SECTION 4 – YOUNG RESEARCHES' PAGE

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ESTIMATING THE PRICE ELASTICITY OF DEMAND FOR FOOD IN BHUTAN: ARE ELASTICITIES DIFFERENT BETWEEN URBAN AND RURAL AREAS AND AMONG DIFFERENT INCOME GROUPS?

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Abstract

Estimating the price elasticity of demand is useful for the design of a Goods and Service Tax (GST), which is currently being discussed as a policy option in Bhutan. As it is described in the research, price elasticity estimates allow policy-makers to differentiate between inelastic and elastic goods, which is useful when predicting consumer's demand as a result of price changes and when making suggestions for GST reform that can maximize revenue collection and minimize welfare implications.

In this paper, the author attempts to estimate the price elasticity of demand for 12 food items in Bhutan, using data from the Bhutan Living Standards Survey (BLSS) 2012. The study suggests that the price elasticity of demand for cooking oil, chillies, maize and vegetables are similar for both rural and urban areas and for all income groups. The elasticities vary between different living areas and different income groups for fish, meat, fruits, tea, rice, milk, cheese, and wheat. The demand for rice, meat and chillies are relatively price inelastic for rural households compared to their urban counterparts, indicating a strong preference towards those food items. The price elasticity of demand increases as income rises for all food items except milk, fish and fruits, whose elasticity decreases as income increases, suggesting that rich household's preference towards healthy and high-quality items. Overall, the price elasticities of the majority of food items vary between -0.7 and -1.6, indicating that there is room for revenue collection by introducing a low GST that covers broad range of items.

In the study, the author used general scientific methods: analysis, synthesis, comparison, generalization.

The author suggests a policy (fiscal-tax) recommendation that can achieve GST revenue objectives and address welfare and equity issues.

Keywords: Goods and Services Tax, price elasticity of demand, food, income groups, living areas.

Introduction

Bhutan is one of the world's smallest economies with a Gross Domestic Product (GDP) of USD 1.962 billion during the income year 2015, and is among the least populated nations with 7,74,830 people (World Bank, 2015). With a low tax to GDP ratio of 14.7%, the total tax revenue collected during the fiscal year 2014-2015 is Nu18.39 billion.[1] Direct

[1] The fiscal year in Bhutan is from July – June. Ngultrum (Nu) is Bhutanese local currency and 1 USD ≈ 67 Nu.

tax collection amounts to Nu11.63 billion, indirect tax collected was Nu6.760 billion and other tax collected was Nu2.11 billion (National Revenue Report, 2014-2015).[2] While income tax constitutes the major source of tax revenue in Bhutan, unlike most of the developed and developing countries, Bhutan does not collect Goods and Service Tax (GST) or Value Added Tax (VAT). GST or VAT form a major source of revenue collection for many of the developing and developed countries. For example, GST in Australia represents 23.4% of its total tax revenue collection for the fiscal year 2014-2015 (Australian Bureau of Statistics, 2016). Similarly, GST or VAT revenue in Hungary, the UK, South Korea, Canada and the US accounted for 23.7%, 20.8%, 17.2%, 13.7%, and 8%, respectively of the total revenue collection.[3] GST rates are on average between 10% to 20%, while Nigeria, Jersey, and Taiwan collects the lowest GST at 5% and Hungry collects the highest GST at 27% (Royal Malaysian Custom Department, 2016). Developing countries such as India, Bangladesh, Nepal, Indonesia, Pakistan and Vietnam collects GST at 12.5%, 15%, 13%, 10%, 15% and 10%, respectively (GNV Consultancy & Service Pty Ltd, 2010).

With the increasing importance and convenience of collecting consumption taxes around the world, Bhutan is at the brink of introducing a GST. However, estimating the price elasticity of demand is crucial for the introduction and effective collection of a GST. Price elasticities may be used to predict tax revenues, minimise deadweight losses, and study welfare implications. The price elasticity of demand "measures the percentage change in quantity demanded in response to the percentage change in its price" (Mankiw 2012; Frank, 2012). Through the price elasticity of demand estimates, we would predict the consumer's behavior to move away from elastic goods and substitution towards inelastic goods. Therefore, the price elasticity makes it possible to estimate the impact of GST on tax revenue collection. Further, price elasticity estimates can also be used for studying the welfare implications and addressing the issue of social justice.

