{otherwise} \end{array}, \tag{14}$$

where w_{FAFH} is the observed FAFH expenditure share; $\varpi(.)$ is the deterministic component of the Working-Leser model as specified in equation (12a); z is a vector of exogenous variables: a subvector of X which explains the observed variation in the FAFH expenditure shares; δ is a vector of comfortable parameters to be estimated. $1[.]$ is a binary indicator function. For the sake of simplicity, D^* is interpreted as an index of a household's intensity of desire to eat out. When this intensity is sufficiently great ($D^* > 0$), the household expresses the desire and we observe $D = 1$, and the reverse is true. ε and υ are stochastic error terms, and everything is as defined before. The error terms ε and υ are assumed to be normally distributed with the variance-covariance matrix

$$\begin{bmatrix} \Sigma_{\varepsilon\varepsilon} & \Sigma_{\varepsilon\upsilon} \\ \Sigma_{\varepsilon\upsilon} & 1 \end{bmatrix},$$

where $\text{var}(\upsilon)$ has been normalized to unity for identification purposes. The unconditional mean of w_{FAFH} can be specified as (Maddala 1983, p. 179)[25]

[24] We do not apply the two-step procedure to the FAH groups. Although there is some amount of censoring in some of the group expenditure shares (see Table 2), we believe that this is not severe enough to bias the parameter estimates when we estimate them by OLS.

[25] It is unconditional because we use all the observations w_{FAFH}, and not the nonzero observations as in (Heien and Wessells 1990) two-step estimation of censored demand system.

$$E(w_{FAFH} \mid E_1, z:\theta) = \Phi(\hat{\delta}X)\varpi(E_1, z) + \sigma\phi(\hat{\delta}X) + \nu, \tag{15}$$

where $\phi(.)$ and $\Phi(.)$ are the standard normal probability density and cumulative distribution functions evaluated at probit maximum likelihood estimates $\hat{\delta}$; σ is a scalar parameter to be estimated, and ν is the new error term.[26] The two-step estimation procedure involves estimating the indicator function in equation (12) by a probit maximum likelihood to construct $\phi(.)$ and $\Phi(.)$ and, then, inserting $\phi(.)$ and $\Phi(.)$ as in equation (15) and estimate it by OLS. During estimation, the censored FAFH expenditure share equation is replaced with the censorship-corrected counterpart. It must be pointed out that the additivity condition at the first-stage budgeting, documented above, longer holds with equation (15) (Yen, Lin and Smallwood 2003).

Endogeneity of off-farm income variables

After determining appropriate functional forms for our two-stage budgeting expenditure share equations, we shift our attention to the potential endogeneity of our off-farm income variable Y_i. Is the off-farm income variables in equations (13a) and (13b) exogenous? While this is an empirical question, we suspect this to be not the case here. If so, then the off-farm income variables in their current form cannot be used to correct for the endogeneity of $\log(E_1)$ and $\log(E_2)$ in the expenditure share equations. Endogeneity of Y_i may arise due to selectivity in off-farm activity participation. This is the archetypical econometric problem facing any researcher in program evaluation analysis using non-experimental (observational) data. Participation in the off-farm income streams—*local* and *migratory*—is subject to entry constraints (Ω_i from the empirical

[26] $\nu = \varepsilon + [\Phi(\hat{\delta}X) - \Phi(\hat{\delta}X)]\varpi(E_1, z:\theta) + \lambda[\phi(\hat{\delta}X) - \phi(\hat{\delta}X)]$.

framework section). This tends to cause some households to self-select into the stream whiles others do not.[27] These constraints activate censoring in the off-farm income variables. As a result, the unobserved factors determining household's decision to participate in an off-farm income stream, and hence the resultant income, are likely to be correlated with the unobserved errors in the expenditure equations in (13a) and (13b). Failure to correct for this endogeneity problem may lead to biased estimates of our off-farm income elasticities.[28] Similarly, an instrumental variable approach is used to correct for the endogeneity of the off-farm income variables. Here, we use their predicted values to instrument for their observed counterparts in equations (13a) and (13b).

Instruments for the off-farm income variables

The key to an instrumental variable estimation is the choice of appropriate and well-behaved instruments. Following the extant Albanian off-farm labor literature, three sets of instruments are used to identify the off-farm income variables Y_i: (i) district off-farm employment rate in in 2001 (e.g., see Kilic et al. 2009) (ii) proportion of district resident population between 15–64 years in 2001 (iii) a binary variable indicating whether a current or previous household member had spoken knowledge of Greek/Italian in 1990 (e.g., see Kilic et al. 2009; Miluka et al. 2010), and (iv) average district remittances (e.g., see Taylor et al. 2003).

The first two instruments are used to correct for the endogeneity of *local* off-farm incomes—wage and self-employment incomes, respectively. The latter two instruments, are on the other hand, used to correct for the endogeneity of *migratory* off-farm income—remittances. The arguments to

[27] This is corroborated by the high number of censoring in our off-farm income variables.

