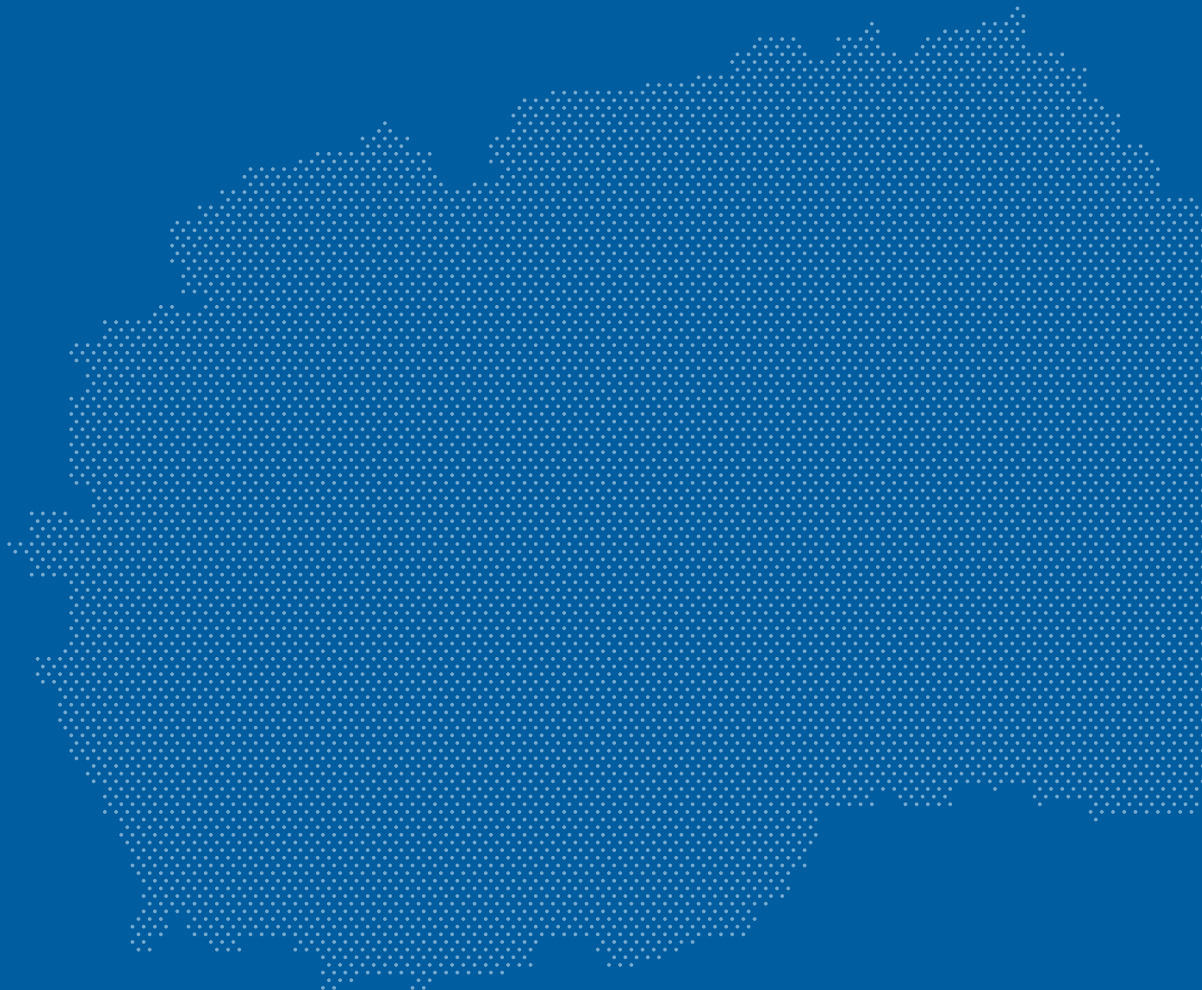# Former Yugoslav Republic of Macedonia

Increasing the welfare effect of the agricultural subsidy programme for food crop production in the former Yugoslav Republic of Macedonia

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Abstract

The objective of this study is to analyse the welfare implications of increasing prices of wheat, maize and rice, and agricultural subsidies on household welfare in the former Yugoslav Republic of Macedonia. Based on this analysis, we propose a redesign of the subsidy programme for these crops, which might help to improve the welfare of households. The results suggest that the effects of increased commodity prices and the current subsidy programme were positive only for male-headed rural households. The newly proposed disbursement scheme for government subsidies is therefore based on targeting female-headed rural households for both wheat and rice, all poor urban households for wheat, and male-headed rural households for rice. Results of the simulation with regard to wheat-maize production suggest that targeting poor urban households could result in a significant welfare effect ranging up to 30–40 per cent of the income of this group of households, assuming it is accompanied by a usufruct of state-owned land and start-off grants for initial investment. Targeting poor female-headed rural households may increase the impact of the scheme from almost zero to about two-thirds of the income of poor male-headed rural households. The effect on the welfare of poor rural rice producers may also be large – up to 20 per cent of household income – taking into account that a considerable effort is however needed to start off rice production.

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1 Introduction

Food crop commodities – namely wheat, maize and rice – are important in the former Yugoslav Republic of Macedonia: 24.5 per cent of households farm one or more of these crops, and more than 50 per cent of rural households spend more than 10 per cent of their budget on them. The overall poverty rate, based on the relative poverty line,[1] was estimated at 27.1 per cent in 2011 – up from 25 per cent in 2006 – while rural poverty was at 37.6 per cent in 2011. Given that more than a fourth of the population lives below the poverty line, it is not a coincidence that a large portion of poor household income is spent on food crop commodities and the derived products.

Prices of food crop commodities have been rising since 2006: in October 2012, they were 46.5 per cent higher than the average level in 2006. The increase has been widespread, but the aforementioned commodities – wheat (118 per cent), maize (165 per cent), and rice (76 per cent) – have experienced price increases larger than other commodities over the same period. However, the production of food commodities has been declining since the 1990s when the planning system was abandoned; at present, it is on average 60 per cent of the production in 1991, though the level varies across the different crops. The increase in prices has been insufficient to increase the production.

Commodity price developments may have large impacts on real incomes of poor households in developing countries. However, little information is available on actual impacts on the poor, despite some concerns expressed in the literature (e.g. FAO, 2011; World Bank, 2008). The overall impact of commodity price increases on the welfare of the poor depends on whether the gains to poor producers outweigh the adverse impacts on poor consumers, on the pattern and response of household income, and on the policy responses. It has been widely claimed that the effects are quite diverse and country-specific (Hertel and Winters, 2006).

Agricultural subsidies have been among government policy programmes generally pursued in times of commodity price increases (Wodon and Zaman, 2010). The right-oriented government of the former Yugoslav Republic of Macedonia, which took office in late 2006, undertook an ambitious agenda for subsidizing agriculture with budget funds that reached 4.5 per cent of total government expenditure in 2011 from virtually zero in 2006. Despite ambiguously communicated, it seems that an overarching

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[1] The relative poverty line is 60 per cent of the median equivalent income.

objective of the programme was to increase production and improve the living conditions of those who are predominantly living or temporarily migrating to rural areas. The programme was designed so that any production would be subsidized with specifically determined lump sums, to support current producers as well as steer former producers to resume crop production. The food crop commodities mentioned above have been subsidized as follows: EUR 150 per cultivated hectare (ha) up to 10 ha of cultivated land; EUR 90 per ha for 10–50 ha; EUR 45 per ha for 50–100 ha; and EUR 15 per ha for more than 100 ha. No special conditions regarding the type of household producing staple foods applied to benefit from the programme.

However, the effects of the agricultural subsidy programme have been, to a large extent, unsatisfactory. Despite an increase in government subsidies, the production of all food crop commodities – except for rice – has further declined, while household welfare – judging by the increase in poverty – has not improved.

Two related policy questions therefore arise. First, what are the likely effects of the observed change in the level of food crop prices on household welfare in the former Yugoslav Republic of Macedonia? Second, what are the likely effects of the government subsidy programme on household welfare, and could another subsidy disbursement scheme strengthen the impact on the welfare of households? This study provides an analytical background for discussion of these questions.

Ideally, our analysis would use household surveys undertaken before and after the price increases and the introduction of the government subsidy programme. This would allow a precise analysis of the effects of the price change and the subsidy on the welfare of households and on farm supply behaviour. However, such data do not exist – or at least not entirely. Instead we therefore use the 2011 Household Budget Survey (HBS), which however does not provide any information on subsidies. Hence, we apply the rules for subsidy disbursement specified above to evaluate their effect. Based on the findings, we propose another scheme for disbursement (for the three crops analysed here) that aims to improve the welfare of households in the former Yugoslav Republic of Macedonia. Therefore, the focus of the study is on the welfare implications of the price increases and government subsidies. We first evaluate how household welfare was affected by the increasing prices of the most important crops, and second, how it was affected by the subsidies which the government introduced for crop farming. Subsequently, we present a new agricultural subsidy programme for food crops redesigned into a tool to alleviate (rural) poverty in the country.

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No in-depth analysis has been undertaken thus far to help understand the consumption and income patterns of households in the former Yugoslav Republic of Macedonia and their decisions with regard to cultivating crop commodities. In particular, the effect of government subsidies remains fully unexamined. Many economists and former policymakers in the former Yugoslav Republic of Macedonia argue that the design of the government agricultural subsidy programme is arbitrary and uninformed, and hence does not act as a mechanism for maximizing the poverty-reduction effect. The design of the programme thus continues to be a topic of heated public debate.

The study is organized as follows: Section 2 presents the HBS data and explains how they meet the particular needs of the analysis. It also explores some of the distinguishing features of household income that anticipate the more sophisticated estimation results that follow. Section 3 gives a brief overview of the relevant literature and sets this study's place in the literature. Section 4 outlines the analytical framework, which is the one applied in Deaton (1989a, 1989b). Section 5 charts the distributional results of a change in crop prices and the introduction of government subsidies, and proposes a new disbursement scheme that improves the impact on welfare. The conclusions are presented in Section 6.

2 Stylized facts

2.1 Macroeconomic aspects

Despite being a poor republic in the former Yugoslavia, the former Yugoslav Republic of Macedonia had a larger production of food crops in 1992 than nowadays. Figure 1 shows the production patterns of the three food crops analysed here, namely wheat, maize and rice. The general non-increasing trend of production is evident for all three crops, with largely emphasized volatility. The introduction of government subsidies in 2007 did not change these patterns – at least not as expected: only rice production increased, but as a continuation of an increasing trend that had begun earlier, while the production of the other two crops stagnated or declined. In addition, as Figure 2 suggests, the share of imported cereals in total consumption increased.
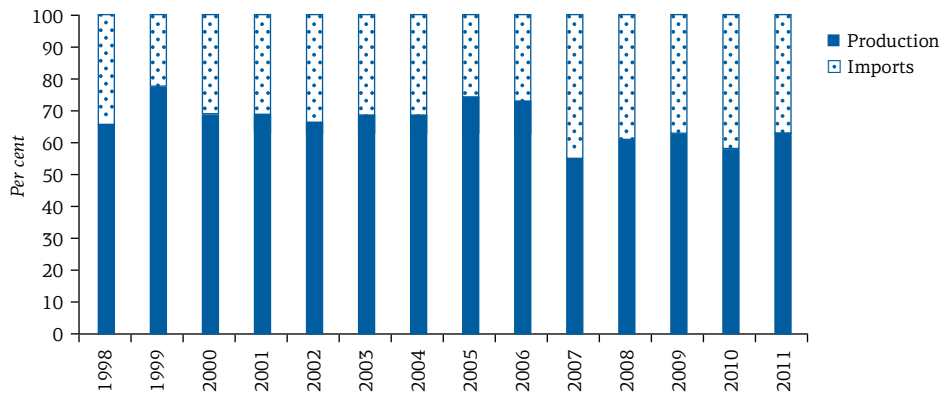
Figure 1 Production of food crop commodities, 1992–2010 (thousands of metric tons)
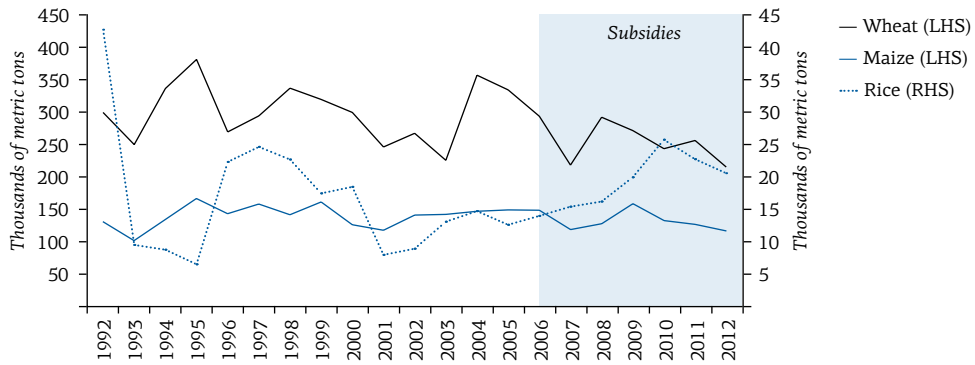
Source: Author's calculations, based on FAO statistics and State Statistical Office.
Note: LHS stands for left-hand scale, RHS for right-hand scale.