Against this background, this paper attempts to provide estimates of the price elasticity of demand for 12 food items in Bhutan and suggest a policy (fiscal-tax) recommendation that can achieve GST revenue objectives and address welfare and equity issues.

Given the importance of estimating the price elasticity of demand, developing countries still lack appropriate and timely data, making it difficult to undertake such an analysis. Nonetheless, developing countries conduct household expenditure surveys and collect information on food consumption and quantities purchased, which can be used to estimate price elasticities.

Numerous studies have been carried out to develop and implement appropriate methodologies using both time-series and cross-sectional household survey data to estimate the price elasticity of demand. For example, studies by Deaton (1988) and Deaton et all. (1992) contributed to a series of such methods and techniques. A study by Houthakker and Prais (1953) analysed the behaviour of the household's food quantity demanded by obtaining per unit consumption values from the household expenditure and quantities. Studies by Timmer & Alderman (1979), Chernichovsky and Meesook (1982) and Pitt (1983) used Indonesian and Bangladesh household survey data to estimate the price elasticity of demand for major food items for Indonesia and Bangladesh. Deaton (1988) also used a 1979 cross-sectional household survey data from Ivory Coast to estimate price elasticities for major food items like beef, meat, fish, cereals and starches. More recently, Nicita (2008) also used a series of cross-sectional household survey data from 1989-2000 to estimate the price and income elasticity of major food items in Mexico to make use for policy advise and evaluate

[2] Direct tax includes personal, business and corporate income tax. Indirect tax includes customs, excise and sales tax. Other tax includes vehicle and motor registration tax and fees, health contribution and municipal tax, royalties and airport service fees.

[3] Information from OECD website, The OECD average is 19.1%.

the impacts of welfare and tax policies.

In the absence of previous studies, this paper uses data from the Bhutan Living Standards Survey (BLSS) 2012 to estimate the price elasticity of demand for food items in Bhutan. The estimation of price elasticities for 12 food items is purely data-driven and not methodologically or conceptually motivated.

1. Data and descriptive statistics

1.1. Data

This paper uses the household level cross-sectional data from the Bhutan Living Standards Survey (BLSS) of 2012 round. The BLSS is a nationally representative survey conducted by National Statistics Bureau of Bhutan (NSB) covering all 20 districts in both rural and urban Bhutan (Bhutan Living Standard Survey Report, 2012). The survey sample covers 8,968 households and 39,825 individuals and provides information on demography, occupation, health, education, assets, sources of income, and consumption expenditures. The BLSS fits the required data set for this study containing necessary information on demographic indicators like household size, location, and details of consumption expenditure that are well defined in quantities, unit of measurement and the unit price. Using the cross-sectional variations in the unit price and quantity consumed in Bhutan in 2012, this study estimates the price elasticity of demand for 12 major food items in Bhutan. From a total of 8,968 households and 475,140 transactions observed in the BLSS 2012 data set, the study dropped 82,327 observations with missing price, quantity, unit, household identity and size and also excluded 843 observations of quantity and income whose frequency was above the 99th percentile. The analysis sample in this study included 8,189 households and 391,970 observations/transactions.

1.2 Descriptive statistics

1.2.1 Food demand in Bhutan

Table 1 sums up the monthly (average) food consumption of Bhutanese households in 2012. The shares are reported as monthly household consumption measured in either kilograms or litres. As expected Table 1. suggests that monthly food consumption is higher among urban households compared to rural households and the demand for food increases as income rises.

1.2.1.1. Rice

Rice comprises five different categories: 1. Bhutanese, 2. Rice Bhog, 3. Fine, 4. FCB, and 5. Other rice. While an average Bhutanese household consumes about 27.27 kgs of rice per month, households living in urban areas consume relatively more than rural households and consumption increases as income rises.

1.2.1.2. *Milk*

Average Bhutanese households consume 2.65 litres of liquid milk per month. While average rural households consume twice as much (3.63 litres) as urban households (1.76 litres), the average milk consumption does not vary much from the mean consumption for the different income groups.