[28] The same argument can be made for farm income Y_F; however, in our present set up, Y_F is observed for all the households in the sample. Also, we include in X all the variables that are likely to affect Y_F, and that we believe this help improve the exogeneity of Y_F.

justify the validity of any chosen instruments, according to Murray (2006), should be made on convincing theoretical grounds, as well as through empirical testing. Here, we advance the theoretical arguments behind the plausibility of our chosen instruments. The first instrument is justified on the grounds that off-farm employment rate is directly related to off-farm job opportunities. The higher the off-farm employment rate, the higher the propensity for a farm household to reallocate labor off the farm, due to the potentials for such labor. Also, higher off-farm employment rate means lower risk and cost of undertaking such an investment, due to the easiness of finding an off-farm job. The second instrument is used as a measure of population density to proxy urbanization. There is a link between urbanization and participation in off-farm self-employment activities. For instance, Bollman and Alasia (2012, p.8) report of higher prevalence of off-farm self-employment activities in rural than in urban Canada. Specifically, du Plessis (2004) reports that self-employment income of women in rural Canada is, comparatively, higher than their cohorts in the urban areas. Here, the maintained hypothesis is that farm households located in less urbanized districts, wishing to diversify income sources, are more likely to set up off-farm self-employment activities as wage employment may be limited. [29]

The remittances variable is composed of private transfers from both households' international and internal migrants. In Albania, it is known that international remittances constitutes a lion's share of private transfers to households (Kilic et al. 2009). Since receipt of remittances is usually

[29] This variable can be related to wage employment income, such that farm households located in more urbanized districts of rural Albania face a higher probability of finding a wage job; in an earlier regression, we found this variable to be insignificant determinant of wage employment income. At the same time, it could related to remittances, such that lower proportion of district resident population between 15—64 years in 2001 may be as a result of earlier migration. We estimated remittances equation with this instrument and, also, find it to be statistically insignificant. This finding is corroborated by Miluka et al. (2010) who find a similar population variable to be insignificant determinant of the number international migrants farm households send abroad. Given the above, we are confident that the proportion of district resident population between 15–64 years in 2001 can be used identification of the off-farm self-employment income variable.

preceded by out-migration of household members, we used an instrument that relates directly to international migration, as well as village norms to remit. The two top destinations for Albanian international migrants are Italy and Greece. Knowledge of Greek/Italian by a former or current household member in 1990 represents cultural affinity, which known to reduce psychic, as well as informational cost of international migration. This has been identified as a key determining factor of out-migration to Greece and Italy, and hence remittances inflows to Albanian households (de Zwager et al. 2005). Given migration, motivations to remit are complex.[30] Following Taylor et al. (2003), we use average level of remittances among households in the district, dropping the observed household, as a proxy for the village norms to remit. We believe that this instrument helps explain the variation in remittances from household's internal migrants.

Estimation strategy

With the above econometric issues addressed, our estimation procedure is summarized as follows; we first estimate the off-farm income with a tobit model (de Janvry and Sadoulet 2001), using the instruments outlined above, to generate predicted values ($\hat{Y}_i$). These are then used to replace their observed values when we estimate equations (13a) and (13b), with an OLS, to generate $\log(\hat{E}_1)$ and $\log(\hat{E}_2)$ in adult equivalent. The respective log predicted expenditures are used to replace their observed counterparts in equations (12a) and (12b). Eventually, the inference as whether the off-farm income variables affect the expenditure shares is made by differentiating w_j and w_k with respect to $\log(\hat{E}_1)$ and $\log(\hat{E}_2)$, respectively. The main econometric shortcoming of this estimation procedure is loss of efficiency due to the use of predicted values. However, since we

[30] For a recent comprehensive and excellent treatment of the different motives for remittances, see Rapoport and Docquier (2006).

are interested in elasticities, rather than the parameter estimates themselves, we apply nonparametric bootstrapping technique (Efron 1987), to the above estimation procedure, to obtain robust standard errors of the elasticity estimates.

Empirical Results and Analysis

Determinants of off-farm incomes

We estimate a tobit model to generate predicted values of the off-farm income variables. In addition to the instrumental variables, we include a number of individual, household and community-level characteristics (see, Table 3). Table 4 presents the marginal effects instead of the coefficient estimates, as the former is more meaningful. Columns 2–4 of Tables 4 represents wage income, self-employment income, and remittances equations, respectively. Overall, the instruments perform well as determinants of total off-farm income (column 1, Table 4) and they have the appropriate signs; individually, they significantly explain variation in their respective off-farm incomes. Additionally, a Wald test performed on the instruments rejects the null that these variables do not jointly explain any variation in each of the off-farm incomes at the 5% level (see Table 4 for associated *p*-values).

A number of human capital variables also help significantly explaining off-farm incomes. For instance, age of household head is positively and significantly related to all types of off-farm incomes, except for self-employment income. As expected, education of household head positively correlated with *local* off-farm earnings, but inversely related to total remittances received in the household. Household size affects *local* off-farm earnings positively, but remittances negatively. There is geographical heterogeneity in types of off-farm incomes. Households in the mountainous

region of rural Albania earn relatively less income from self-employment activities compared to households in the central region of the country. Similarly, households located in the coastal region of rural Albania receive less remittances compared to their counterparts in the central region when a family member migrates.

First-stage budgeting: Effect of off-farm incomes on FAH and FAFH consumption patterns

Our main focus is to estimate the impact of a portfolio of off-farm incomes on food consumption patterns. The first stage of the two-stage budgeting is given in equation (12a), with equation (15) substituted for *FAFH* expenditure share equation.[31] Before reporting our elasticity estimates, we begin to assess evidence to support our assertion that off-farm income variables are indeed endogenous in equations (13a) and (13b). The results in Table 5 show that the uncorrected model underestimates the impact of wage and self-employment incomes on household expenditures, compared to the endogeneity-corrected model. Interestingly, the coefficient on remittances reverses in sign after instrumentation. The model without instruments would have predicted positive impact of remittances on household expenditures when it is, in fact, negative. With all the econometric issues addressed, we estimate the expenditure shares as a system. We avoid singularity of the variance-covariance matrix by omitting the share equation for total nonfood expenditures during estimation.[32] We report unconditional elasticity estimates from the first-stage budgeting in Table 6.

[31] We include a quadratic term of $\log(\hat{E}_1)$ in the FAFH expenditure share equation.

