Consumption Behavior and Household Economies of Scale
An Analysis of Variations across Rural-Urban Regions of Pakistan

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***Abstract* - The study attempts to explore the expenditure elasticities of various food items across the provinces of Pakistan while taking in to account the rural and urban regions separately. Household Integrated Income and Consumption Survey (hereafter HIICS) data for the year 2015-2016 is utilized. In addition, the household economies of scale towards the consumption are also being focused on the same lines. The study has made use of double log specification of Engel curve. The included 20 food items are appeared as normal commodities having expenditure elasticity less than one. All the expenditure elasticities have positive signs and are less than one which shows that all the food commodities are necessities and normal goods i.e. as income increases their expenditure will increase at a decreasing rate. The negative sign of the household size depicts that there is a negative relationship with consumption i.e. supports the notion that households with higher family size enjoy the economies of scale towards the consumption of food.**

Keywords: **Consumer Demand; Expenditure Elasticities; Household Economies of Scale.**

I. INTRODUCTION

In an economy, consumption of food and non-food items of an individual plays a significant role towards individual's welfare and also contributes in business activities such as investment. It is one of the known facts that a family purely depends on the level of their income and wants to imitate their consumption patterns. In the same way, household economies of scale is one of the aspect of sharing household goods which helps in making the larger households better off at the same level of per capita resources. Due to the importance of consumption, numerous studies have been devoted on the household consumption while utilizing different econometric methods. This includes the studies of [1]; [2]; [3]; [4]; [5]; [6]; [7]; [8]; [9]; [10]; [11]; and [12]. These studies have used different specifications of Engel method such as linear, semi-log, double-log, piglog, double-log inverse and semi-log inverse in order to estimate the expenditure elasticities.

Keeping in mind the importance of the issue, the main objectives of this study are to calculate the expenditure elasticities and household economies of scale for various food commodities on the basis of inter provincial analysis. The information of expenditure elasticities enables us to determine the nature of the particular product and change in the consumption pattern towards any given change in income. The information will simultaneously facilitate the public sector to determine the size/extent of taxation on those particular food items without distorting the spending patterns of the public.

Household Integrated Income and Consumption Survey (HIICS) for the year 2015-16 is used to analyze the household consumption patterns. Twenty commonly used food commodities have been taken for this purpose. The variables selected in this study are per capita consumption (PCC), per capita expenditures (PCE) and household size (HHS). A double-logarithmic specification of Engel curves is used to calculate the expenditure elasticities and household economies of scale.

The remaining part of the paper is systematized as: section 2 deals with the research methodology and data, section 3 contain the expenditure elasticities followed by section 4, which contains information about the household economies of scale on the basis of inter provincial analysis. Finally section 5 contains the conclusion of the study.

II. MODEL SPECIFICATION & DATA

As Engel's method was considered to be the consistent method, it pointed out that the economies of scale should cause the food share to increase as the household size increase, not decrease. A decline in the food share increases the welfare resources as well (Engel's first law). It also appeared to be a reasonable fact that the food share must decline whenever there was an increase in the welfare felt as the household size and the

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welfare resources increase in fraction. A decrease in the food share (defined earlier) was only expected whenever the food expenditure per capita decreases with constant PCE and in this case, welfare does not expect to increase.

In Engel's method, the commodities selected for estimation are generally used in terms of quantities for consumption. This happens because expenditure gives a better explanation of the quantity as well as quality of commodities consumed and also prevent from the problem of aggregation for heterogeneous commodities.[1] The equation for the Engel curve is as:

$$E_i = a_i + b_i Y + \mu_i \quad (1)$$

Where, E_i is the total expenditure on i^{th} consumption head by each household, Y is represented as the total income, a & b are unknown parameters and μ_i is the error term. As there are a lot of functional forms used for the estimation of the Engel curve, but in this study, the most appropriate specification is used which is the double logarithmic specification as this seems to be very simple and easy to estimate and interpret and one of the main thing is that Engel method's basic intention is to treat the elasticities. This is one of the commonly used functional forms and Engel himself used the double log functional form in his paper of 1857. By putting the total expenditures and household size as an independent variables in the Engel equation, following double log specification is emerged:

$$\ln E_{ij} = a_{ij} + b_{ij} \ln E_j + c_{ij} \ln HS_j + \mu_{ij} \quad (2)$$

As it is mentioned above that double-log specification has various advantages over other functional forms so double logarithmic specification of Engel method is used in this study as it is considered as the basis for measuring the scale of economies and it tells about the correct shares of food and indicates welfare among different sizes & composition of the households, with lower food shares specified the higher welfare. This method conveys the positive economies of scale and when there is an increase in the household size there is a reduction in the share of food.