1.2.1.3. *Fish*

Households consume about 1.29 kgs of fish per month. The consumption of fish is on average similar across households of different living areas and different income groups. Further, it may be observed that Bhutanese households have concentrated demand towards two specific type of fish priced nu. 150 and nu. 165.

1.2.1.4. Meat (including poultry)

Average households consume 3.76 kgs of meat per month. Meat includes different types, both fresh and dried beef, pork, chicken, mutton, buffalo, yak, and other types of

Table 1.

Mean monthly consumption for each food item (kilograms/litres)

Food Items	Bhutan	Urban	Rural	Household income quintiles				
				1	2	3	4	5
Rice	34.49 (18.90)	32.77 (17.00)	36.37 (20.61)	32.14 (20.40)	35.53 (19.71)	35.67 (18.59)	34.62 (17.95)	34.21 (18.29)
Milk	2.65 (4.43)	1.76 (3.08)	3.63 (5.37)	2.80 (4.84)	3.56 (5.29)	2.73 (4.66)	2.13 (3.81)	2.35 (3.69)
Fish	1.29 (0.98)	1.37 (0.99)	1.21 (0.95)	1.04 (0.93)	1.19 (0.94)	1.28 (0.94)	1.36 (0.96)	1.46 (1.03)
Meat	3.11 (2.23)	3.47 (2.30)	2.74 (2.07)	2.28 (1.97)	2.70 (2.05)	3.09 (2.16)	3.36 (2.19)	3.75 (2.37)
Cooking Oil	3.76 (2.12)	3.91 (2.10)	3.60 (2.14)	3.20 (2.18)	3.43 (1.98)	3.65 (2.08)	4.00 (2.10)	4.24 (2.10)
Fruits	6.37 (4.26)	7.86 (4.63)	4.76 (3.10)	4.15 (3.18)	5.37 (3.53)	6.18 (4.21)	7.08 (4.37)	8.01 (4.45)
Wheat	0.11 (0.56)	0.04 (0.32)	0.19 (0.73)	0.13 (0.62)	0.16 (0.71)	0.11 (0.55)	0.08 (0.48)	0.08 (0.48)
Maize	2.14 (4.61)	0.20 (0.47)	4.25 (5.98)	4.50 (5.88)	3.71 (5.88)	2.04 (4.63)	1.13 (3.30)	0.55 (2.10)
Chillies	3.66 (2.15)	3.37 (2.09)	3.65 (2.21)	3.41 (2.12)	3.60 (2.18)	3.68 (2.11)	3.65 (2.10)	3.85 (2.21)
Tea	0.36 (0.36)	0.36 (0.36)	0.39 (0.37)	0.32 (0.35)	0.38 (0.36)	0.38 (0.35)	0.38 (0.37)	0.39 (0.37)
Vegetables	32.02 (13.29)	34.40 (13.21)	29.42 (13.20)	25.35 (12.32)	30.32 (12.93)	32.40 (12.88)	33.79 (13.01)	35.54 (13.41)
Cheese	1.76 (1.24)	1.83 (1.22)	1.69 (1.24)	1.54 (1.24)	1.65 (1.24)	1.68 (1.19)	1.78 (1.18)	2.03 (1.27)
N	8,057	4,170	3,887	1,281	1,371	1,587	1,827	1,991

Note: Figures in parentheses refer to the standard deviation.

meat. As expected the average consumption of meat is higher for urban compared to rural households and increases as income rises.

1.2.1.5. Cooking Oil

Average households consume 3.76 litres of cooking oil. The average consumption of rural and urban household is almost identical but average consumption increases as income rises.

1.2.1.6. Fruits

While the average household consumes 6.37 kgs of fruits, urban households consume more than the rural households. The average consumption also increases significantly as income increases and the richest income households on average consume almost twice the average consumption of the poorest households.

1.2.1.7. Wheat & Maize

Although the average consumption of wheat and maize are fewer compared to other food items, wheat and maize are largely consumed more by rural and poor households compared to urban and rich households. Wheat and maize can generally be classified as inferior goods, as their consumption decreases as income increases.