[32] The additivity condition implied in the Working-Leser model no longer holds here. We check this through the invariance condition implied in such a system estimation; the result shows that the parameter estimates, expectedly, are not invariant to the share equation deleted. To retrieve the estimates of the TNF share equation, we follow approach suggested by Pudney (1989), and used by Yen, Lin and Smallwood (2003), by treating the TNF share equation as a residual equation; this makes sense here since the focus of this paper is on the food expenditure shares. With this, invariance is no longer of primary interest.

Unconditional elasticities

We report our results in terms of elasticities, since parameter estimates are hardly meaningful by themselves (see the Appendix for the derivation of elasticities). Table 6 presents the unconditional elasticities of FAH and FAFH expenditure shares with respect to different types of off-farm income. As one might expect, FAH is a necessity while FAFH is a luxury. Furthermore, Table 6 indicates that off-farm incomes have mixed impacts on the food expenditure shares. For example, FAH and FAFH quantities respond positively to increases in off-farm wage income. Specifically, a 10% increase in off-farm wage income is associated with about 0.8% and 21% increase in the quantity purchased of FAH and FAFH, respectively. The large elasticity of FAFH consumption may be surprising at first glance, however, there seems to be a trend in this direction in transitional economies (Ma et al. 2006; Dong and Hu 2010; and Liu et al. 2015 for urban China, Chang and Yen 2011 for Taiwan, Andrej, Jan and Marian 2015 for Slovakia, and Staudigel and Shröck 2015 for Russia). The reasons for this finding in rural Albania are twofold: (i) for some households it may reflect genuine changes in food preferences due to changing position in the income distribution; such that higher household income, due to additional off-farm wage income, causes the households to spend more on FAFH, a luxury commodity (Table 4-1 shows that off-farm wage income increases across all the total food expenditure quintiles); (ii) in some cases it may reflect opportunity cost of time associated with meal preparation at home, due to multiple job-holdings by the members of the household in the local off-farm economy, precipitated by off-farm labor reallocations. This cost will be particularly more pronounced in households where female household members tend to reallocate their labor off the farm.

On the other hand we find no significant impact of off-farm self-employment income on either FAH or FAFH consumption. The reason for this may be the fear of "eating" one's working capital, because self-employment is likely used for the purposes of income growth and asset accumulation.[33] Another reason can be attributed to the low participation rates in off-farm self-employment activities in rural Albania (Table 1). In practice, off-farm wage and self-employment tend to be mutually exclusive activities; members of households with wage employment are less inclined to set up self-employment activities (Ruben and van den Berg 2001). Moreover, we find a negative and significant impact of remittances on FAH and FAFH consumption. A 10% increase in total remittances causes FAH and FAFH consumption to decrease by 0.3% and 8%, respectively. These findings probably suggest that remittances (especially those from international migrants), in rural Albania, is used for nonfood consumption (Table 6).[34] The finding, here, of the impact of remittances on food consumption is generally consistent with what other researchers have found elsewhere. Adams and Cuecuecha (2010) find that Guatemalan households receiving international remittances spend less at the margin on food than households receiving internal remittances compared to what they would have spent without any remittances. They instead find that remittance-receiving households (either from internal or international migrants) spend more at the margin on education and housing than what they would have spent on these investment goods without the receipt of remittances.

Education of the household head is negatively associated FAH and FAFH consumption; but it is positively related to the decision to eat outside the home (Column 2 Table 6). The number of children in a household is negatively associated with FAFH consumption, which is

[33] Most self-employment businesses in rural Albania are small, informal outlets operating either from home or from mobile or road-side venues (Kilic et al. 2009).
[34] The impact of remittances on TNF is positive but not statistically significant.

encouraging. Geographical heterogeneity is evident in the decision to eat outside the home. A relocation of a farm household from central to the mountain region of Albania increases the likelihood that the household will eat outside the home (Column 2 Table 6).

Conditional elasticities

Table 7 reports conditional elasticity estimates from the system estimation of conditional expenditure shares of disaggregated food groups consumed at home. All conditional expenditure elasticities are statistically significant at the 1% level. The results indicate that cereals and fats & oils groups are necessities while meat and fish, milk and dairy, fruits and vegetables, and "other FAH" are luxuries. Table 7 shows that off-farm wage income and remittances have direct and mixed impacts on households' consumption of cereals food group at home. Specifically, we find that a 10% increase in off-farm wage income significantly increases cereal-based food consumption by 0.5%. However, given the same 10% increase in remittances, cereal-based food consumption decreases by 0.3%. Aside cereals, off-farm wage income is positively associated with at-home consumption of meat and fish, and FV but negatively with milk and dairy products; however these impacts are not statistically significant. Aside the statistical significance, the magnitudes of the impact of off-farm wage income are consistent with the general observation of increasing consumption of meat and FV by Albanian households since the fall of communism (Imami, Zhllima and Chan-Halbrendt 2013). Consistent with the finding above, off-farm self-employment income has no impact on any of the FAH food groups, however, the direction of the elasticity estimates follows closely that of off-farm wage income.

Conclusions

This paper uses a nationally-representative micro-level data to analyze the impact of a portfolio off-farm incomes—wage income, self-employment income and remittances—on food consumption patterns in rural Albania using Working-Leser framework with the underlying assumption of two-stage budgeting. We modify the conventional Working-Leser model to compute individual effect of different off-farm incomes on household food expenditure shares. Households are first assumed to allocate their total budget among food at home (FAH), food away from home (FAFH), and other expenditures. In the second stage of budgeting, households allocate their budget for food at home on six food groups—cereals, meat and fish, milk and dairy products, fruits and vegetables, fats and oil, and other FAH.