The data selected for this study is Household Integrated Economic Survey (HIICS) for the year 2015-16. Twenty commonly used commodities are selected for this study i.e. Milk Fresh & Boiled, Milk packed, Beef, Mutton, Chicken Meat, Apple, Potato, Onion, Tomato, Salt, Red Chilies, Sugar, Wheat & Wheat Flour, Rice & Rice Flour, Mash, Moong, Masoor, Vegetable Ghee, Cooking Oil and Tea. The variables used in this study are: per capita expenditures, per capita consumption and household size.

III. EXPENDITURE ELASTICITIES

The estimated expenditure elasticities for the selected food items, at provincial levels are illustrated in appendix, Table 1. All the expenditure elasticities have positive signs and lies between zero and one ($0 \leq Ey \leq 1$), which gives a picture that all included food commodities are normal goods and fall under the category of necessities i.e. the consumption is less affected by a change in income.

An interesting feature is that the elasticity of wheat is the lowest one among all other food stuffs and among all the provinces of Pakistan.[2] And, likewise elasticity of Packed Milk is the highest one among all other food stuffs and among all the provinces of Pakistan. These particular results are very much closer to reality and reflect that the consumption of wheat is important for the poor people and tends to decrease with higher income. And on the other end the consumption of Packed Milk is important for the rich people and tends to increase with higher income.

In totality, no uniform trend in the estimated results is observed results, when we make a comparison across the provinces. For Milk, the magnitudes of expenditure elasticity are same for Punjab and Balochistan and higher than the Sindh and KPK. This reflects that the Milk expenditure patterns of the inhabitants of Punjab and Balochistan are closer and different from the rest of the two provinces.

Expenditure patterns in case of Beef and Mutton are similar in the provinces of Punjab and Sindh, but for the rest of the two provinces the magnitude is lower. In case of Beef the difference between the magnitudes is minute but on the other end, in case of Mutton, a vast difference is observed among KPK and Balochistan. The expenditure patterns towards the mutton are affected relatively less in KPK as compared to other three provinces of Pakistan. This result reflects the taste of the people of KPK towards Mutton which turns out to be a basic need and inelastic.

In Pakistan, Apples have been grown as commercial fruit Plants in Balochistan since long. This is the sole reason that expenditure elasticity of Apple for Balochistan is lowest in comparison with other provinces of Pakistan. The highest magnitude of the expenditure elasticity is observed in Punjab where it turns out to be more elastic.

Almost among all the provinces, Potato appears a less responsive item towards any change in income as compared to Onion and Tomato. In case of Salt and Chillies, the expenditure elasticity is almost same in Punjab and Sindh but a bit higher in rest of the two provinces. Surprisingly, spending behavior on Sugar reflects the same trend across the four provinces in Pakistan and turned out to be quite inelastic.

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The pulses (i.e. Mash, Moong, and Masoor), having almost same magnitude of expenditure elasticity reflects the uniform spending pattern in all the provinces of Pakistan except Balochistan where the magnitude is high. This is an indication that people of Balochistan will forgo the use of Pulses if sometime there comes a small reduction in their incomes.

Vegetable Ghee and cooking oil appeared to be less elastic in Punjab and Sindh but more responsive in other two provinces. A reverse scenario is observed in case of tea, which turned out to be more responsive in case of Punjab and Sindh.

A. Expenditure Elasticities-Rural-Urban Analysis

The expenditure elasticities for the rural and urban areas of the four provinces of Pakistan are also calculated.[3] It is noticed that all the food commodities are having positive expenditure elasticities in the rural regions which represent that these are normal goods. Secondly, all of them are less than one which means that all selected food items are necessities for rural Pakistan. The positive expenditure elasticities represent that the expenditure will increase as income will be increased. It has further been noticed that the change in the consumption of food groups are having one percent significance level of probability as there is an increase in income.