1.2.1.8. Chillies

Households on average consume 3.66 kgs of chillies per month. For both urban and rural households and different income groups, the average consumption levels of chillies are similar.

1.2.1.9. Tea

An average household consumes about 0.36 kgs of tea per month. The different living areas and the different income groups have similar consumption of tea on average.

1.2.1.10. Vegetables

Average Bhutanese households consume 32.02 kgs of vegetables per month. The difference in average consumption between rural (29.42 kgs) and urban households (34.40 kgs) is not as large as the differences across the income distribution. For instance, poor households consume only 25.35 kgs of vegetables on average, compared to 35.54 kgs consumed by rich households. The middle-income group consumes about 32.40 kgs per month on average.

1.2.1.11. Cheese

The average household consumes 1.76 kgs of cheese per month. The consumption levels of urban and rural household are similar and consumption levels increase only marginally as income rises.

1.2.2. Food prices in Bhutan

Table 2. summarises the average price (in Ngultrums, Nu) paid by Bhutanese households for the 12 food items, measured in kilograms or litres. Average Bhutanese households pay nu. 201.37, nu. 192.54 and nu. 157.43 for meat, tea and fish, respectively, which are among the most expensive food items, and nu. 33.3, nu. 35.06 and nu. 38.32 for rice, maize and milk, which are among the cheapest items. However, other items of vegetables and fruits cost the least at nu. 15 and chillies (nu. 514) and meat (nu. 600) are the most expensive items. There are small price variations between urban and rural areas and among different income groups. In 2012, one USD would buy 53.44 Ngultrums (National Statistics Bureau of Bhutan, 2013).

1.2.3. Monthly household expenditure on food items

Table 3 sums up the monthly household expenditure on food items by both rural and urban areas and different income groups. Average Bhutanese households spend nu. 7,124.33 per month on food, and urban households spend a bit more (nu. 8,087.91) compared to rural

Table 2.

Average price (per kilogram/litre) for each food item (in Ngultrums)

Food Items	Mean	Standard deviation	Minimum	Maximum	Number of observations
Rice	33.3	11.52	20	60	8,090
Milk	38.32	8.26	30	50	3,956
Fish	157.43	17.67	120	200	7,126
Meat	201.37	46.83	100	600	7,620
Cooking Oil	87.04	6.43	70	200	7,994
Fruits	57.05	24.1	15	375	8,079
Wheat	45.61	8.56	30	60	505
Maize	35.06	12.25	15	50	3,369
Chillies	148	92.26	40	514	8,120
Tea	192.54	15.8	130	200	6,573
Vegetables	54.59	23.72	15	270	8,227
Cheese	291.38	109.15	115.56	2750	7,659

Table 3.

Monthly household expenditure /consumption on food (in Ngultrums)

Group	Mean	Standard Deviation	Minimum	Maximum	Number of observations
Bhutan	7,362.24	3178.12	606	37,315.73	8,836
Urban	8,110.14	3394.05	708.83	37,315.73	4,549
Rural	6,568.63	2715.37	606	32,127.88	4,287
Income 1	5,629.72	2497.36	606	19,299.07	1,395
Income 2	6,360.25	2524.01	1,089.38	23,617.28	1,498
Income 3	6,845.59	2488.12	923.7	19,699.62	1,769
Income 4	7,631.22	2765.23	1,685.58	32,127.88	2,006
Income 5	9,342.06	3715.99	1,125.33	37,315.73	2,168

households (nu. 6,633.58). The average monthly expenditure on food consumption increases throughout the income groups, as expected.

1.2.4 Household Size

The average Bhutanese household consists of 4.34 members. The minimum number in a household is one and the maximum member is 17. The average household sizes are almost identical for urban and rural areas and all income groups.