We find that off-farm wage income and remittances, among three sources of off-farm income we considered have significant impacts on household food consumption patterns in rural Albania. Income from off-farm wage employment has a positive and significant impact on FAH and FAFH consumption. Remittances, on the other hand, has the opposite effect on food consumption at home and away from home. Results from the second-stage budgeting indicate the farm households use off-farm wage income to increase their consumption of cereal-based foods at home. Remittances have the opposite effect on households' consumption of cereal-based foods at home. Overall, the results confirm that off-farm wage employment plays a crucial role in maintaining and improving household food security in rural Albania, especially, by increasing staple food consumption at home, and that migrant remittances are likely spent on nonfood consumption and investment rather than food consumption.

The high-elastic response of FAFH consumption to off-farm wage income should be of concern to stakeholders involved in designing nutritional programs in rural Albania; it may be partially responsible for worsening of nutrition situation in rural Albania (INSTAT and IPH 2012). Although I do not model disaggregated food groups within the aggregate group of FAFH, previous studies typically agree that FAFH are generally less healthy than home-prepared meals (Guthrie, Lin and Frazao 2002; Mancino, Todd and Lin 2009) and are associated with health issues including obesity and cardiovascular diseases.

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APPENDIX

The expenditure elasticity from the Working-Leser model can be derived using the general relation

$$w = \frac{pq}{E} \Rightarrow q = \frac{wE}{p} \tag{A-1}$$

$$\frac{\partial q}{\partial E}\frac{E}{q} = \left(\frac{w}{p} + \frac{E\frac{\partial w}{\partial E}}{p}\right)\frac{E}{q} = \frac{wE}{pq} + \left(\frac{\partial w}{\partial \log(\mathrm{E})}\frac{E}{pq}\right)$$

$$\frac{\partial q}{\partial E}\frac{E}{q} = \eta = 1 + \left(\frac{\partial w}{\partial \log(E)}\right)\frac{1}{w} \tag{A-2}$$

Simple Working-Leser Model

Expenditure elasticity

Applying the formula in equation (A-2) to the simple Working-Leser mode in equation (11a) and (11b), I respectively calculate the unconditional and conditional expenditure elasticities as

$$\eta_j = \left(b_j / w_j\right) + 1$$

$$\eta_k = \left(b_k / w_k\right) + 1$$

Quadratic Working-Leser Model

Expenditure elasticity

Applying the formula in equation (A-2) to the quadratic Working-Leser model, below, I respectively calculate the unconditional and conditional expenditure elasticities as

$$w_j = a_{0j} + b_{1j}\log(E_1) + b_{2j}\log(E_1)^2 + \gamma X$$

$$w_k = a_{0k} + b_{1k}\log(E_2) + b_{2k}\log(E_2)^2 + \gamma X$$

$$\eta_j = \left(\frac{b_{1j} + 2b_{2j}\log(E_1)}{w_j}\right) + 1$$

$$\eta_k = \left(\frac{b_{1k} + 2b_{2k}\log(E_2)}{w_k}\right) + 1$$

Off-farm income elasticity

From equation (A-1), I derive the off-farm income elasticities as

$$\frac{\partial q}{\partial Y_i}\frac{Y_i}{q} = \xi = \left[\frac{w}{p}\frac{\partial E}{\partial Y_i} + \frac{E}{p}\frac{\partial w}{\partial E}\frac{\partial E}{\partial Y_i}\right]\frac{Y_i}{q} \Rightarrow \left[w\frac{\partial E}{\partial Y_i} + E\frac{\partial w}{\partial E}\frac{\partial E}{\partial Y_i}\right]\frac{Y_i}{pq} \text{ , noting } pq = wE$$

Recognizing equation (13a) and (13b), I respectively calculate the unconditional and conditional off-farm income elasticities, using the formula above, as

$$\xi_{ji} = \left[\left(w_j + b_{1j} + 2b_{2j}\right)\alpha_2\right]\frac{Y_i}{w_j E_1}$$

$$\xi_{ki} = \left[\left(w_k + b_{1k} + 2b_{2k}\right)\beta_2\right]\frac{Y_i}{w_k E_2}$$

To obtain the above elasticities for the simple Working-Leser model, set b_{2j}, $b_{2k} = 0$.

Elasticity with respect to household variables

From equation (A-1), I derive elasticity with respect to the household variables as

$$\frac{\partial q}{\partial X}\frac{X}{q} = \pi = \left[\frac{w}{p}\frac{\partial E}{\partial X} + \frac{E}{p}\left(\frac{\partial w}{\partial X} + \frac{\partial w}{\partial E}\frac{\partial E}{\partial X}\right)\right]\frac{X}{q}$$

Recognizing equation (13a) and (13b), I respectively calculate the unconditional and conditional elasticities, using the formula above, as

$$\pi_j = \left[w_j\alpha_2 + \gamma_j E_1 + \left(b_{1j} + 2b_{2j}\right)\alpha_2\right]\frac{X}{w_j E_1}$$

$$\pi_k = \left[w_k\beta_2 + \gamma_k E_2 + \left(b_{1k} + 2b_{2k}\right)\beta_2\right]\frac{X}{w_k E_2}$$

To obtain the above elasticities for the simple Working-Leser model, set b_{2j}, $b_{2k} = 0$.