Figure 2 Production versus import of cereals, 1998–2012 (per cent)

Source: Author's calculations, based on FAO statistics and National Bank of the Republic of Macedonia.

Figure 3 presents the price changes that accompanied these production patterns. At the same time that the government subsidy programme was introduced, food commodities marked the largest price increase in years, mainly due to weather-related shortages occurring in different countries worldwide. The increase in prices was widespread, but the food crops analysed here experienced the largest price increases between 2006 and 2012 at the international stage: wheat (118 per cent), maize (165 per cent), and rice (76 per cent).

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Figure 3 Prices of food commodities, 2000–2012 (USD per metric ton)
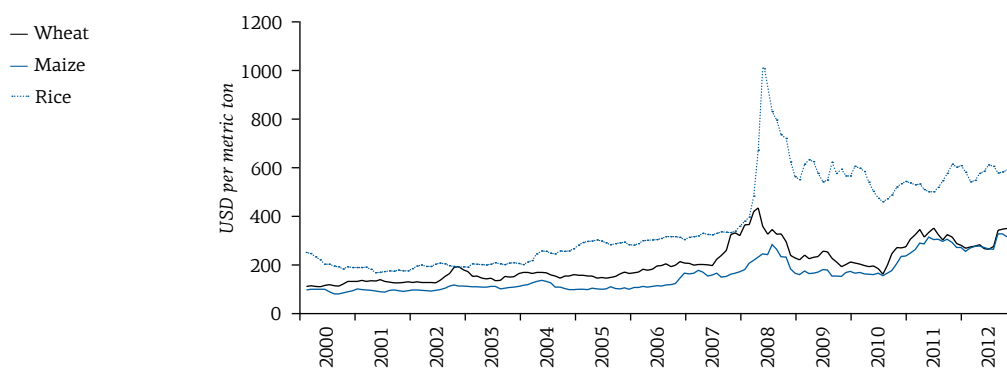
Source: Author's calculations, based on IMF statistics.

2.2 Microeconomic patterns of demand and supply

We use data from the 2011 HBS[2] to describe the patterns of demand and supply of wheat, maize and rice, with respect to urban/rural households and gender of the household head. Table 1 shows the number of surveyed households and their distribution over the country. A total of 3,566 surveyed households are analysed; these households are distributed over two geographical sections and by gender of household head. Although the share of urban households may be overrepresented, due to a lower expense in surveying urban households, in this study we will use the weights obtained alongside the dataset to correct for this issue.

Table 1 Structure of the survey

		Geographical distribution		
		Urban	Rural	Total
Gender of head of household	**Male**	2,092	817	2,909
	Female	553	104	657
	Total	2,645	921	3,566

Source: 2011 HBS.

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[2] Ideally, we would have preferred to start with the 2006 HBS (the survey before the price hike), but data on the income and expenditure of cereals (wheat and maize) and rice were largely missing because surveyed households at that time were answering the survey on a voluntary basis only. However, the 2011 HBS served the purpose well, because, as observed in Figure 1, no large changes in the produced quantities occurred between 2006 and 2011.

Table 2 presents sample means for the main variables of interest. Throughout this study, we will be using total household income per capita as a preferred measure of household living standards. Judging by this criterion, and ignoring any price differences, households in urban areas have a higher living standard than those in rural areas, and female-headed households are wealthier than male-headed households. While the first regularity is expected, the second regularity may be surprising, but still logical for the former Yugoslav Republic of Macedonia – at least partially. Namely, in a predominantly still patriarchic-minded society, a female-headed household signifies that a male head has passed away or migrated; in the former case, this reduces the household size (as well as total income); in the latter case, with the reduction of its size, the household is likely to receive remittances, which elevate its per capita income.[3] It could be observed that the average household size is lower for female-headed households, whereas the difference in household size between urban and rural households is likely insignificant. Finally, the average age of the head of household is quite high, due to households often consisting of grandparents, parents and children, with a grandparent reported as head of household.

Table 2 Summary statistics

		All HH	Geographical distribution		Gender of head of household	
			Urban	Rural	Male	Female
HH characteristics	HH size	3.8	3.7	4.1	4.0	2.8
	Age of HH head	55.7	55.4	56.9	53.9	62.6
	Income per capita	6,125	6,928	3,744	5,778	7,470
Annual production (kg per HH)	Wheat/maize	886.1	0.3	3,511.7	955.7	616.9
	Rice	37.7	0	149.5	45.5	10.8
Annual expenditure (kg per HH)	Wheat/maize	293.7	136.5	759.7	304.7	251.1
	Rice	27.3	27.7	26.0	27.3	27.0
Annual self-consumption (kg per HH)	Wheat/maize	14.8	0	58.8	15.9	10.8
	Rice	0.2	0	0.7	0.2	0.02
Income share (per cent)	Wheat/maize	5.2	0	20.7	5.6	3.8
	Rice	0.3	0	1.2	0.3	0.3

[3] Remittances are an important source of income in the former Yugoslav Republic of Macedonia, amounting to more than 4 per cent of GDP per year. About one-fourth of the households are remittance receivers.

		All HH	Geographical distribution		Gender of head of household	
			Urban	Rural	Male	Female
Expenditure share	Wheat/maize	1.7	0.8	4.3	1.7	1.8
(per cent)	Rice	0.6	0.6	0.6	0.6	0.7
Self-consumption	Wheat/maize	0.1	0	0.4	0.1	0.1
share (per cent)	Rice	0	0	0	0	0

Source: Author's calculations, based on the 2011 HBS.
*Note: HH stands for household, kg for kilogram; income per capita is measured in Macedonian denar (MKD).*

The fourth and fifth columns of Table 2 show the geographical and gender distribution of crop quantities, and income and expenditure shares. At the outset, it is estimated that in the former Yugoslav Republic of Macedonia, about 90,000 households cultivate wheat and maize, and about 10,000 to 11,000 cultivate rice. Expectedly, urban households do not produce these crops (or they do so in a negligible amount); hence we will focus on rural households. Wheat and maize appear to be an important source of income for rural households – a rural household produces on average 3.5 metric tons of wheat and maize per year and earns about 21 per cent of its income from cultivation. About one-fifth of that amount is the average expenditure on wheat and maize per rural household, which is five times more than for urban households. Note that under expenditure on wheat and maize, we count both grains and bread produced, given an aggregation of household expenditures in the household survey. The figures nevertheless seem plausible because the share of bread in the consumption basket of rural households is higher due to rural households being poorer than urban households and to their continued tradition to bake bread domestically. Female-headed households produce one-third less wheat and maize than male-headed households, which underscores the role played by males in cultivating this crop (including the necessity to handle large machinery).

The importance of rice in both income and consumption of households in the former Yugoslav Republic of Macedonia is significantly lower than for wheat and maize. Rice is also almost exclusively produced in rural households: male-headed households are larger producers in absolute terms, but rice production has equal importance, in relative terms, for both male- and female-headed households. Likewise, both types of households are not different in their consumption of rice.

Nevertheless, the averages presented in Table 2 are likely insufficient to consider the distributional effects of potential price changes on the crops considered here. There are rich and poor households in both rural and urban regions and across male- and female-headed households. Production

and consumption patterns are far from being independent of household resources. If it is true that wealthier households are those that produce crops for sale, while poor households hardly satisfy their own needs, then the direct effects of higher prices, while being potentially beneficial for the entire sector (especially the rural one), might as well worsen the income of poor households. Figures 4 and 5 show the estimates of the distribution of living standards across households by both geographical section and gender. The kernel-smoothing graphs illustrate the estimated density functions of the logarithm of household per capita income.[4]

Figure 4 Per capita income distribution by geographical section
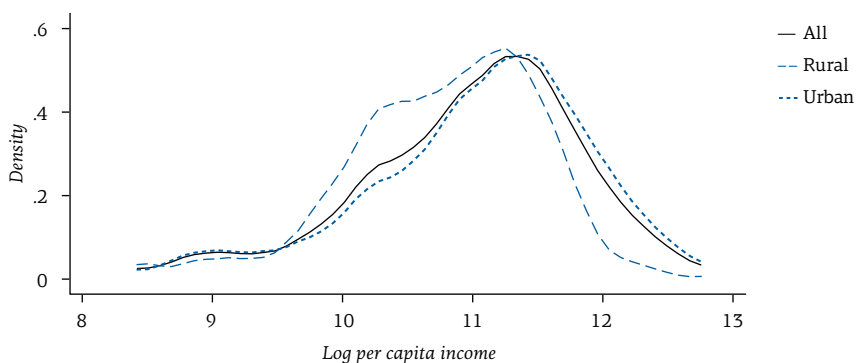
Source: Author's estimations, based on the 2011 HBS.

Figure 5 Per capita income distribution by gender of household head
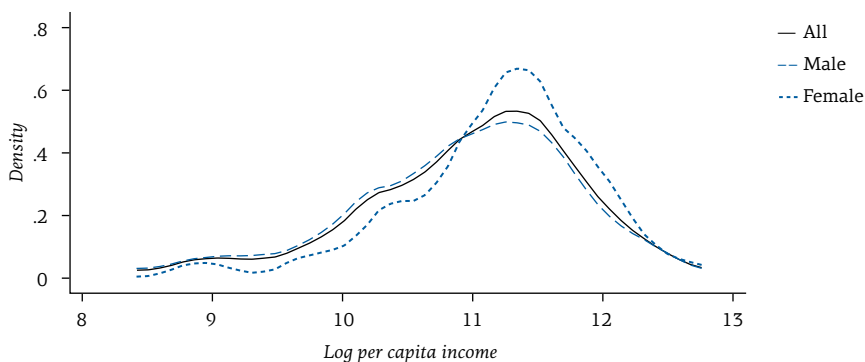
Source: Author's estimations, based on the 2011 HBS.

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[4] We use the logarithm of the income per capita, as it is usually strongly positively skewed.

The figures show a difference between the wealth of urban and rural households, in favour of the former; although the difference may seem small, it is still important given the logarithmic scale. However, rural households in the middle of the distribution are wealthier than their urban counterparts and then extend into a long upper tail, suggesting that there are very rich households even within the rural sector. Conversely, the contingent of wealthy urban households is quite pronounced. Figure 5 suggests that female-headed households are more "equal" in terms of income than male-headed households. Male-headed households are more likely to be observed in both the poor and the rich tails of the income distribution.

Considering (a) the importance of wheat and maize for households in the former Yugoslav Republic of Macedonia, (b) the price spike since 2006, (c) the implementation of government subsidies, and (d) the diversity of households in terms of wealth, the discussion above highlights the importance of evaluating the effects of increasing prices and agricultural subsidies on the welfare of households. This will be the aim of our analysis.

3 Literature review

Recent spikes in global food prices have sparked a new strand of literature to investigate their effects on poverty. For instance, using household level information for selected low-income countries, Ivanic and Martin (2008) find that the share of the population living below the poverty line has increased as a result of higher food prices in eight of the nine countries included in their study. Similarly, de Hoyos and Medvedev (2011) provide a formal assessment of the implications of higher prices for global poverty using a representative sample of 63 to 93 per cent of the population of the developing world. Their study finds an increase in extreme poverty[5] headcount at the global level of 1.7 percentage points, albeit ranging from negligible in Eastern Europe to considerably large in sub-Saharan Africa. A similar magnitude of poverty increase due to price hikes is found by Wodon *et al.* (2008) in sub-Saharan Africa.