2. Regression Method

2.1 Ordinary Least Square strategy

This study engages a simple regression and static demand model that predicts the effects of the explanatory variable on the dependent variable for a single time period. Using a log-log demand function, the household monthly quantity (food item) consumed is regressed on control variables including price, household size and expenditure on total monthly food consumption. The demand function takes the following form:

$$\ln (Y_{ih}) = \beta o + \beta_1 \ln (P_{ih}) + \beta_2 X_{1h} + \beta_3 X_{2h} + \varepsilon_{ih}$$

where, for each item i and household h, Yih is the quantity demanded/consumed, Pih is the price, X1h is the household size, X2h is the total monthly food expenditure and εih is the unexplained error term. Using this demand function, the price elasticity of demand is estimated for 12 food items across different living areas of rural and urban Bhutan, and across different income groups. From the demand equation, the coefficient of the log price, β1, is the price elasticity of demand.

Due to data limitations, the demand specification omits explanatory variables such as the availability of substitutes and the tastes and preferences of households. Therefore, a number of potentially relevant determinants cannot be included in the model.

2.2. Instrument Variable Strategy

A potential problem of using the OLS approach is endogenity, where a likely correlation between the model regressors and the error term may bias the results. To address this problem, an instrument variable (IV) strategy is often used. Similar to Livaitan (1961), Blundell et al. (1998), Bhalotra and Attfield (1998) cited in Hasan (2016) and Sinning and Hasan (2016), this paper employs household income as an instrument of household expenditure. Household income is a strong candidate that fulfills the conditions for a good IV because income and expenditure are closely related and the household income should affect demand only through household expenditure but not directly. The IV technique is applied to the same demand model and the elasticity results (see Table 5, in the Appendix) do not differ qualitatively from those of the OLS approach, suggesting that the OLS estimates are largely unbiased. Consequently, the paper focuses on the analysis and interpretation of the OLS results.

3. Results

Table 4 includes the estimates of the price elasticity of demand for 12 food items in Bhutan, its differences between urban and rural households and different income groups. As expected, all price elasticity estimates are negative and most of them are significant at a one per cent significance level. The results provide an interesting insight into the behavioural responses to price changes.

The elasticity estimates are interpreted as own-price elasticities and are also compared to the variation in different living areas and income groups. Items like oil (–0.44), fish (–0.69), meat (–0.71) and fruits (–0.73) have relatively inelastic demand compared to chillies (–0.81), tea (–0.88), vegetables (–1.05), rice (–1.35) and milk (–1.62). Cheese (–2.16), maize (–2.76) and wheat (–2.85) are highly demand elastic. A study by Chern et al. (2003) on Japanese food consumption found similar own-price elasticities for fish (–0.70) and meat (–0.52) and Green et al. (2013) found similar estimates for meat (–0.78) for many developing and developed countries. Sinning & Hasan (2016) found similar elasticity for fish and seafood (–0.73) in Australia.

Items like maize, vegetables and cheese have similar elasticities in urban and rural areas and across the income distribution. Meat and cheese are relatively elastic in rural areas

Table 4.