Moving towards the discussion of the consumption of different food commodities, it has been observed that the expenditure elasticity of packed milk is higher in terms of magnitude for rural regions in comparison with urban regions. This shows that the increased total expenditure has a clear stimulus for the consumption of packed milk in both rural and urban regions.

Similarly, the lowest expenditure elasticity in both rural and urban regions is very less. This result reflects that the consumption of wheat is important for the poor people and tends to decrease with higher income. The smaller elasticities, the less the consumption is affected by a change in income. The people living in both regions mostly consume wheat and wheat flour that is the reason why its elasticity is less than 0.1. Further it has been observed that the elasticity of wheat is less than the rice & rice flour which tells that people in the both regions of the four provinces are spending more on wheat.

The expenditure elasticity for milk fresh and boiled milk is more or less similar in both rural and urban regions of the four provinces and the magnitude is smaller too. This is an indication that milk fresh and boiled is very much in the habits of the individuals residing in these regions. However, the elasticity is bit higher for Balochistan and Punjab in case of rural regions which are a signal that this commodity is more sensitive towards any given change in income.

In case of meat products, it has been seen that their expenditure elasticities lies within the range of 0.2 to 0.4, which illustrates that among these three types of meat, consumers wants to consume mutton, chicken meat and beef according to the level of their income. There is one more thing which can be taken into consideration is that the expenditure elasticity in rural region of Sindh is greater which means that its consumption will affect at a high rate as income will change.

The expenditure elasticities for apple are highest in rural and urban regions of Punjab followed by Sindh and KPK. But in Balochistan, the elasticity is less than the other provinces. This might be due to the fact that the availability makes it quite inelastic in this region. Moving towards the group of Vegetables and Salt, low magnitude of elasticities is observed. This might be because the salt group is mandatory part of cooking.

The elasticities of rice and rice flour is again relatively less in magnitude in both of the regions. In rural regions, the lowest elasticity is in KPK followed by Punjab and Balochistan. In urban regions, the elasticity is lowest in again KPK followed by Balochistan and Sindh. While keeping in view the elasticity of this commodity in the rural and urban regions of Sindh, this is having a negative sign which depicts that this is an inferior good in the Sindh. This means that when there is an increase in income, this will decline the demand and consumption as well. This may also tend to change the wish of a consumer to more luxurious substitutes.

The elasticity of pulses in the urban regions of the four provinces is the lowest. This reveals that the consumption of pulses is important for the poor and are likely to decrease with higher incomes of the individuals residing in these areas. In case of edible oils, the expenditure elasticities of vegetable ghee are low as compared with the cooking oil. This demonstrates that the consumption of vegetable ghee is less likely to change with a change in income. With higher incomes of the persons, the quantity of cooking oil and vegetable ghee consumed will not increase but its quality may be improved. While talking about tea, the expenditure elasticity is not more than 0.24 which is also considered as a basic need for the individuals.

IV. HOUSEHOLD ECONOMIES OF SCALE

Household economies of scale refers to relation between household size and consumption expenditure on food. The results highlighted the fact that there is a negative relationship between consumption of food and the household size, i.e. when the household size increases, the consumption will decline.

Table 4 (see in appendix) shows the household sizes with the consumption of all the food commodities selected in this study for all the provinces of Pakistan. This is to note that if the magnitude of household size elasticity is higher this means that a minor change in the household size will affect the per capita consumption drastically and vice versa. In these results, all the commodities are having the elasticities lower than 0.1. But when the household economies of scale for the packed milk are concerned, it is representing the highest magnitudes among the rest of all.

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A. Household Size Elasticities-Rural-Urban Analysis

Table 5 and 6 (see appendix) represents the household size elasticities of the rural and urban regions respectively. We ended up with the same results as almost all the household economies of scale are negative. This shows that as there is an increase in the household size the household size economies emerges and consumers get benefit of that while spending less on food items. The commodities whose magnitudes are less, they represents clearly that consumers are getting pleasure from their better living standards while spending less on food items as there is an increase in their family members. While the food commodities which are having greater magnitudes represent that one unit increase in family size leads to reduction in the expenditure.