An also recent study by Aksoy and Isik-Dikmelik (2008) however challenges the idea that higher food prices unambiguously deteriorate the income of the poor. Using household survey data from nine low-income countries, the study finds that net sellers are disproportionately represented among

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[5] Extreme poverty refers to a condition that is characterized by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends not only on income but also on access to services.

the poor, hence an increase in food prices could transfer income from richer to poorer households. However, many other studies (e.g. Poulton *et al.*, 2006; Christiaensen and Demery, 2007) argue that the rural poor are more frequently net buyers and thus a price increase exerts a negative impact on them. Consequently, although studies tend to find that higher food prices have a negative impact on the poor, the relationship is neither unique nor universal, but depends on the specific context (Hertel and Winters, 2006). Earlier studies (e.g. Deaton, 1989a; Ravallion, 1990; Ravallion and van de Walle, 1991; Friedman and Levinsohn, 2002), other than offering contribution to the methodological approach to this issue, examine similar issues and provide specific policy recommendations for specific countries.

In contrast to this discussion, the effect of agricultural subsidies – as a potentially countervailing programme to rising food prices[6] – on household welfare and poverty remains largely unexamined. Only Wodon and Zaman (2010) discuss agricultural subsidies as a policy to counter the effects of rising food prices, but no estimates have been provided in this context. The present study therefore builds on these grounds. It will estimate the welfare effect of changes in crop prices and propose a redesign of government subsidies to improve their effect on alleviating poverty in the former Yugoslav Republic of Macedonia.

4   Methodology and data

4.1 Methodology

The analysis of the distributional impact of price increases follows a methodology outlined by Singh *et al.* (1986) and Deaton (1989a, 1997), and subsequently widely applied (Barrett and Dorosh, 1996; Budd, 1993; Ivanic and Martin, 2008; Wodon *et al.*, 2008; Klytchnikova and Diop, 2010). The argument made is that the non-parametric techniques in Deaton's methodology do not impose any structure on the data and hence make full use of the information available. Deaton's framework can be summarized as follows. The change in welfare following a change in prices for a household is:

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[6]   We should note here that for a country that imports food and is a price taker on world markets, such as the former Yugoslav Republic of Macedonia, a consumption subsidy would countervail increasing food prices by lowering the domestic price of consumed food. However, a production subsidy – the one analysed here – would further increase domestic food prices. Therefore, interpretation of our findings should be made with caution from this viewpoint.

$$\Delta w_{ij} = \sum_{j=1}^{n} \Delta p_j \left[(prod_{ij} - cons_{ij}) + \eta_j L_i \right] \tag{1}$$

where Δw_{ij} is the welfare effect expressed in percentage terms of the initial consumption level of household i for good j, Δp_j is the percentage change in prices for each good considered (category by category), $prod_{ij}$ is the income share coming from production of good j (household sales of item j divided by total income), $cons_{ij}$ is the expenditure share of good j (household consumption of item j divided by total consumption), η_j is the wage rate elasticity with respect to changes in prices of good j, and L_i is the labour share in household income.

Our analysis proceeds as follows. We use non-parametric techniques to estimate the production, consumption and labour income effects of the observed price changes over 2006–2012. We disentangle the effects on households by geographical distribution and gender to be able to judge which target group, which part of the income distribution and which specific food crop commodity may benefit the most from agricultural subsidies.

Once we identify these groups, we conduct a simulation of the effect of subsidies using equation (1). Based on the findings, we propose a scheme for disbursement of the proposed amount of agricultural subsidies for 2012, i.e. we direct the funds to specific groups of households instead of them being disbursed linearly to everyone. We then evaluate the welfare effects of this alternative subsidy scheme.

To undertake the analysis, we need information on household production, consumption and sales of the above agricultural products. For conducting the proposed research, the Household Budget Survey of the former Yugoslav Republic of Macedonia in 2011 is used. In addition to the usual demographic and labour market data, the HBS contains data on production and consumption of the above-mentioned food crops. A disadvantage, however, is that the HBS reports those parameters for wheat and maize grains together. With rice, this gives two categories of food commodities to be analysed in this study.

4.2 Simulation

The HBS does not contain data for subsidies. We therefore analyse the impact of the existing scheme by applying the prevailing rules for subsidy disbursement. To evaluate the current scheme, which is based on lump sums per cultivated hectare and not per produced kilogram, we need to assume a certain production of the food crop per hectare. For this, we will use the average kilogram per hectare ratio for cereals of 3,373 metric tons

per hectare in the former Yugoslav Republic of Macedonia obtained from the Ministry of Agriculture, Forestry and Water Management. We will then base the simulation on the transformation of kilograms into hectares.

Table 3 Conversion rates for crop subsidies, averages for 2006–2009

Subsidy rules per hectare	Subsidy rules per kilogram
EUR 150 per ha up to 10 ha	4.45 cents per kg up to 10 ha
EUR 90 per ha for 10–50 ha	2.67 cents per kg for 10–50 ha
EUR 45 per ha for 50–100 ha	1.33 cents per kg for 50–100 ha
EUR 15 per ha for above 100 ha	0.44 cents per kg for above 100 ha

Source: Author's calculations, based on Ministry of Agriculture, Forestry and Water Management.
Note: The conversion follows these steps: First, we observe kilograms produced by a household; second, we use the conversion of 3,373 metric tons per hectare to find the plot size that a household owns; and third, based on this information, we compute the subsidy a household receives.

The simulation should make some assumptions with respect to the change in production due to subsidies. However, we should be cautious in this regard, as the stylized facts of Section 2 suggest that despite both price increases and government subsidies, crop production in the former Yugoslav Republic of Macedonia stagnated or continued to fall. As further support to this claim, Table 4 presents simple tests for structural breaks in the annual time series (1992–2012) for the nationwide quantity produced of wheat, maize and rice. If the subsidy had a bearing on production, one would expect to detect a structural shift after the implementation of the subsidy programme. The figures shown are the t-statistics for the significance of the potential shift in production when subsidies were introduced.[7] The test does not claim that the potential shift has happened due to the introduction of subsidies only, but simply tests whether a shift has occurred. We consider three different years to capture lagged effects of the 2006 subsidy programme on production. Results suggest that a structural shift in the production cannot be claimed, as all t-statistics are within the "insignificance" range of between –1.96 and 1.96 for the 5 per cent significance level.

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[7] In essence, we regress the production on a constant term and a dummy variable for a shift in any of the three years (2006, 2007 and 2008).

Table 4 Testing for structural breaks in production around the introduction of subsidies

	t-statistics		
	Wheat	**Maize**	**Rice**
2006	–0.6958	–0.0343	0.1502
2007	–1.3325	–1.4196	0.1532
2008	1.3015	0.4073	0.0855

Source: Author's estimations, based on FAO statistics.

Table 5 investigates the issue further. It portrays a simple regression of total cereal production on subsidies to check the magnitude with which they potentially affect production. The regression also includes prices, as these are expected to drag production up, and the log of income, so as to capture any general economic trends that may affect production (such as the ongoing crisis). We use annual time-series data over 2003–2012 collected from FAO statistics, the Ministry of Agriculture, Forestry and Water Management, and the State Statistical Office. We present results from an ordinary least squares (OLS) estimator, as well as from a generalized method of moments (GMM) estimator, which take into account potential endogeneity of variables (for instance, subsidies may lead to increased production, but more production will trigger a larger amount of subsidies to be paid out). However, all coefficients are insignificant, suggesting that in the case of the former Yugoslav Republic of Macedonia, subsidies (not increasing prices) are not correlated with increased production, which is fully in line with what we observe in Figure 1.

Table 5 Reaction of production to subsidies

	OLS	**GMM[§]**
Log of income	1.18	1.34
Log of subsidies	–0.24	–0.24
Prices	–0.24	–0.53
Constant	0.59	–

Source: Author's estimations.
Note: None of the estimated parameters are found to be significant at the 10 per cent level.
§ means that two lags of the independent variables are used as instruments.

For the analysis, we also need data on wages and total income of households. The HBS provides data on all sources of income in households, so the share of labour income in the total income is readily available. The price pass-through and the wage-price elasticity with respect to prices are obtained as follows.

4.3 Price pass-through

In the analysis we need some guidance on calculating the magnitude of the pass-through of international to domestic prices. This is essential in the analysis as the Ministry of Agriculture, Forestry and Water Management exerts limited control over price changes through mediating negotiations between purchasers and producers, so that excessive movements of prices in either direction are somehow smoothed.[8] To support this, we run a regression of the domestic price index of cereals on the international price index for each quarter in 2005–2011 (Table 6). Data are obtained from the Ministry of Agriculture, Forestry and Water Management and FAO statistics. The result is a pass-through estimate of 0.42, which supports our claim regarding the variance smoothing likely exerted by the Ministry of Agriculture, Forestry and Water Management. Hence, we rely on this figure in the further analysis.

Table 6 Reaction of domestic to international prices

Dependent variable: Domestic prices	
	OLS
International prices	0.42***
R-square	0.81

Source: Author's estimations.

*Note: *, ** and *** denote statistical significance at the 10, 5 and 1 per cent level, respectively. Both series have been de-seasoned and de-trended. These procedures boil down to regressing the variable on a constant, a trend and seasonal dummies. The residual of such regression is the de-trended/de-seasoned variable. As the procedure includes a constant, the constant does not appear in this model. Estimates are robust to arbitrary heteroskedasticity and autocorrelation.*

4.4 Wage-price elasticity

We estimate the wage-price elasticity (η in equation (1)) from aggregate wages and economy-wide price time-series index (consumer price index, CPI) obtained from the State Statistical Office of the former Yugoslav Republic of Macedonia (both expressed as indices). The latter is available on a quarterly basis for 1997–2012, which gives sufficient observations for a credible econometric analysis.[9]

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[8] For example, the process of negotiations in 2013 is explained here:
http://republika.mk/?p=93101 (in Macedonian).

[9] Although estimates for the two goods instead of the entire consumption basket may be desirable and may give the analysis further credibility, the relevant series for the former Yugoslav Republic of Macedonia were available to the author only at the annual level for 2006–2012, which is insufficient for a credible estimation of the elasticities.

Table 7 presents the results: OLS results in column (1), and GMM results in column (2). Note that because both wages and prices contained a trend, we work with the de-trended series. The trend may be the result of a third variable, the most prominent being economic growth. The risk of a bias arising from the omission of an important variable in the model is thus reduced. The OLS estimate suggests that a 1 percentage point increase in prices results in a 0.64 percentage point increase in wages.

Table 7 Wage-price elasticity

	(1) OLS	(2) GMM
Prices	0.641***	0.626**
Observations	64	60
R-square	0.105	0.069
Underidentification test (p-value)	-	0.0000
H_0: The model is underidentified		
Weak identification test (Kleibergen-Paap rk Wald F statistic) H_0: The model is weakly identified	-	40.18***
Hansen J test (p-value) H_0: Instruments are valid	-	0.2452

Source: Author's estimations.
*Note: *, ** and *** denote statistical significance at the 10.5 and 1 per cent level. Series have been de-seasoned and de-trended. These procedures boil down to regressing the variable on a constant, a trend and seasonal dummies. The residual of such regression is the de-trended/de-seasoned variable. As the procedure includes a constant, the constant does not appear in this model. Estimates are robust to arbitrary heteroskedasticity and autocorrelation of order one. The GMM estimation uses a set of lagged prices (four periods) to correct for potential endogeneity.*

However, one may argue that these results may still suffer endogeneity bias stemming from simultaneity.[10] In other words, the coefficient on prices may reflect the positive effect that increasing prices exert on wages, but also the rising pressure on prices, which may be exerted by rising wages. Hence, we need an instrumental-variable (IV) estimator to tackle all potential sources of endogeneity. Column (2) reflects the model with a GMM estimator (see e.g. Baltagi, 2008); the model is well specified according to the respective tests. The coefficient on prices, though, does not differentiate more than the OLS estimate: a 1 percentage point increase in prices results in an increase in wages of 0.626 percentage point, on average and other things being equal. The finding is sensible and in line with the findings and discussion in Jovanovic and Petreski (2012) for price-wage elasticities in transition economies. Therefore, in the analysis, we use this estimated wage-price elasticity.

5   Findings and discussion

This section presents the results of the analysis. Results are analysed and discussed in the following order: First, we present the welfare effects of the rising prices of wheat, maize and rice; second, we show the welfare effects of government subsidies for these crops; and third, we describe the welfare results of a new proposed scheme for subsidy disbursement, which potentially increases the overall welfare and shields the vulnerable groups of households. Note that the sections visualize only the overall result decomposed into rural/urban and male-/female-headed households; the particular components of the welfare function are shown in Annexes 1 and 2.