Price elasticity of demand for Bhutan by living area and income group

Food Items	Overall	Urban	Rural	Household income quintiles 1	2	3	4	5
Rice	-1.35***	-2.18***	-0.95***	-0.72***	-1.15***	-1.57***	-1.82***	-1.67***
	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)	(0.04)	(0.04)	(0.03)
	[12,568]	[6,908]	[5,660]	[1,832]	[2,010]	[2,411]	[2,893]	[3,414]
Milk	-1.62***	-0.55***	-2.01***	-1.64***	-1.72***	-2.12***	-1.49***	-1.00***
	(0.02)	(0.73)	(0.58)	(0.34)	(0.26)	(0.2)	(0.17)	(0.15)
	[4,340]	[1,964]	[2,376]	[646]	[824]	[846]	[921]	[1,103]
Fish	-0.69***	-0.19	-1.10**	-1.20***	-1.08	-0.75***	-0.28	-0.39***
	(0.09)	(0.11)	(0.15)	(0.28)	(0.22)	(0.18)	(0.18)	(0.19)
	[4,622]	[1,243]	[3,379]	[958]	[1,009]	[957]	[898]	[800]
Meat	-0.71***	-1.03***	-0.50***	-0.61***	-0.67***	-0.71***	-0.85***	-0.70***
	(0.02)	(0.02)	(0.03)	(0.05)	(0.04)	(0.04)	(0.03)	(0.03)
	[26,794]	[14,797]	[11,997]	[3,456]	[4,159]	[5,290]	[6,398]	[7,491]
Chillies	-0.81***	-0.97***	-0.73***	-0.69***	-0.78***	-0.87***	-0.88***	-0.87***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
	[14,698]	[7,427]	[7,271]	[2,373]	[2,458]	[2,906]	[3,329]	[3,632]
Cooking Oil	-0.44***	0.29	-0.58***	-0.85***	-0.69***	-0.16	-0.07	0.04
	(0.09)	(0.15)	(0.12)	(0.26)	(0.19)	(0.02)	(0.18)	(0.21)
	[9,815]	[5,038]	[4,777]	[1,509]	[1,653]	[1,942]	[2,277]	[2,434]
Fruits	-0.73***	-0.67***	-0.90***	-0.84***	-0.89***	-0.79***	-0.70***	-0.64***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
	[60,129]	[34,255]	[25,874]	[7,062]	[9,329]	[11,741]	[14,652]	[17,345]
Wheat	-2.85***	-2.16***	-2.87***	-1.98**	-2.15***	-3.46***	-2.81***	-3.00***
	(0.25)	(0.37)	(0.34)	(0.69)	(0.55)	(0.55)	(0.53)	(0.49)
	[642]	[171]	[471]	[116]	[147]	[131]	[121]	[127]
Maize	-2.76***	-1.05	-2.07***	-2.21***	-2.45***	-2.82***	-2.74***	-2.32***
	(0.06)	(0.8)	(0.1)	(0.16)	(0.15)	(0.12)	(0.13)	(0.15)
	[3,656]	[1,170]	[2,486]	[902]	[795]	[718]	[668]	[573]
Tea	-0.88***		-0.83***	-0.54***	-1.04***	-0.84***	-0.86***	-1.11***
	(0.1)	-	(0.12)	(0.27)	(0.20)	(0.21)	(0.22)	(0.25)
	[7,112]		[3,572]	[1,053]	[1,240]	[1,436]	[1,606]	[1,777]
Vegetables	-1.05***	-1.07***	-1.08***	-1.05***	-1.07***	-1.09***	-1.06***	-1.01***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	[101,581]	[54,368]	[47,213]	[13,901]	[16,635]	[20,039]	[23,695]	[27,311]
Cheese	-2.16***	-4.45***	-2.02***	-1.97***	-2.13***	-2.31***	-2.05***	-2.30***
	(0.03)	(0.1)	(0.04)	(0.08)	(0.08)	(0.01)	(0.01)	(0.01)
	[12,118]	[7,100]	[5,018]	[1,476]	[1,750]	[2,426]	[2,988]	[3,478]

Note: ***, ** and * refer to statistically significance at 1%, 5% and 10% levels, respectively.
Figures in parentheses refer to the standard error & figures in [bracket] refer to number of observations.

as compared to urban areas though their elasticity remains similar across income groups. The price elasticity for rice is higher in urban areas compared to the rural areas and becomes more elastic as income rises. Fish and fruits are relatively inelastic in urban areas compared to rural areas and its elasticity falls as income rises. Own-price elasticities for milk, wheat and tea vary across living areas and across income groups.

3.1. Rice

Rice is considered as a staple food in Bhutan, which is reflected by a relatively inelastic demand in rural areas and in lower income groups. However, the possibility to substitute away from consuming rice or the availability of different rice brands (substituting from cheap to expensive or vice-versa) explains the price elastic demand for urban areas, and medium and high income groups.

3.2. Milk

The own-price elasticity for milk is –1.62 for Bhutan. While milk is demand elastic, the interesting difference between urban areas with a relatively inelastic demand compared to the highly elastic demand by rural areas is not something unexpected. The price sensitive demand for rural areas can be explained by the rural peoples' choice and opportunities to produce their own milk, which the urban dwellers cannot. The elasticity estimates among different income groups also provide a meaningful insight. Although the elasticity for milk across all income groups is elastic, the richest section possesses a lower price elasticity compared to the poor and the medium income groups.