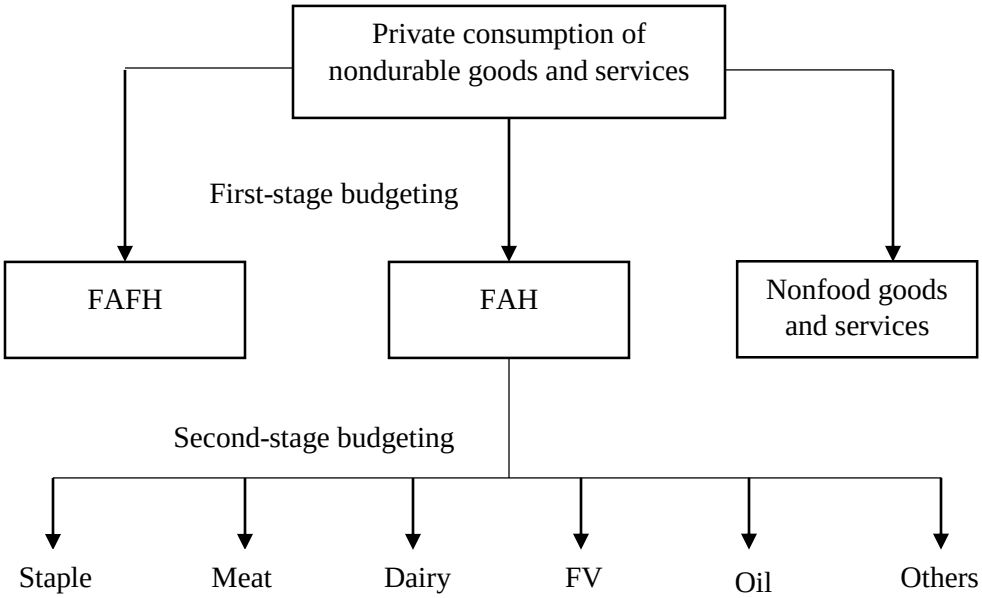

Figure 1. Partitioning of food consumption expenditures.

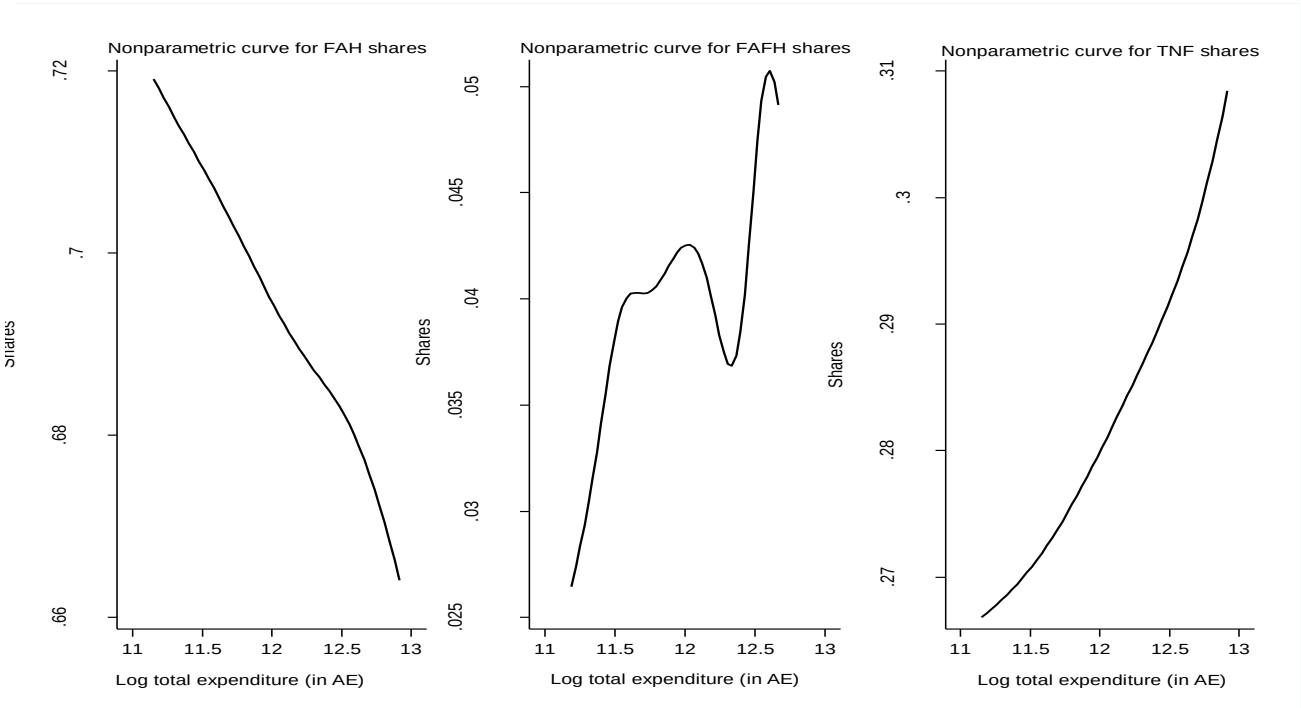

Figure 2. Nonparametric Engel curves for first-stage budgeting expenditure shares.