In Punjab, the commodities which are having low magnitudes are potato, salt, wheat and wheat flour, rice and rice flour. This can be clearly seen that consumers are satisfied from the superior living standard that is why they are spending less on food items as there is an increase in number of the members of family. Rest of the commodities are equal and greater to the magnitude 0.05, which illustrates that when there is an increase in family size, this leads to reduction in the expenditure on milk packed, beef, mutton, chicken meat, apple, onion, tomato, chilies, sugar, mash, moong, masoor, vegetable ghee, cooking oil and tea.

In Sindh, the greatest magnitude is of mutton followed by apples, mash, chicken meat, beef, masoor, moong, sugar, milk packed, salt and tea. This reveals the fact that when the increase in the family size is observed, it reduces the expenditure on these various food items which are having higher magnitudes. Opposite is observed in case of low magnitudes. The lowest magnitudes food items observed in the rural Sindh are milk fresh and boiled, potato, onion, tomato, chilies, wheat, rice, vegetable ghee and cooking oil. This depicts that spending on these food items are less when it is compared with the other living standards of life.

In Balochistan the highest magnitude is of milk packed and masoor pulse i.e. 0.09 & 0.08. This means that with one unit increase in family size, the expenditure on packed milk and masoor is decreased by 0.09 and 0.08 percent respectively. The lowest magnitudes observed in rural Balochistan are sugar and rice i.e. 0.001 approximately. In rural regions most of the commodities are having low household economies of scale and there are only few ones which lie in the category of high magnitudes such as mash, moong, masoor and cooking oil.

In KPK, the lowest elasticity with respect to household size is of wheat and wheat flour i.e. 0.01. Other commodities that have low elasticities are milk fresh and boiled, beef, onion, salt, sugar, wheat, rice, moong, vegetable ghee and tea. The low household economies of scale depicts that these commodities are less responsive towards family size. The highest elasticity is of milk packed and mutton i.e. 0.12 and 0.14 respectively. Commodities such as chicken meat, apple, potato, tomato, chilies, mash, masoor and cooking are having the household economies of scale less than 0.12 but they are considered in high magnitudes. This shows that the commodities with higher magnitudes are more responsive towards the family size.

V. CONCLUSION

It has been noticed that all the included food commodities are appeared as normal goods and are considered as necessities of individuals. The commodities appeared to be more income responsive in rural areas as compared to urban areas. This fact is noticeable because the individuals residing in rural regions are having the slighter purchasing power as compared to urban regions. On the other hand, the individuals are having economies of scale to the household size.

Same scenario is being observed that the household economies of scale in rural areas are less responsive towards the family size and the magnitudes in these areas of the four provinces are much lower in these areas than in the urban areas. This divulges the fact that greater households or households with multiple members are able to achieve the same standard of living at lower per capita expenditures on goods than smaller households.

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APPENDIX:

Table I: Expenditure Elasticities [PROVINCIAL Analysis]

Commodities	Punjab	Sindh	Balochistan	KPK
Milk Fresh & Boiled	0.20*	0.18*	0.20**	0.18*
Milk Packed	0.58*	0.48	0.28	0.39**
Beef	0.29*	0.28*	0.23**	0.23*
Mutton	0.34*	0.35**	0.25**	0.16
Chicken Meat	0.29*	0.27*	0.22*	0.30*
Apple	0.37*	0.28*	0.16	0.25**
Potato	0.18*	0.04	0.13**	0.21*
Onion	0.21*	0.11**	0.21*	0.23*
Tomato	0.25*	0.17*	0.23**	0.23*
Salt	0.17*	0.18*	0.29*	0.24*
Chilies	0.15*	0.11**	0.20**	0.22**
Sugar	0.19*	0.18*	0.15**	0.16*
Wheat & Wheat Flour	0.04**	0.07**	0.02	0.06**
Rice & Rice Flour	0.14*	0.07	0.14	0.11
Mash	0.19*	0.28**	0.30**	0.28*
Moong	0.19*	0.24*	0.25*	0.28*
Masoor	0.19*	0.20*	0.37*	0.28**
Vegetable Ghee	0.15*	0.15*	0.16**	0.11**
Cooking Oil	0.19**	0.15*	0.29**	0.24**
Tea	0.20*	0.19**	0.12**	0.14*