3.3. Fish

The initial own-price elasticity of demand for fish was positive with an estimate of 0.05. The estimate results for fish suggested that fish demand increases when price for fish increases, which is unlikely. Thus, a further examination on the fish quantities and price reveals that households in that period mostly consumed specific types of fish that were priced nu. 165 and nu. 165.55, respectively, which constitute 35% of the total observations, leading to a biased estimate. Therefore, the model estimated above did not include the fish prices and quantities consumed at nu. 165 and 165.55. The resulting elasticities obtained after imposing this sample restriction have the expected sign and are similar to those of other meat and poultry item.

3.4. Meat (including poultry)

Overall, meat is demand inelastic in Bhutan. The relatively elastic demand in urban areas compared to rural areas can be explained by the availability of large quantities of other types of meat items that include both fresh and dried beef, pork, chicken, fish, mutton, yak and buffalo meat, which are close substitutes for each other and are more easily available in urban areas than in rural areas. The low elasticity estimates for all income groups offers a significant insight to the correlation between meat being inelastic and the drastic increase of meat import (demand) over the past few years despite the increase in meat prices.

3.5. Chillies

The inelastic demand for chillies can be explained by Bhutanese consumption of chillies in almost every meal/day as spice, seasoning, tastemaker and also commonly as a vegetable.

3.6. Cooking Oil

Cooking oil is demand inelastic with own price elasticity estimate of –0.44. While the elasticity of demand for cooking oil in urban areas could not be explained owing to missing

variation in the price data, the rural areas also possess an inelastic demand. The consumption of cooking oil on a day-to-day basis by almost all household helps to explain the inelastic demand estimate.

3.7. Fruits

While the overall price elasticity falls in the inelastic zone for fruits, rural areas have a relatively elastic demand compared to urban areas and the elasticity falls as income increases. The lower elasticity estimates for urban areas and for rich people might be explained by their superior income level, which allows them to consume fruits that maintain healthy food and diet habits.

3.8. Wheat, Maize and Cheese

The own-price elasticity of demand for wheat, maize and cheese is elastic. The highly elastic demand may be due to the possibility of substituting away from these items when prices increase, which is not surprising for items like wheat, maize and cheese.

4. Policy implications for GST revenue

The price elasticity of demand is intended to provide important information to planners and policy-makers to accurately forecast and analyse the impact of the introduction of a consumption tax on the change in consumption (quantity demanded), the tax revenue collected and welfare implications. The study suggests that the majority of the food items estimated possesses a moderately elastic demand with own-price elasticities ranging between –0.7 and –1.6 and therefore suggests that the scope for generating revenue by introducing a low GST rate that covers a broad base appears to be a way to raise tax revenue while minimising dead weight loss. However, items like wheat, maize and cheese are highly elastic and also consumed mostly by poor and rural households and therefore taxing those items will not only be less effective and generate lower revenue but also hurt the poor and rural households. On the other hand, items like milk, fruits, fish and meat are relatively inelastic for urban and higher income households, suggesting that taxing those items is more likely to generate tax revenue and minimise welfare effects.

Summary and concluding remarks

This study estimates the price elasticity of demand for 12 food items in Bhutan and its difference between rural and urban households and among different income groups, using the BLSS 2012. The study suggests that cheese, wheat and maize are highly demand elastic and cooking oil is demand inelastic, while the remaining food items range from –0.7 to –1.6. The elasticity difference between urban and rural areas and across income groups suggests that rice, chillies and meat are relatively demand inelastic for rural and poor households while milk, fruits and fish are relatively demand inelastic for urban and rich households. The overall elasticity estimates point to the suitability of a low GST rate that covers a broad range of items to increase revenue collection and minimise equity concerns.

The estimates obtained in this paper may also be useful for researchers studying issues related to agricultural, trade (imports), health, subsidies and welfare programs. However, this paper could not consider income elasticities and cross-price elasticities of demand, which are also crucial for any policy analysis concerning food consumption, and hence, further research covering those areas can provide useful and important insights.

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Appendix

Table 5.

The IV results for price elasticity of demand for Bhutan and by different living and income groups.