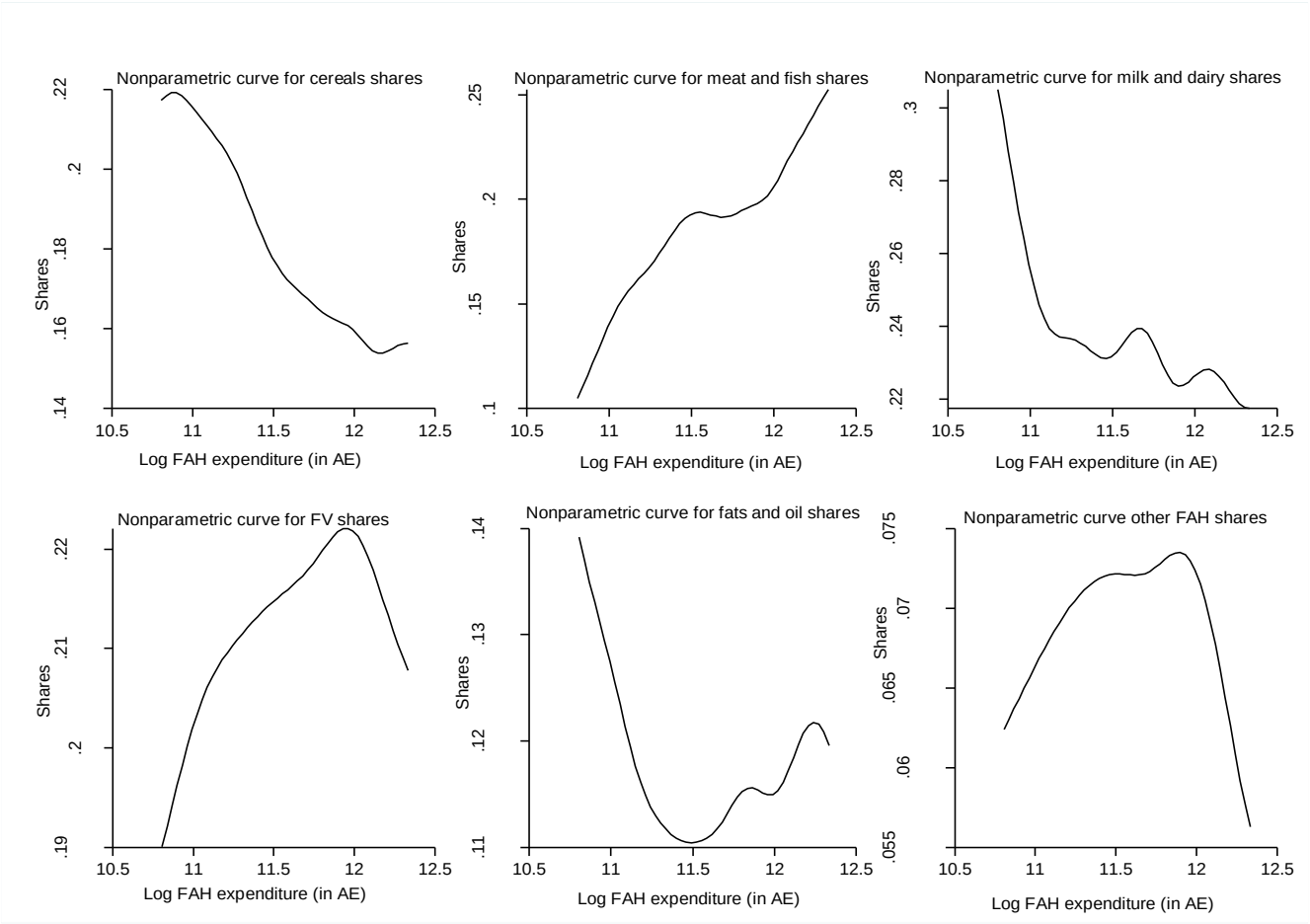

Figure 3. Nonparametric Engel curves for second-stage budgeting expenditure shares.

Table 1: Weighted off-farm activity participation rates and incomes by total household food expenditure (in adult equivalent) quintiles

Quintiles	1	2	3	4	5	Total
Participation rates						
Any off-farm	0.56	0.58	0.66	0.76	0.77	0.62
Local						
Wage employment	0.23	0.30	0.32	0.37	0.33	0.28
Self-employment	0.08	0.09	0.10	0.12	0.16	0.10
Migratory						
Remittances	0.34	0.34	0.39	0.44	0.48	0.38
Incomes						
Any off-farm	148.73	172.67	237.85	267.02	359.89	223.04
Local						
Wage employment	65.33	80.85	108.54	136.31	131.52	95.59
Self-employment	38	59.51	82.03	80.69	158.36	77.82
Migratory						
Remittances	45.4	32.31	47.27	50.02	70.01	49.63

Note: All income variables are in 1000 Albanian Leks. Due to rounding off, the total does not add to the average of columns 1–5.

Table 2: Weighted means of overall sample, and mean difference test by food expenditures and FAH shares

Variables	Overall	Off-farm	No off-farm	t-value	Frequency of zero shares
First-stage budgeting					
Food	0.72	0.76	0.71	-6.25***	0
FAH	0.70	0.68	0.75	-7.31***	0
FAFH	0.02	0.03	0.01	4.90***	596
Nonfood	0.28	0.29	0.24	6.25***	0
Second-stage budgeting					
Cereals	0.18	0.17	0.19	-2.50***	0
Meat	0.19	0.21	0.17	5.50***	17
Dairy	0.23	0.21	0.25	-5.78***	3
Fruits and vegetables	0.22	0.23	0.21	2.68***	0
Fats and oil	0.11	0.11	0.12	-2.54***	0
Others	0.07	0.07	0.06	2.52***	2
Observations	1383	864	519		

Note: ***, **,*Significant at the 1%, 5% and 10% levels, respectively.

Table 3: Weighted means of overall sample, and mean difference test by off-farm participation