5.1 Welfare effects of rising prices

The welfare change in terms of share of household income due to the observed price change of wheat and maize between 2006 and 2011 at each point of the income distribution is estimated and plotted in Figures 6, 7 and 8 – the first refers to all households, and the next two refer to urban and rural households, respectively. Note that the respective price changes over this period for wheat-maize and rice are 102.5 per cent and 81.8 per cent, not considering the international-domestic price pass-through. The price change results in a positive welfare change for all households over the income distribution. However, when disaggregated according to gender, results suggest that male-headed households are better off and poor female-headed households are worse off.

Figure 6   Welfare change for all households due to increasing prices – Wheat and maize
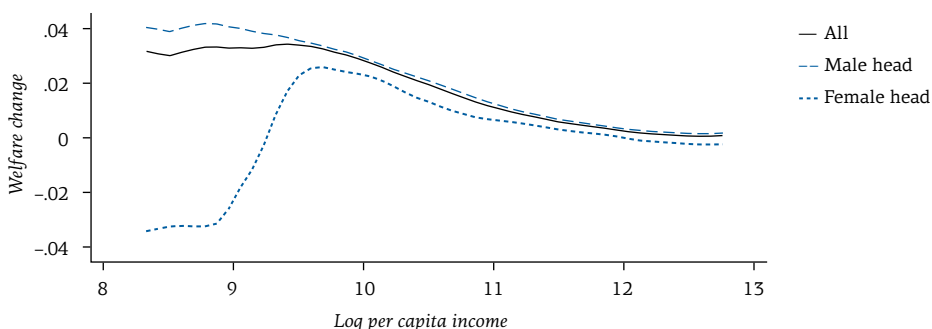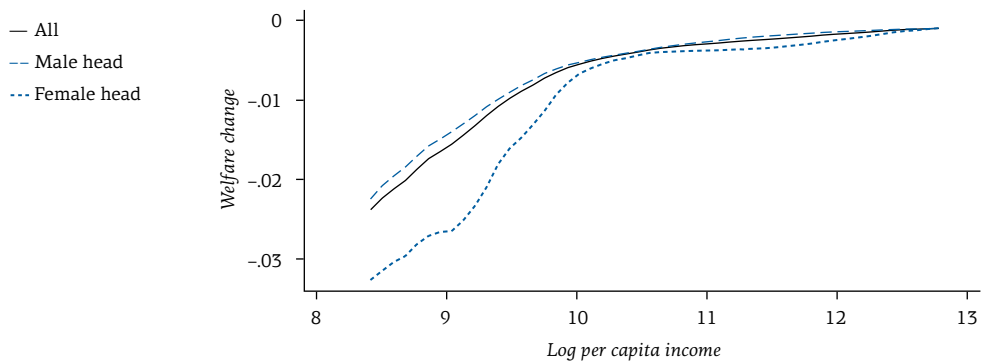

Source: Author's estimations, based on the 2011 HBS.

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[10] Endogeneity bias may arise because of an omitted variable, measurement error and simultaneity. See further explanations in Wooldridge (2002). OLS estimates in this study have the omitted variable bias to an extent reduced by using de-trended series. However, the overall endogeneity may be addressed only by an IV estimator as is GMM.

However, a more detailed look is worth considering. The disaggregation between urban and rural households is essential, because as we have seen in Section 2, urban households in the former Yugoslav Republic of Macedonia do not produce wheat and maize or do so negligibly. The result is expectedly an overall negative welfare effect of increasing prices on those households – the effect being more pronounced on female-headed urban households (Figure 7). In contrast, the overall welfare effect on rural households is positive (Figure 8) – the effect being negative only on female-headed rural households in the negligible fourth percentile of the income distribution.

Figure 7 Welfare change for urban households due to increasing prices – Wheat and maize

— All
–– Male head
··· Female head

Log per capita income

Source: Author's estimations, based on the 2011 HBS.

Figure 8 Welfare change for rural households due to increasing prices – Wheat and maize

— All
–– Male head
··· Female head

Log per capita income
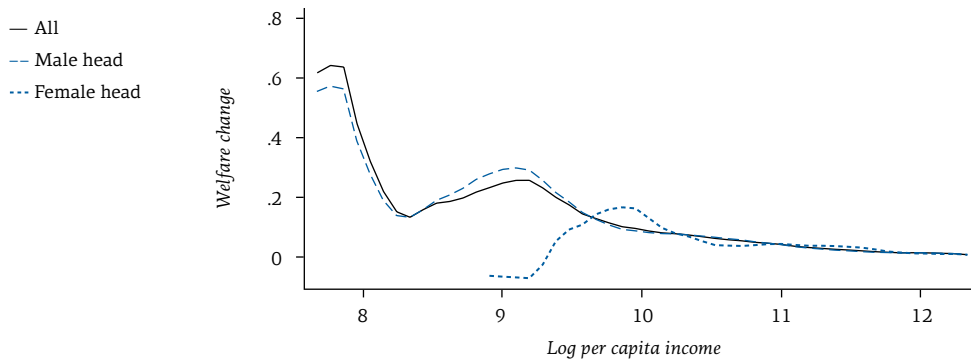
Source: Author's estimations, based on the 2011 HBS.

A closer look at the drivers of these results in Annex 1 suggests the usual Engel's Law, or its wheat-maize equivalent – that, on average, the share of budget spent on wheat and maize declines as the living standard rises. It is also clear that female-headed households spend more on wheat-maize in the left part of the income distribution. However, while urban households have virtually no income from wheat-maize (no production), rural households earn part of their income from this type of agricultural production, the share being larger for the poorer male-headed households. Female-headed poor households, interestingly, have a low income share from wheat-maize, which is likely due to the task of cultivating wheat and maize being perceived as a male job (due to the difficulty of cultivation and the necessity to handle large machinery). This fact then drives the negative welfare effect of the price change on poor female-headed rural households. It is worth mentioning that the labour income share in total budget increases with the level of income of the household but it occurs at a faster pace for urban households.

The welfare change in terms of share of household income due to the observed price change of rice between 2006 and 2011 at each point of the income distribution is estimated and plotted in Figures 9, 10 and 11 – the first refers to all households, and the next two refer to urban and rural households, respectively. The price change results in a negative welfare effect on all female-headed households over the income distribution and on poor male-headed households.
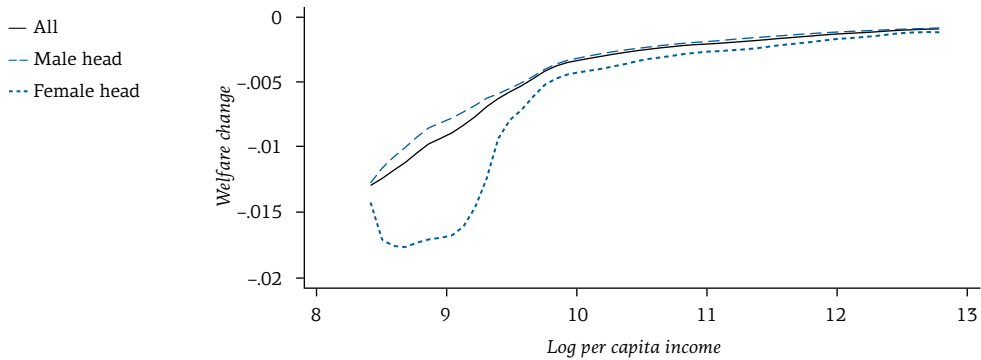
Figure 9 Welfare change for all households due to increasing prices – Rice
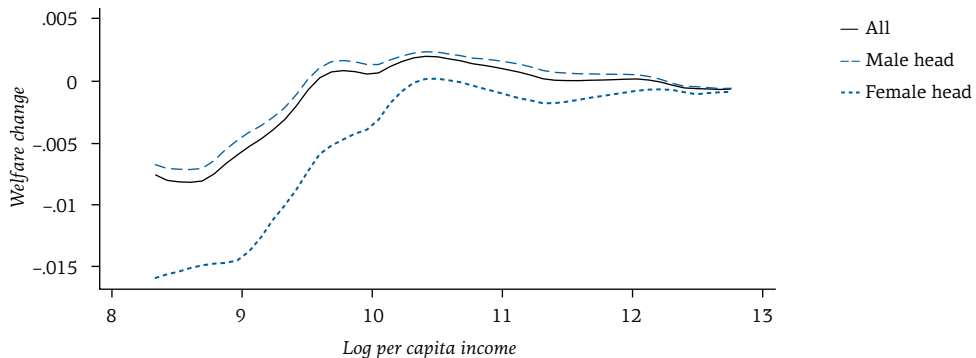
A more detailed look suggests that urban households are negatively affected by the price increase along the entire income distribution. This is expected, given that they do not produce rice, or do so negligibly. The result for rural households is mixed. Overall, only the poorest male-headed households are slightly negatively affected and a small part of female-headed households (only about 6 per cent) on the left of the income distribution also shows a negative welfare change.

Figure 10 Welfare change for urban households due to increasing prices – Rice

Source: Author's estimations, based on the 2011 HBS.

Figure 11 Welfare change for rural households due to increasing prices – Rice
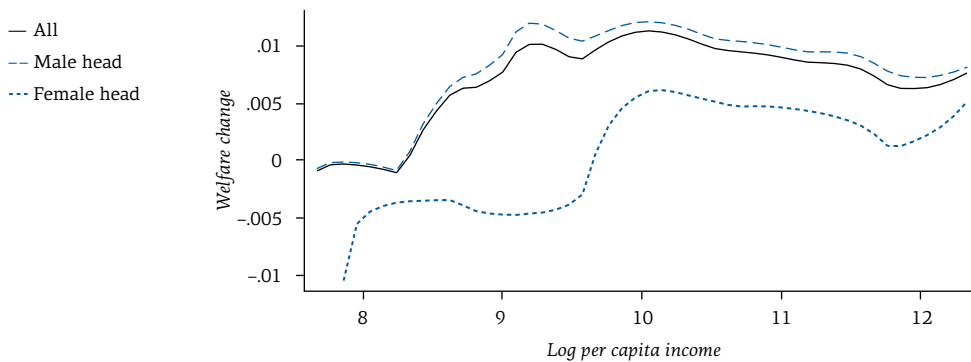
Source: Author's estimations, based on the 2011 HBS.

The drivers of those results may be seen in Annex 2. Again, we observe Engel's Law – rice consumption share declines as the living standard increases – and the decline is expectedly steeper for the female-headed urban households. Surprisingly, the rice consumption share is pronounced only for middle-income female-headed rural households and not for the poorest ones, which may suggest that the latter still compensate the need for rice consumption with some other cheaper crop. This group of households also does not cultivate rice; the cultivation is mostly spread over the left of the middle of the income distribution for female-headed rural households, but also for male-headed rural households. However, given the dominance of the labour income share, the welfare effect is positive on both urban and rural households in 2006 and 2011, with the exception of the poorest female-headed households. Hence, the finding with regard to the poorest female-headed households drives the negative welfare effect on these households when prices of rice increase.

5.2 Welfare effects of the introduction of government subsidies

Figures 12 and 13 estimate the welfare change due to government subsidies for the food crops discussed here. The conversion rates presented in Table 3 are used to disburse subsidies in the current scheme. The welfare function is then re-estimated by considering the income from subsidies within the production income. Note that because currently only rural households have an agricultural production, these households are the target of the current agricultural subsidy programme. Hence, the graphs present the results only for the rural households. Also note that this simulation implicitly assumes that the subsidy is completely passed-through to recipient prices and it does not affect market prices. The effect of the agricultural subsidy programme on wheat and maize may be considered important, because it reaches up to 60 per cent of total income for the poor male-headed rural households (although they account for only about 2 per cent of all households). The share then falls to 20–30 per cent for male-headed households up to about the fifth percentile of the income distribution and subsides to zero afterwards. However, given that female-headed rural households were found not to be largely engaged in wheat-maize production (Section 5.1), the effect of the government subsidy is small (about 10 per cent) for the lowest percentiles: it rises to 15–18 per cent for the first decile and then subsides to zero.

Figure 13 presents the welfare result of a government subsidy for rice and portrays a different picture. Given the smaller production of rice, the effect of the government subsidy is also small or negligible. This is mainly because both the poorest male- and female-headed rural households were

found to be larger consumers than producers of rice, possibly suggesting that the subsidy is perceived as insufficient to cover the effort needed for the cultivation of rice.