Food Items	Overall	Urban	Rural	Household income quintiles				
				1	2	3	4	5
Rice	-1.28*** (0.02) [12,396]	-2.17*** (0.03) [6,865]	-0.92*** (0.03) [5,531]	-0.70*** (0.06) [1,657]	-0.85*** (0.13) [2,020]	-1.41*** (0.8) [2,410]	-1.84*** (0.06) [2,893]	-1.60 (0.05) [3,416]
Milk	-1.61*** (0.11) [4,300]	-0.73*** (0.28) [1,955]	-2.15*** (0.20) [2,345]	-1.89*** (0.46) [603]	-1.86*** (0.34) [823]	-1.76*** (0.66) [847]	-1.06 (0.63) [922]	-0.76 (0.26) [1,105]
Fish	-0.62*** (0.09) [4542]	-0.20 (0.12) [1,233]	-1.10*** (0.15) [3,309]	-1.21*** (0.29) [878]	-0.85 (0.45) [1,009]	-0.58 (0.31) [957]	-0.26 (0.22) [898]	0.01 (0.37) [800]
Meat	-0.77*** (0.02) [26,481]	-1.06*** (0.02) [14,710]	-0.55*** (0.03) [11,771]	-0.94*** (0.13) [3,140]	-0.39 (0.21) [4,159]	-0.86*** (0.10) [5,289]	-0.86*** (0.06) [6,398]	-0.70*** (0.04) [7,495]
Chillies	-0.82*** (0.01) [14,479]	-0.96*** (0.01) [7,374]	-0.74*** (0.01) [7,105]	-0.71*** (0.02) [2,150]	-0.79*** (0.03) [2,458]	-0.88*** (0.02) [2,970]	-0.88*** (0.02) [3,331]	-0.87*** (0.02) [3,633]
Cooking Oil	-0.36*** (0.10) [9,662]	0.30 (0.15) [5,002]	-0.51*** (0.13) [4,660]	-0.74* (0.33) [1,357]	-0.62* (0.28) [1,652]	0.08 (0.35) [1,942]	0.07 (0.21) [2,277]	-0.04 (0.24) [2,434]
Fruits	-0.81*** (0.01) [59,487]	-0.67*** (0.01) [34,031]	-0.93*** (0.01) [25,456]	-0.95*** (0.06) [6,435]	-0.93*** (0.03) [9,327]	-0.88*** (0.03) [11,734]	-0.71*** (0.02) [14,652]	-0.67*** (0.02) [17,339]
Wheat	-2.41 (0.34) [631]	-2.23 (0.63) [169]	-2.48*** (0.41) [462]	-1.66 (1.66) [106]	-0.93 (2.27) [147]	-3.29*** (0.83) [130]	-3.55** (1.45) [121]	-3.27*** (1.25) [127]
Maize	-2.50*** (0.08) [3,574]	-1.18 (0.83) [1,159]	-1.99*** (0.10) [2,415]	-2.22*** (0.19) [820]	-2.12*** (0.25) [795]	-2.45*** (0.37) [718]	-2.47*** (0.49) [668]	-2.01*** (0.65) [573]
Tea	-0.96*** (0.10) [6,995]	-	-0.92*** (0.13) [3,484]	-0.92*** (0.34) [947]	-0.93 (0.22) [1,237]	-0.68 (0.38) [1,435]	-0.90*** (0.33) [1,602]	-0.84* (0.36) [1,774]
Vegetables	-1.08*** (0.01) [100,346]	-1.08*** (0.01) [54,021]	-1.09*** (0.01) [46,325]	-1.07*** (0.02) [12,664]	-1.11*** (0.02) [16,641]	-1.22*** (0.03) [20,039]	-1.07*** (0.01) [23,687]	-1.03*** (0.01) [27,315]
Cheese	-2.13*** (0.04) [11,964]	-4.45*** (0.10) [7,055]	-1.93*** (0.46) [4,909]	-1.70*** (0.29) [1,323]	-2.25*** (0.17) [1,749]	-2.15*** (0.19) [2,425]	-1.95*** (0.10) [2,989]	-2.31*** (0.07) [3,478]

Note: ***, ** and * refer to statistically significance at 1%, 5% and 10% levels, respectively.
Figures in parentheses refer to the standard error and figures in [bracket] refer to number of observations.