Variables	Overall	Off-farm	No off-farm	t-value
Household Characteristics				
Female household (HH) head	0.06	0.06	0.05	0.43
Age of HH head	50.64	51.01	49.91	1.37
Married HH head	0.93	0.94	0.92	0.76
Education of HH head	8.13	8.37	7.65	3.26***
HH size	4.74	4.59	5.05	-4.41***
No. children (≤14 years)	1.30	1.17	1.55	-4.97***
No. adults (15–60 years)	2.92	2.93	2.90	0.37
No. elderly adults (≥61 years)	0.50	0.46	0.57	-2.19***
Nonagricultural Assets				
Nonlabor income	0.57	0.59	0.53	1.34
Agricultural Assets				
Land size cultivated (Hectares)	0.87	0.87	0.87	0.14
No. farm plots owned	3.44	3.42	3.49	-0.58
No. of farm machines owned	0.36	0.35	0.37	-0.37
No. of livestock unit	1.74	1.55	2.13	-5.00***
Farm income	1.81	1.74	1.94	-2.68***
If HH receives extension advice	0.37	0.37	0.38	-0.24
Instruments				
District off-farm employment rate in 2001	0.46	0.48	0.42	7.49***
Proportion of population (15–64 years)	0.63	0.63	0.63	-0.10
Greek/Italian in 1990	0.09	0.12	0.04	5.03***
Average district remittances	0.47	0.49	0.41	4.77***
Community Characteristics				
HH is in Coastal region	0.32	0.32	0.32	-0.11***
HH is in Mountain region	0.15	0.13	0.21	-4.89***
HH is in Central region	0.53	0.56	0.47	2.67***
Observations	1383	864	519	

Note: ***, **, * Significant at the 1%, 5% and 10% levels, respectively.

Table 4: Marginal effects of tobit estimation of determinants of off-farm incomes

Variables	Total	Wage Income	Self-employment Income	Remittances
Instruments				
Off-farm employment rate in 2001	243.773***	197.156***		
	(49.932)	(28.183)		
Proportion of population (15–64 years)	-1255.719***		-1862.564**	
	(399.495)		(779.884)	
Greek/Italian in 1990	108.926***			24.500***
	(32.807)			(5.996)
Average district remittances	0.406**			0.447***
	(0.197)			(0.058)
Household Characteristics				
Female household (HH) head	3.532	-29.256	-138.589*	36.707***
	(31.593)	(27.457)	(78.357)	(12.556)
Age of HH head	1.869***	1.316***	1.250	0.337*
	(0.530)	(0.403)	(1.276)	(0.174)
Married HH head	13.930	-21.197	-109.914*	34.591***
	(32.644)	(24.001)	(64.458)	(12.205)
Education of HH head	9.705***	13.882***	15.541***	-2.644***
	(1.902)	(1.292)	(4.313)	(0.623)
HH size	1.724	6.729***	26.363***	-8.733***
	(4.173)	(2.510)	(8.619)	(1.115)
Nonlabor income	-0.147**	-0.194***	-0.435**	0.115***
	(0.060)	(0.064)	(0.195)	(0.026)
Agricultural Assets				
Land size cultivated (Hectares)	20.112	-7.944	1.579	12.480***
	(12.965)	(9.149)	(27.594)	(3.562)
No. farm plots owned	-2.309	-1.207	5.670	-1.377
	(4.355)	(2.984)	(9.048)	(1.242)
No. farm machines owned	-7.136	-6.325	-3.906	3.534
	(7.754)	(6.152)	(19.029)	(2.324)
No. livestock unit	-24.455***	-13.061***	-30.566***	-0.613
	(4.166)	(3.028)	(11.338)	(1.000)
If HH receives ext. advice	-1.075	1.417	-10.588	-0.900
	(14.277)	(9.031)	(30.595)	(3.925)
Community Characteristics				
HH is in Coastal region	-24.303	-16.536	29.418	-8.326*
	(15.504)	(10.901)	(34.531)	(4.750)
HH is in Mountain region	-51.820***	-5.390	-102.528**	-2.546
	(19.948)	(10.302)	(40.214)	(4.492)
Wald test of instrument significance	0.00			0.00
No. obs.	1983	1383	1383	1383

Note: Standard errors in parentheses is calculated by the delta method; ***, **, * denote significance at 1%, 5%, and 10%, respectively.

Table 5. Impact of off-farm incomes on household expenditures

	Uncorrected model		Endogeneity-corrected model	
Variables	E_1	E_2	E_1	E_2
Wage employment	0.212***	0.073***	0.328***	0.251***
	(0.043)‡	(0.023)	(0.073)†	(0.050)
Self-employment	0.121***	0.038***	0.133	0.049
	(0.021)	(0.011)	(0.097)	(0.042)
Remittances	0.145**	0.034	-0.249*	-0.246***
	(0.056)	(0.031)	(0.132)	(0.073)
No. obs.	1383	1383	1383	1383

Note: We have omitted estimates for the other covariates for the sake of brevity.
‡ Heteroscedasticity-robust standard errors in parentheses
†Standard errors in parentheses are based on 1,000 bootstrap replications.
***, **, * denote significance at 1%, 5%, and 10%, respectively.

Table 6. Elasticity estimates of the impact of off-farm incomes on first-stage budgeting expenditure shares

	FAH	FAFH		TNF
Variables		Decision[a]	Budget share	
Total expenditure	0.960***		1.145***	1.100***
	(0.046)†		(0.304)†	(0.117)†
Off-farm Incomes				
Wage employment	0.076***		2.110***	-0.110*
	(0.018)		(0.741)	(0.056)
Self-employment	0.025		0.696	-0.036
	(0.018)		(0.464)	(0.027)
Remittances	-0.030*		-0.833*	0.043
	(0.016)		(0.493)	(0.031)
Household Characteristics				
Female household (HH) head	0.029	-0.009	0.728	-0.006*
	(0.024)	(0.009)‡	(0.632)	(0.004)
Age of HH head	-0.210	0.066	-4.828	0.104
	(0.216)	(0.132)	(5.296)	(0.072)
Married HH head	0.335	-0.014	8.803	-0.055
	(0.239)	(0.123)	(6.481)	(0.054)
Education of HH head	-0.561**	0.227***	-13.104**	0.142***
	(0.222)	(0.061)	(6.515)	(0.038)
No. children	-0.088	0.015	-2.852*	-0.015
	(0.061)	(0.030)	(1.683)	(0.018)
No. adults	-0.082	-0.060	-1.631	0.099***
	(0.124)	(0.059)	(3.081)	(0.038)
No. elderly adults	-0.014	0.017	-0.446	-0.007
	(0.025)	(0.022)	(0.644)	(0.012)
Agricultural Assets				
Land size cultivated (Hectares)	0.047	0.110***		0.012