Note: *, ** significant at 1 percent and five percent respectively

Table II: Expenditure Elasticities [Provincial Analysis of RURAL Regions]

Commodities	Punjab	Sindh	Balochistan	KPK
Milk Fresh & Boiled	0.21*	0.18*	0.27**	0.19**
Milk Packed	0.50**	0.75	0.23	0.44**
Beef	0.30*	0.28*	0.25**	0.25*
Mutton	0.36**	0.42**	0.30**	0.18
Chicken Meat	0.26*	0.30*	0.30*	0.34*
Apple	0.38*	0.30**	0.15	0.27**
Potato	0.21*	0.03	0.13**	0.21*
Onion	0.21*	0.10**	0.23*	0.25*
Tomato	0.23*	0.14**	0.26**	0.23*
Salt	0.20*	0.21*	0.33*	0.25*
Chilies	0.16*	0.17*	0.22**	0.24**
Sugar	0.21*	0.24*	0.20**	0.19**
Wheat & Wheat Flour	0.06**	0.12**	0.03	0.08**
Rice & Rice Flour	0.13**	-0.09	0.11	0.09
Mash	0.20**	0.35**	0.37*	0.34*
Moong	0.21*	0.26*	0.32*	0.30**
Masoor	0.20*	0.24*	0.42*	0.32**
Vegetable Ghee	0.16*	0.17*	0.19**	0.12*
Cooking Oil	0.26**	0.10	0.21	0.31**
Tea	0.21*	0.24*	0.15**	0.14**

Note: *, ** significant at 1 percent and five percent respectively

Table III: Expenditure Elasticities [Provincial Analysis of URBAN Regions]

Commodities	Punjab	Sindh	Balochistan	KPK
Milk Fresh & Boiled	0.17*	0.18*	0.15	0.16**
Milk Packed	0.61**	0.47**	0.39	0.36**
Beef	0.27**	0.28*	0.18**	0.21**
Mutton	0.29**	0.32**	0.18**	0.23
Chicken Meat	0.29*	0.24*	0.12**	0.28**
Apple	0.34*	0.27*	0.19**	0.23**
Potato	0.13*	0.03	0.12**	0.18**
Onion	0.19**	0.11**	0.16**	0.20**
Tomato	0.24**	0.19*	0.18**	0.23**
Salt	0.12**	0.12**	0.24**	0.21**
Chilies	0.12*	0.06**	0.19**	0.19**
Sugar	0.15*	0.11**	0.08**	0.11**
Wheat & Wheat Flour	0.02	0.01	0.01	0.03**
Rice & Rice Flour	0.14**	-0.06	0.16	0.10**
Mash	0.19**	0.26**	0.21**	0.24**
Moong	0.17*	0.23**	0.15**	0.25**
Masoor	0.17**	0.17**	0.28**	0.23**
Vegetable Ghee	0.11**	0.07**	0.11**	0.10**
Cooking Oil	0.15**	0.16**	0.37**	0.20**
Tea	0.17**	0.15*	0.09**	0.12**

Note: *, ** significant at 1 percent and five percent respectively

Table IV: Household Economies of Scale [PROVINCIAL Analysis]

Commodities	Punjab	Sindh	Balochistan	KPK
Milk Fresh & Boiled	-0.05*	-0.05*	-0.03**	-0.05**
Milk Packed	-0.11**	-0.14**	-0.15**	-0.11**
Beef	-0.07*	-0.09*	-0.03**	-0.05*
Mutton	-0.08**	-0.12*	-0.03**	-0.12**
Chicken Meat	-0.07*	-0.08*	-0.03**	-0.07*
Apple	-0.08*	-0.09*	-0.03	-0.07*
Potato	-0.04*	-0.01	-0.01**	-0.05*
Onion	-0.06*	-0.04*	-0.03**	-0.05*
Tomato	-0.07*	-0.05*	-0.04**	-0.05*
Salt	-0.05*	-0.04*	-0.05*	-0.04*
Chilies	-0.06*	-0.03*	-0.03**	-0.06*
Sugar	-0.05*	-0.04*	-0.01	-0.03**
Wheat & Wheat Flour	-0.02**	-0.01*	0.00	-0.01
Rice & Rice Flour	-0.04*	0.02*	-0.00	-0.03*
Mash	-0.06*	-0.06**	-0.06*	-0.07*
Moong	-0.06*	-0.06*	-0.07*	-0.06**
Masoor	-0.06*	-0.05*	-0.08*	-0.07*
Vegetable Ghee	-0.05*	-0.02**	-0.03**	-0.02**
Cooking Oil	-0.08**	-0.06*	-0.06**	-0.06**
Tea	-0.06*	-0.05*	-0.02**	-0.02**