Figure 12 Welfare change for rural households due to subsidies – Wheat and maize

— All
–– Male head
··· Female head
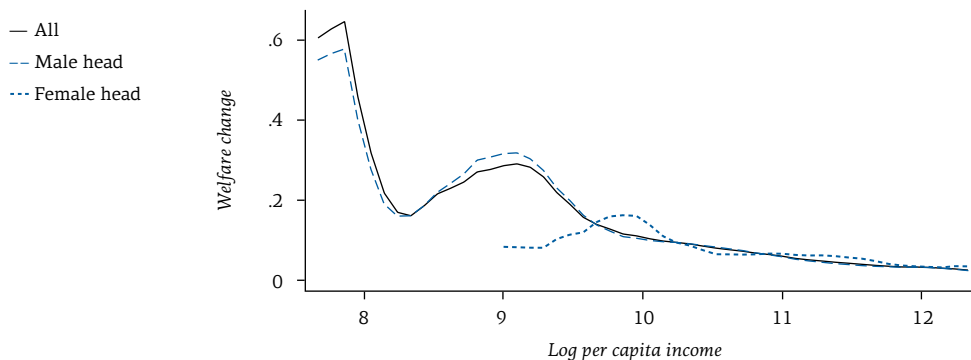
Source: Author's estimations, based on the 2011 HBS.

Figure 13 Welfare change for rural households due to subsidies – Rice

— All
–– Male head
··· Female head
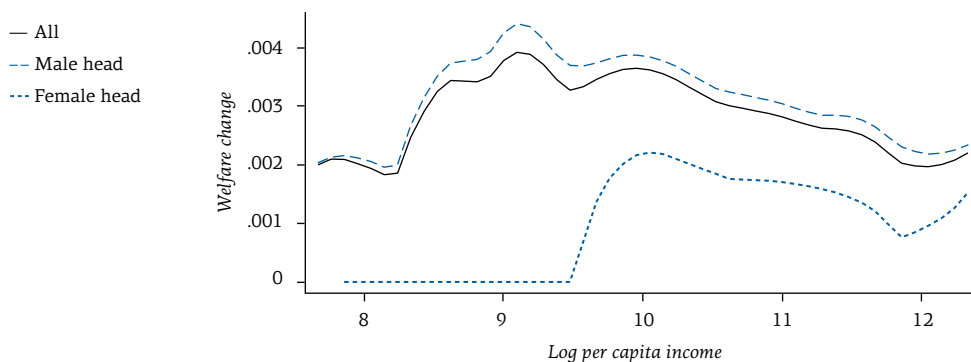
Source: Author's estimations, based on the 2011 HBS.
Note: There are very few observations in the zero-affected area.

Figures 14 and 15 combine the price and subsidy effect on the welfare of rural households. Apparently, both effects are positive for the male-headed rural households that produce wheat and maize (Figure 14). In fact, for the poorest households, the welfare more than doubles, whereas for those on the left of the income distribution – i.e. 15 per cent to 20 per cent of all male-headed households – it ranges from 30 per cent to 60 per cent of the initial income, which is also a significant positive change. However, female-headed rural households show a different effect: for those in the first decile, the effect is somewhat positive, but not as much as for the male-headed households. Note that because urban households do not produce wheat, the urban equivalent of Figure 14 is Figure 7.

Figure 15 shows a positive welfare change due to increasing prices and government subsidies for male rice producers, and a negative welfare change for female rice producers (for about 10 per cent of total female rice producers), because increasing prices dominate and rice subsidies are rather small for the overall welfare effect to be significant. Note that because urban households do not produce rice either, the urban equivalent of Figure 15 is Figure 11.
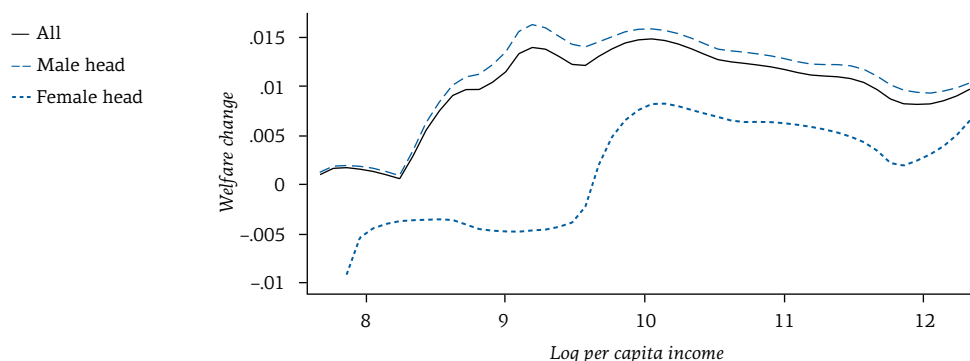
Figure 14 Welfare change for rural households due to subsidies and prices – Wheat and maize
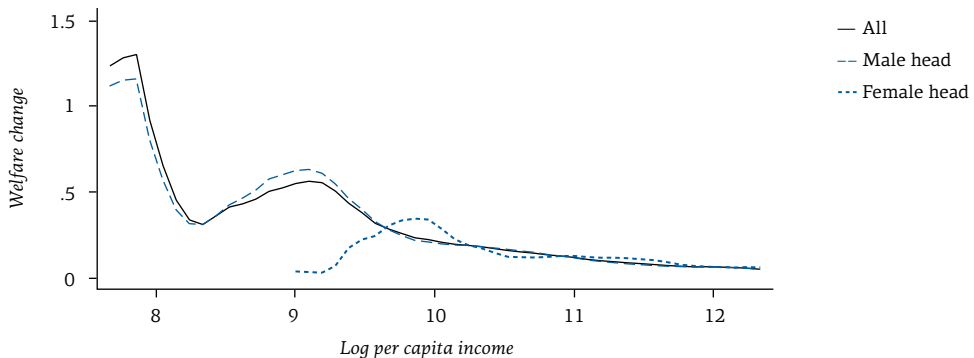
Source: Author's calculations, based on the 2011 HBS.

Figure 15   Welfare change for rural households due to subsidies and prices – Rice

Finally, Table 8 gives the share of the estimated amounts of wheat and rice subsidies in 2012 and compares them with the actual amounts. However, we are not able to make a comparison with the actual amounts for individual crops, as these figures are not available separately, but only as a cumulative amount for the entire plant-type production. Results of the simulation seem plausible: the government spends nearly one-third of the plant-type subsidies for the production of wheat and maize, while the amount disbursed for rice production is negligible, namely 1.2 per cent.

Table 8   Actual versus simulated subsidies

	Actual subsidies for all plant-type production	Estimated subsidies for wheat-maize production	Estimated subsidies for rice production
Subsidies (EUR)	56,800,000	16,926,400	681,600
Share in all plant-type production subsidies (per cent)	-	29.8	1.2

5.3 New scheme for subsidy disbursement

The above analysis offers several lines of thought with regard to a possible modification of the current scheme of agricultural subsidies for wheat-maize and rice, in particular:

- The poorest female-headed rural households should be targeted more intensively to encourage them to produce wheat and maize, especially because of the large effect that production may have on the welfare of this group along income distribution.

- All rice producers should be targeted with possibly larger subsidies per cultivated hectare and with a more intensive targeting of the poorest households.

- Poorest urban households (largely defined as those in the first two quintiles of the income distribution) should also be a target of the programme for wheat and maize (rice production being rather specific due to the difficulty of the production process and the climatic conditions it requires). The programme should target in particular the female-headed households, given the possibility to accompany it by a usufruct of state-owned land[11] and one-off subsidies for purchase of the minimum equipment for agricultural production. These instruments may attract urban dwellers, and particularly former rural-urban migrants, to get them involved in agricultural production.

Given these findings, we propose the following new scheme for subsidy disbursement, presented in Table 9.

Table 9 New proposed scheme for subsidy disbursement

Wheat/Maize	Rice
All households – Reduction of the subsidy to EUR 110 per ha	*All households* – Increase of the subsidy to EUR 250 per ha
Female-headed rural households with per capita income of less than EUR 220 – Increase of the subsidy to EUR 185 per ha	*Female-headed rural households with per capita income of less than EUR 360* – Increase of the subsidy to EUR 375 per ha
All urban households with per capita income of less than EUR 360 – Subsidy of EUR 100 per ha – State-owned land up to 1.15 ha at usufruct – Initial lump sums for investment into minimal machinery for agricultural production	*Male-headed rural households with per capita income of less than EUR 80* – Increase of the subsidy to EUR 375 per ha

Source: Author.

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[11] According to the official numbers from the Ministry of Agriculture, Forestry and Water Management, about 48 per cent of the entire land in the former Yugoslav Republic of Macedonia is agricultural land (about one million ha). The state owns about 20 per cent – i.e. about 200,000 ha – of the arable land.

We will now present the welfare effects of the new scheme. Table 10 suggests that these effects have been drawn on the assumption that the government does not wish to change the overall amount devoted to subsidizing wheat-maize production, whereas that of rice production is assumed to double. The doubling, though, is mainly driven by the increased subsidy per cultivated hectare and only negligibly by the increased production, as this was something we could only assume with great caution. Note that increasing the subsidy for wheat-maize may require huge efforts by the government, whereas increasing the rice subsidy is a fairly small endeavour with potentially large welfare effects, especially on poor female-headed households, as we will see next. However, increasing the rice subsidy may trigger a problem – male-headed households may start to declare themselves as female-headed households to be eligible for the higher subsidy. While the government should find a mechanism to prevent such situations, this analysis assumes that it does not occur at all.

Table 10 Actual versus simulated subsidies after modification

	Actual subsidies for all plant-type production	Estimated subsidies for wheat-maize production	Estimated subsidies for rice production
Subsidies (EUR)	56,800,000	17,539,465	1,502,835
Share in all plant-type production subsidies (per cent)	–	30.8	2.6

Sources: Author's calculations and Ministry of Agriculture, Forestry and Water Management.
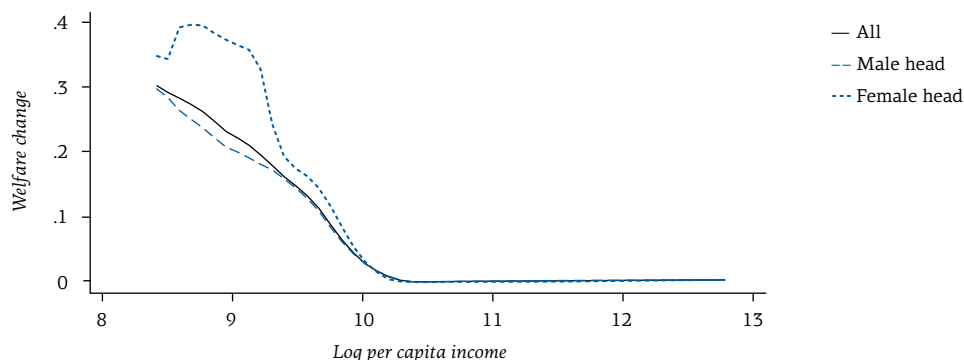
Figures 16 and 17 present the results of the new subsidy scheme for wheat and maize for urban and rural households, respectively. Apparently, the new scheme produces a sizeable effect on the targeted urban households (Figure 16), as they are already poor and even a small "intervention" by the government would turn the welfare effect from significantly negative to significantly positive. However, although a large effort will be needed for an urban household to decide to engage in agricultural production, the graph shows that the benefits may be considerable and would unquestionably rescue these households from falling into destitute poverty, as their share of income from wages is already low. Note that poor urban households are most likely situated in smaller towns, where the connection with villages is still lively; this suggests that engaging in agriculture may still be a viable option for them. Agricultural experts suggest that while the initial one-off grant or subsidized loan of about EUR 3,000 may serve for the required initial investment, the harvest, which requires large machinery, may need to be outsourced. Such a grant scheme to be offered by the

government is comparable with the current scheme for support of single-employee start-ups, and may be considered together.

Targeted female-headed rural households (Figure 17) may also reap large benefits but only if they decide for a larger-scale production. Namely, the graph assumes that these households would expand wheat-maize sown land from the present low amounts to at least an average of about 1.15 cultivated hectares. If this is the case, the poorest female-headed rural households may increase the welfare effect of the scheme from virtually zero to about two-thirds of the income of their male counterparts. However, this assumption is rather strong, given our findings that subsidies do not increase production, and should therefore be approached with considerable caution.