	(0.066)	(0.042)		(0.021)
No. farm plots owned	0.040	-0.130**		0.072***
	(0.081)	(0.057)		(0.026)
No. farm machines owned	0.023	0.051***		-0.007
	(0.021)	(0.016)		(0.006)
No. of livestock unit	0.211**	-0.060**		-0.040***
	(0.104)	(0.030)		(0.015)
If HH receives ext. advice	-0.019	0.027		0.037***
	(0.031)	(0.020)		(0.009)
Community Characteristics				
HH is in Coastal region	0.016	-0.015	0.749	0.022**
	(0.034)	(0.020)	(0.842)	(0.010)
HH is in Mountain region	0.036	0.116***	1.887	0.051***
	(0.046)	(0.024)	(1.247)	(0.013)
No. obs.	1383	1383	1383	1383

Note: All the elasticities are calculated at the sample means. Identification in the two-step estimation of the *FAFH* share equation relies on the nonlinearity of $\phi(.)/\Phi(.)$ term from equation (15). For more robust identification, it is usually recommended that exclusion restrictions be imposed so as to improve the nonlinearity in the $\phi(.)/\Phi(.)$ term. We have used household agricultural assets to satisfy this exclusion restriction, where we allow them to affect the decision equation but not the outcome (share) equation. The findings for the off-farm income variables are robust to not imposing the exclusion restriction; however, the significance of education of HH head, No. children and No. of adults vanishes without the restriction.

† Standard errors in parentheses are based on 1,000 bootstrap replications.

[a] Elasticity estimates of probit MLE of decision to eat outside the home.

‡ Standard errors in parentheses are calculated by the delta method.

***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 7. Elasticity estimates of the impact of off-farm incomes on second-stage budgeting expenditure shares

	Cereals	Meat & fish	Milk & dairy	FV	Fats & oil	Other FAH
FAH expenditure	0.541***	1.035***	1.348***	1.030***	0.872***	1.056***
	(0.094)†	(0.115)	(0.114)	(0.079)	(0.110)	(0.116)
Off-farm Incomes						
Wage employment	0.049***	0.188	-0.279	0.270	-0.773	0.328
	(0.015)	(2.452)	(0.626)	(0.420)	(0.536)	(2.594)
Self-employment	0.008	0.030	-0.045	0.043	-0.123	0.052
	(0.007)	(0.309)	(0.153)	(0.120)	(0.147)	(0.472)
Remittances	-0.025**	-0.096	0.142	-0.137	0.394	-0.167
	(0.010)	(1.256)	(0.323)	(0.223)	(0.280)	(1.236)
Household Characteristics						
Female household (HH) head	0.012	0.060	-0.066	0.117	-0.162	0.299
	(0.010)	(0.116)	(0.115)	(0.089)	(0.298)	(0.198)
Age of HH head	-0.050	-0.392	0.289	-0.702	1.107	-1.922
	(0.130)	(0.913)	(0.939)	(0.774)	(2.642)	(1.880)
Married HH head	0.109	0.729	-0.769	1.322	-1.783	3.498
	(0.130)	(1.296)	(1.274)	(0.986)	(3.354)	(2.231)
Education of HH head	-0.361***	-1.028	1.157	-2.123	2.976	-5.822**
	(0.125)	(1.939)	(1.963)	(1.396)	(4.219)	(2.566)

No. children	-0.016	-0.196	0.216	-0.239	0.730	-0.690
	(0.029)	(0.278)	(0.260)	(0.209)	(0.741)	(0.490)
No. adults	-0.023	-0.044	0.193	-0.127	0.096	-0.248
	(0.061)	(0.364)	(0.342)	(0.342)	(1.295)	(0.953)
No. elderly adults	0.025	0.025	-0.016	-0.008	-0.053	0.032
	(0.018)	(0.078)	(0.076)	(0.076)	(0.281)	(0.209)
Agricultural Assets						
Land size cultivated (Hectares)	0.032	0.078	-0.093	0.209	-0.629	0.489
	(0.040)	(0.249)	(0.240)	(0.223)	(0.764)	(0.569)
No. farm plots owned	-0.025	0.110	-0.108	0.165	-0.442	0.395
	(0.050)	(0.272)	(0.285)	(0.281)	(0.872)	(0.693)
No. farm machines owned	0.009	0.090	-0.084	0.105	-0.372	0.337*
	(0.012)	(0.123)	(0.116)	(0.089)	(0.308)	(0.201)
No. of livestock unit	0.110**	0.395	-0.352	0.605	-2.209	1.850*
	(0.049)	(0.631)	(0.638)	(0.475)	(1.529)	(0.947)
If HH receives ext. advice	-0.042**	-0.047	0.079	-0.122	0.380	-0.327
	(0.017)	(0.117)	(0.122)	(0.111)	(0.365)	(0.264)
Community Characteristics						
HH is in Coastal region	-0.002	0.088	-0.081	0.093	-0.262	0.201
	(0.018)	(0.109)	(0.112)	(0.108)	(0.362)	(0.270)
HH is in Mountain region	0.011	0.006	-0.028	0.113	-0.411	0.445
	(0.023)	(0.169)	(0.167)	(0.149)	(0.518)	(0.360)
No. obs.	1383	1383	1383	1383	1383	1383

Note: All the elasticities are calculated at the sample means

† Standard errors in parentheses are based on 1,000 bootstrap replications.

***, **, * denote significance at 1%, 5%, and 10%, respectively.