Although the current scheme does not likely have an effect on production, the new scheme we propose may start influencing production due to the provision of larger subsidies for specific households. In addition, one should bear in mind that the results are also conditional on resolving two important issues: (a) declaring the household as female-headed when it is actually male-headed to qualify for a higher subsidy; and (b) traditionally lower participation of women in production activities.

Figure 16 Welfare change for urban households after scheme modification – Wheat and maize
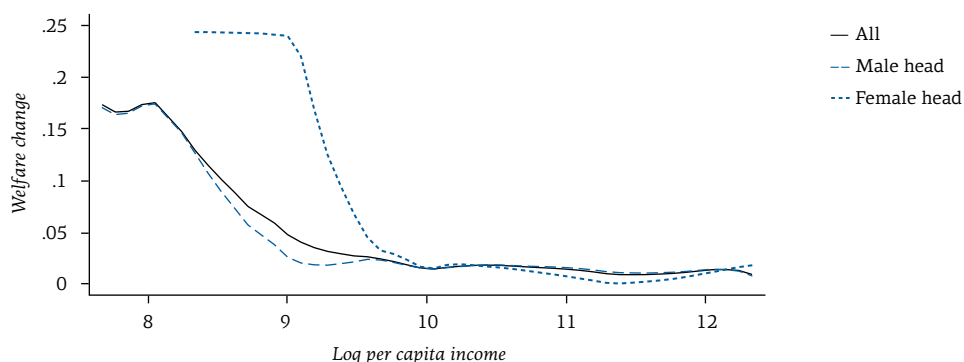

Source: Author's estimations.
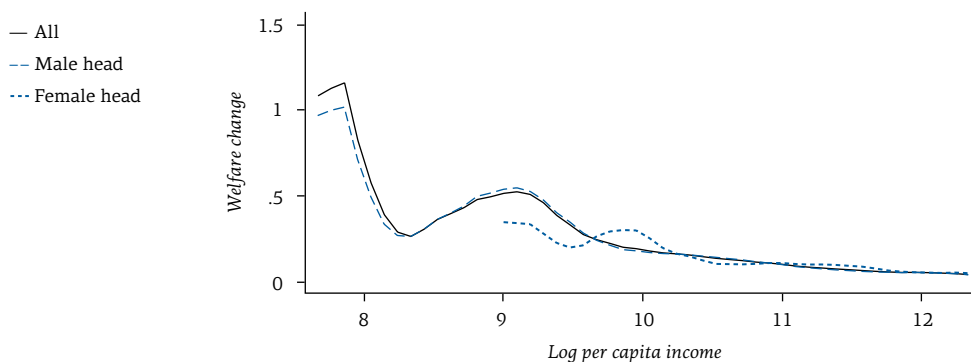
Source: Author's estimations.

Figure 18 presents the results of the new subsidy scheme for rice for rural households only. There are two important caveats with regard to the cultivation of rice and subsequently to the proposed scheme. First, although urban households were found to be negatively affected by the rice price increase, it is unlikely that they can be steered to produce rice even if offered free-of-charge state-owned land or additional subsidies for initial investment in machinery. This is due to the specificity of rice production. Second, the proposed scheme targets all rural households (producers and non-producers). This seems ambitious because rice production requires specific climate for production (specific regions of the country), in addition to the particularities of the production process (for instance, planting rice under water). From that viewpoint, the results presented in Figure 18 seem to overestimate the welfare impact of the new subsidy scheme. Unfortunately, we do not have the regional information in the survey that would allow us to target the regions known for rice production only. Still, the information obtained in Figure 18 is valuable, as it suggests that the effects of a well-targeted subsidy programme for rice may be sizeable, assuming that the considerably larger subsidy per hectare offered will motivate poor households that otherwise cultivate smaller plots of land to increase production. For the poor female-headed rural households, the overall welfare effect turns from slightly negative to significantly positive, and with a considerable share of rice income in overall income, due to the low initial income level.

Figure 18 Welfare change for rural households after scheme modification – Rice

Source: Author's estimations.

6 Conclusions and policy recommendations

The objective of this study was to analyse the welfare implications of rising prices of wheat, maize and rice and those of agricultural subsidies on household welfare in the former Yugoslav Republic of Macedonia. We used the 2011 Household Budget Survey data and non-parametric techniques to estimate these effects on household welfare along the segments of the income distribution.

Results suggest that increasing prices of wheat, maize and rice exerted positive welfare effects on male-headed rural households only, whereas the effects on female-headed rural households and all urban households were generally negative, largely due to the different production patterns. The welfare effect of the government subsidy programme for wheat and maize production was positive for all rural households: fairly large for male-headed households and small for female-headed rural households. The effect on rice production was zero or negligible, largely due to the small subsidy amount versus the large effort needed for the cultivation of rice. Overall, both price and subsidy effects were found positive only for the male-headed rural households.

Based on these findings, we evaluated a new disbursement scheme for government subsidies targeting female-headed rural households for both crops (wheat-maize and rice); all poor urban households for wheat; and

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male-headed rural households for rice. For the poor urban households, we also proposed the possibility of a usufruct of state-owned land and initial subsidy for investment in machinery; for the poor rural rice producers, we proposed an effort to steer non-producers to become engaged in production where possible, along with a larger subsidy per cultivated hectare. However, the simulation setup is largely based on re-distributional effects and only modestly on increased production effects, as we were unable to document that subsidies positively affected cereal production in the former Yugoslav Republic of Macedonia.

Results of the simulation suggest that targeting poor urban households for wheat-maize production could result in a significant welfare effect ranging up to 30–40 per cent of the initial income of this group of households. Targeting poor female-headed rural households may increase the impact of the scheme to about two-thirds of the income of poor male-headed rural households, preventing this vulnerable group from falling into destitute poverty. The effect on poor rural rice producers may also be large – up to 20 per cent of household income – taking into account that a considerable effort is however needed to start off rice production.
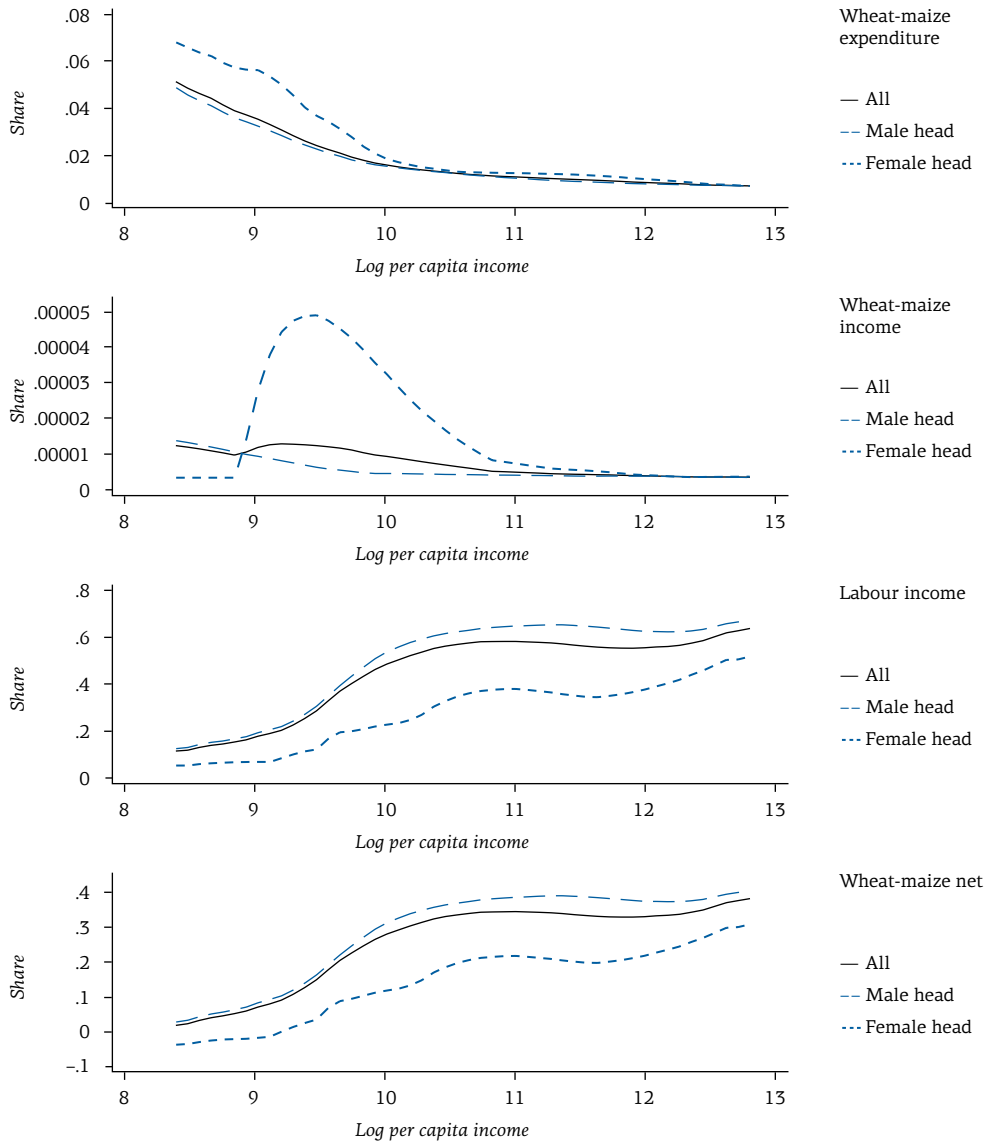
Hence, the policy recommendations stemming from this analysis dovetail to putting particular emphasis on poor female-headed rural households for both wheat-maize and rice production, increasing the subsidy for rice production due to its specificity and large effort needed, and offering the usufruct of state-owned land and start-off grants for poor urban households to encourage them to produce wheat and maize.

Although this analysis was motivated by the fact that the government uses subsidies to target the poor, it abstracts from discussing other more direct means to address poverty in the economy. Other policies would include social financial assistance schemes, in-work benefits, conditional cash transfers and the like. Even though the interplay of those policies with the agricultural subsidies programme may be interesting to analyse, it remains a topic for future research and discussion.

Annex

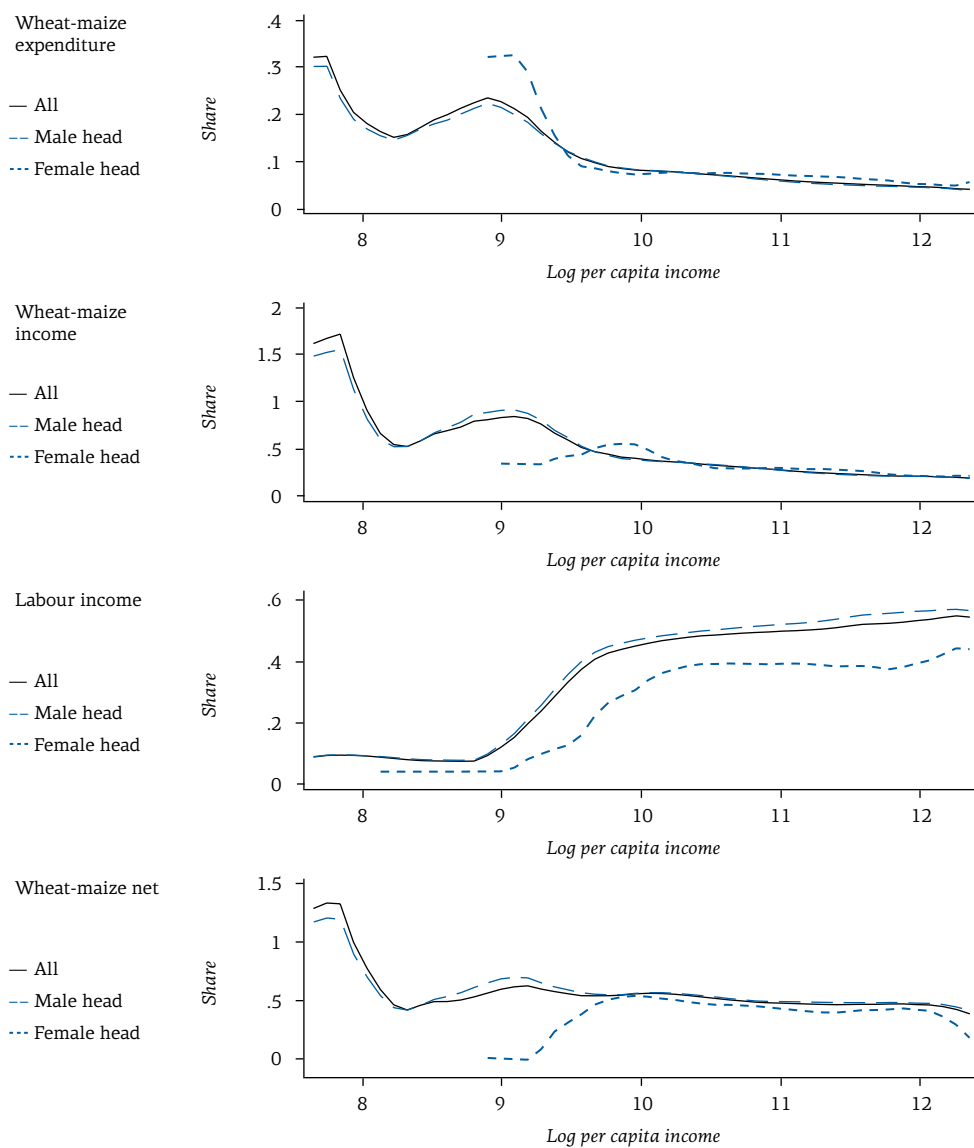## Annex 1: Detailed diagrams – Price change for wheat and maize

Figure A1.1 Components of the welfare function of urban households in 2006 – Wheat and maize

Figure A1.2 Components of the welfare function of rural households in 2006 – Wheat and maize

Wheat-maize
expenditure

— All
-- Male head
··· Female head

Wheat-maize
income

— All
-- Male head
··· Female head

Labour income

— All
-- Male head
··· Female head

Wheat-maize net

— All
-- Male head
··· Female head

Source: Author's estimations, based on the 2011 HBS.

FYROM

Figure A1.3 Components of the welfare function of urban households in 2012 – Wheat and maize
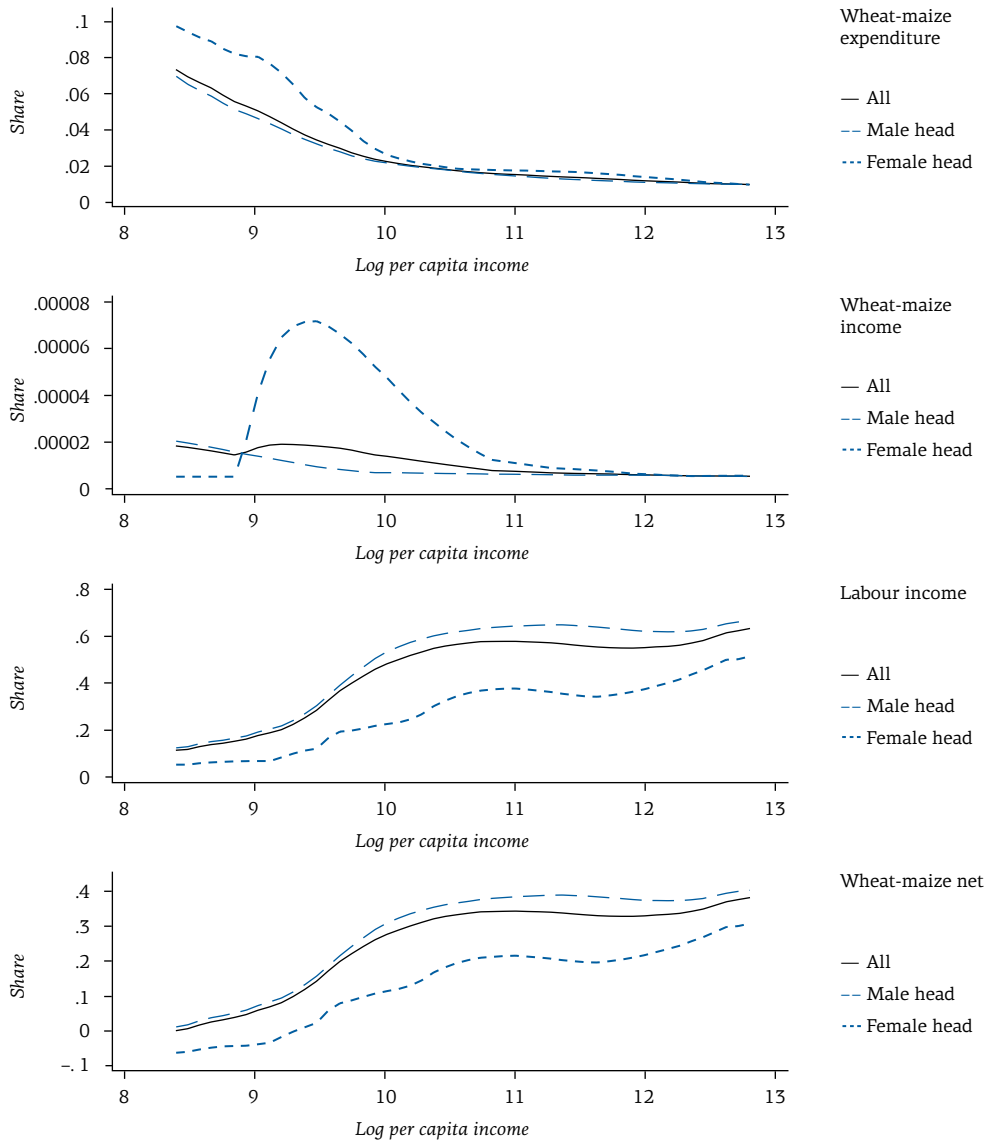
Figure A1.4 Components of the welfare function of rural households in 2012 – Wheat and maize
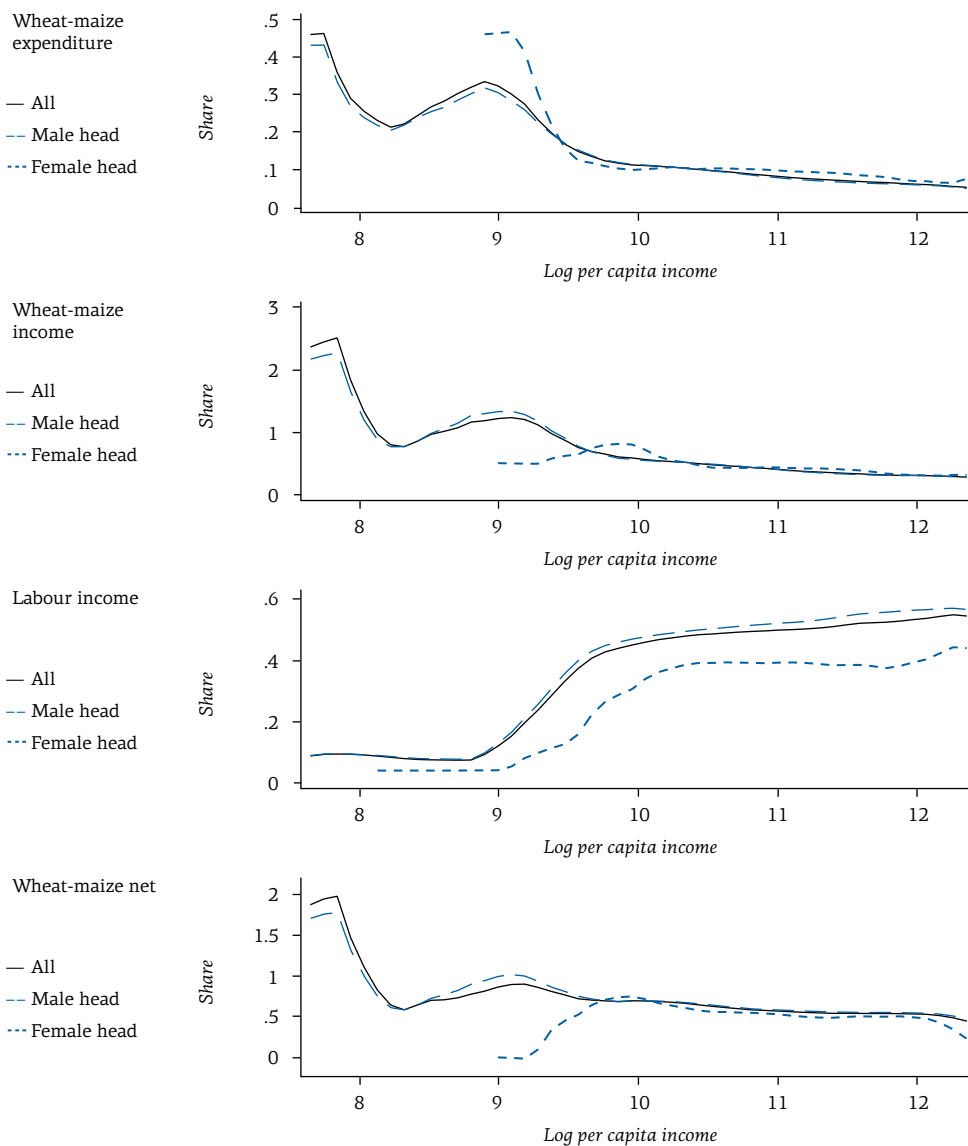

Wheat-maize expenditure

— All
-- Male head
··· Female head

Wheat-maize income

— All
-- Male head
··· Female head

Labour income

— All
-- Male head
··· Female head

Wheat-maize net

— All
-- Male head
··· Female head

Source: Author's estimations, based on the 2011 HBS.

Annex 2: Detailed diagrams – Price change for rice

Figure A2.1 Components of the welfare function of urban households in 2006 – Rice

Source: Author's estimations, based on the 2011 HBS.

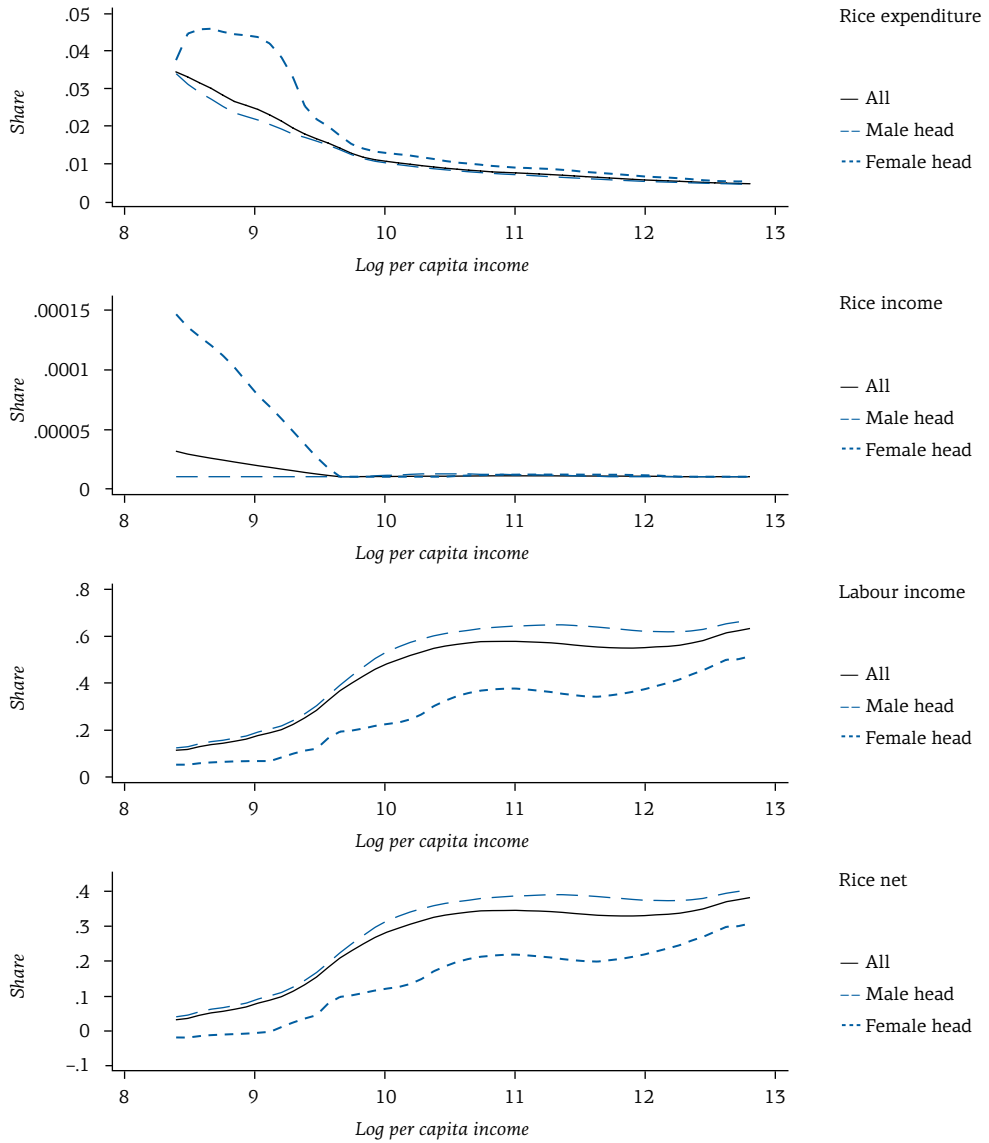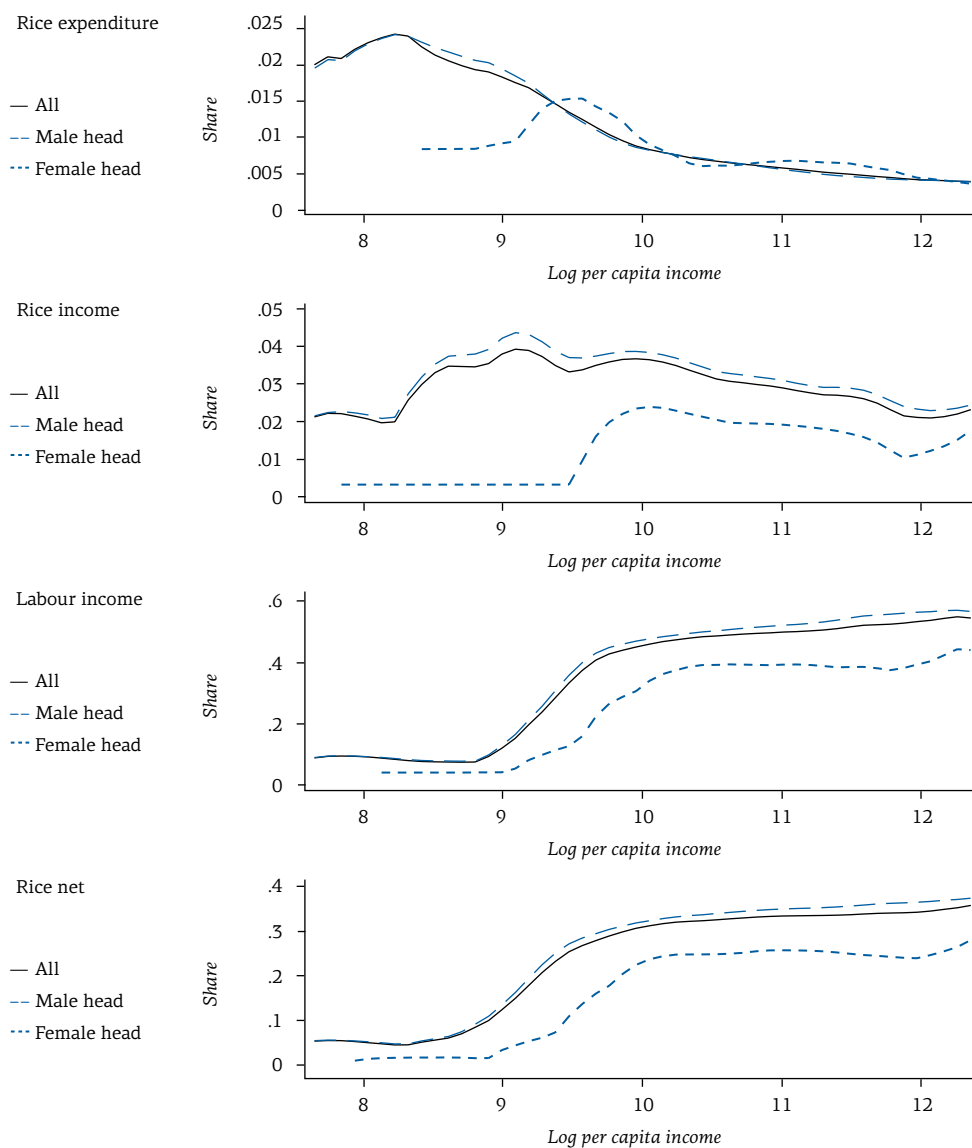Figure A2.2 Components of the welfare function of rural households in 2006 – Rice

Rice expenditure

— All
-- Male head
··· Female head

Share

Rice income

— All
-- Male head
··· Female head

Share

Labour income

— All
-- Male head
··· Female head

Share

Rice net

— All
-- Male head
··· Female head

Share

Log per capita income

Source: Author's estimations, based on the 2011 HBS.

FYROM

Figure A2.3 Components of the welfare function of urban households in 2012 – Rice

Rice expenditure

— All
– – Male head
··· Female head

Rice income

— All
– – Male head
··· Female head

Labour income

— All
– – Male head
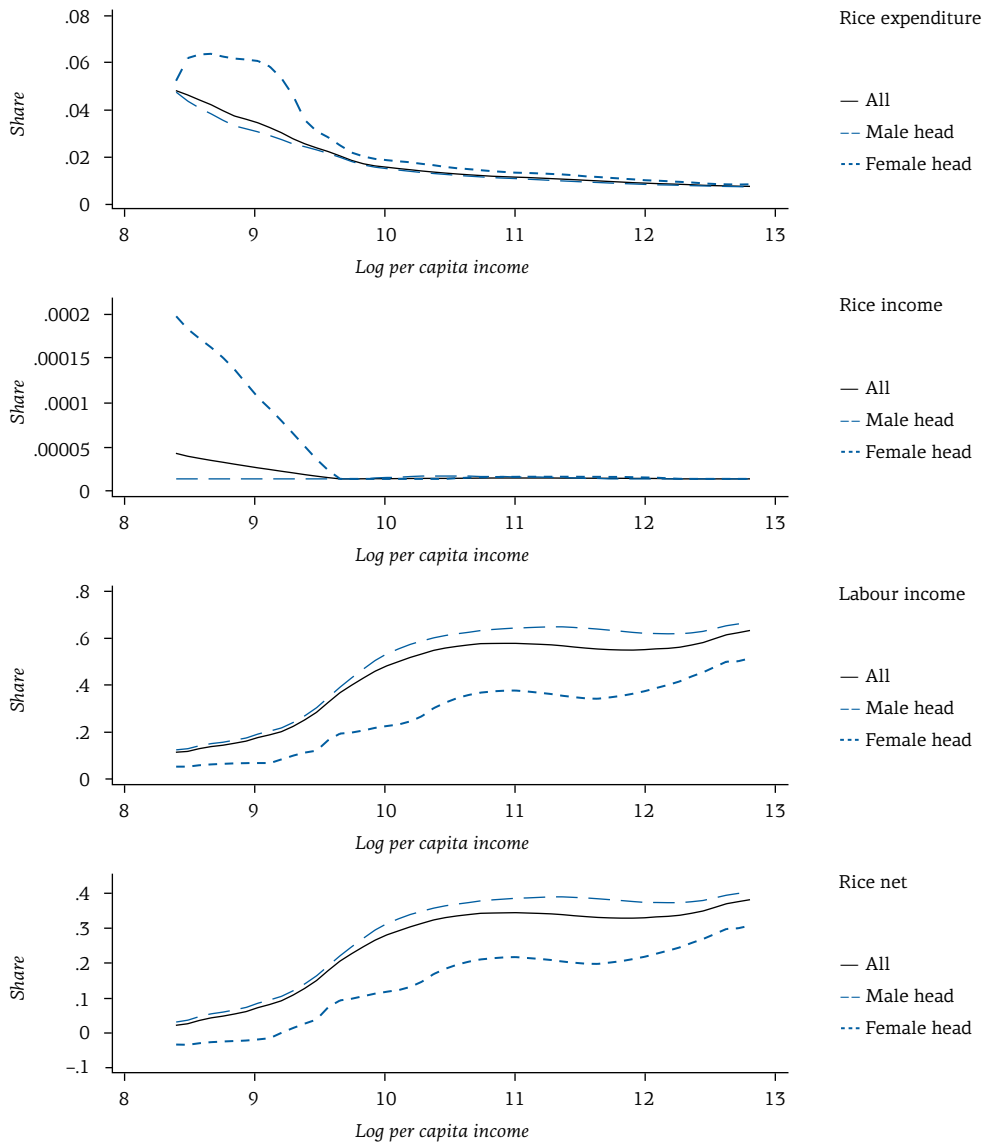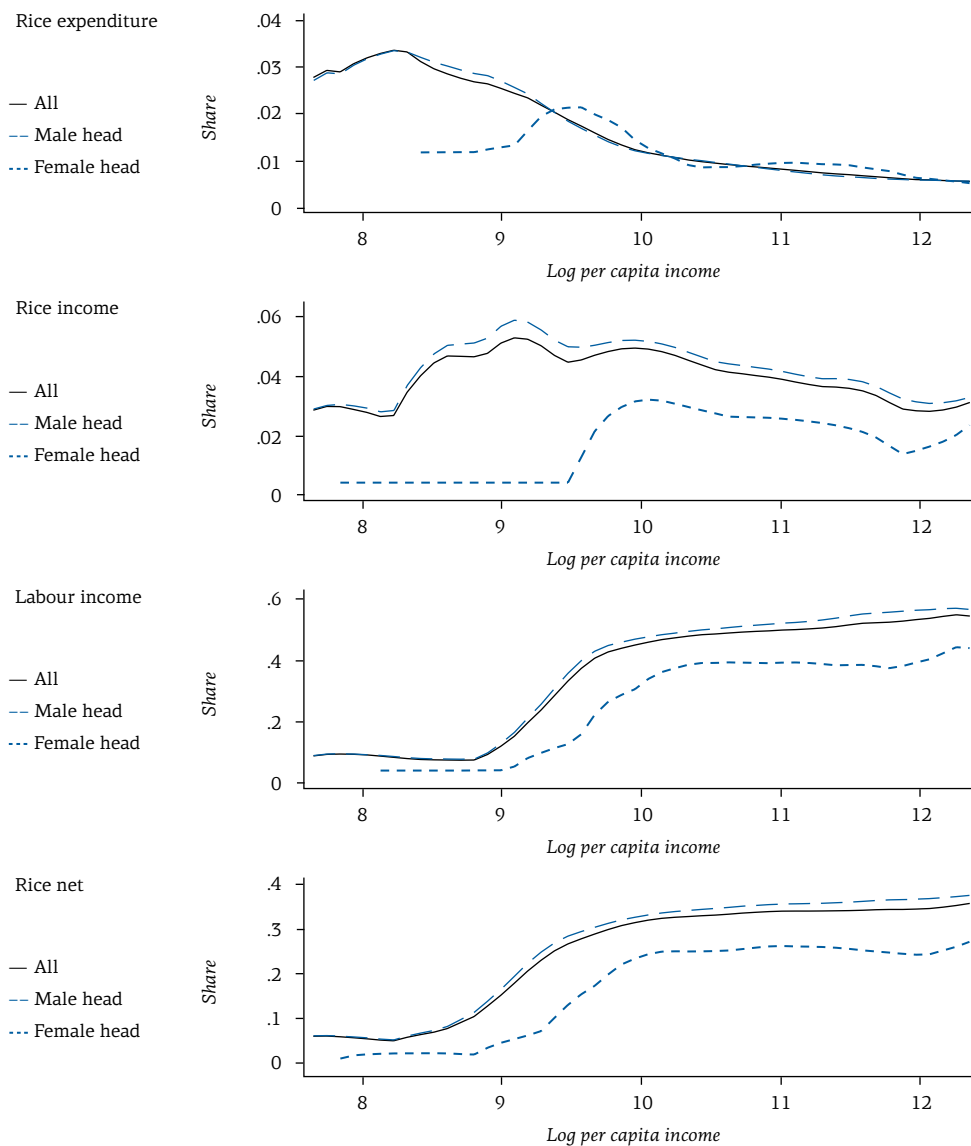··· Female head

Rice net

— All
– – Male head
··· Female head

Source: Author's estimations, based on the 2011 HBS.

Figure A2.4 Components of the welfare function of rural households in 2012 – Rice

Rice expenditure

— All
-- Male head
... Female head

Share

Rice income

— All
-- Male head
... Female head

Share

Labour income

— All
-- Male head
... Female head

Share

Rice net

— All
-- Male head
... Female head

Share

Log per capita income

Source: Author's estimations, based on the 2011 HBS.

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