Note: *, ** significant at 1 percent and five percent respectively

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Table V: Household Economies of Scale [Provincial Analysis of RURAL Regions]

Commodities	Punjab	Sindh	Balochistan	KPK
Milk Fresh & Boiled	-0.05**	-0.04**	-0.03**	-0.04**
Milk Packed	-0.10**	-0.06	-0.09**	-0.12**
Beef	-0.07*	-0.07*	-0.03**	-0.04**
Mutton	-0.05**	-0.13**	-0.03**	-0.14**
Chicken Meat	-0.06*	-0.07*	-0.02**	-0.08*
Apple	-0.07*	-0.08*	-0.02*	-0.06*
Potato	-0.04*	-0.01**	-0.01**	-0.05*
Onion	-0.05*	-0.03**	-0.03**	-0.04*
Tomato	-0.06*	-0.04**	-0.04**	-0.05*
Salt	-0.03**	-0.05*	-0.04**	-0.03**
Chilies	-0.05*	-0.03*	-0.04**	-0.06**
Sugar	-0.05*	-0.06*	-0.00	-0.02**
Wheat & Wheat Flour	-0.01**	-0.02**	0.01**	-0.01**
Rice & Rice Flour	-0.04**	0.02**	0.00	-0.04**
Mash	-0.06**	-0.08**	-0.06**	-0.06**
Moong	-0.05*	-0.06*	-0.06**	-0.04**
Masoor	-0.06**	-0.06**	-0.08*	-0.06**
Vegetable Ghee	-0.05*	-0.03**	-0.02**	-0.02**
Cooking Oil	-0.08**	-0.04**	-0.07**	-0.06**
Tea	-0.05*	-0.05*	-0.02**	-0.02**

Note: *, ** significant at 1 percent and five percent respectively

Table VI: Household Economies of Scale [Provincial Analysis of URBAN Regions]

Commodities	Punjab	Sindh	Balochistan	KPK
Milk Fresh & Boiled	-0.06*	-0.06*	-0.03**	-0.04**
Milk Packed	-0.11**	-0.14**	-0.26**	-0.09**
Beef	-0.08**	-0.10*	-0.00	-0.05**
Mutton	-0.09	-0.11*	-0.04**	-0.09**
Chicken Meat	-0.08*	-0.09*	-0.04**	-0.06**
Apple	-0.09*	-0.10*	-0.04**	-0.08**
Potato	-0.05*	-0.02**	-0.01**	-0.05**
Onion	-0.06*	-0.05*	-0.03**	-0.06*
Tomato	-0.07*	-0.07*	-0.04**	-0.05**
Salt	-0.06*	-0.04**	-0.06**	-0.05**
Chilies	-0.06*	-0.02**	-0.02**	-0.06**
Sugar	-0.05*	-0.03**	-0.02**	-0.03**
Wheat & Wheat Flour	-0.01**	-0.00	-0.00	-0.00
Rice & Rice Flour	-0.04**	0.00	-0.01**	-0.03**
Mash	-0.06**	-0.07**	-0.05**	-0.07**
Moong	-0.06**	-0.07*	-0.06**	-0.07**
Masoor	-0.06**	-0.06**	-0.07*	-0.07**
Vegetable Ghee	-0.05*	-0.03**	-0.04**	-0.02**
Cooking Oil	-0.08**	-0.05**	-0.05**	-0.06**
Tea	-0.06*	-0.04**	-0.02**	-0.02**

Note: *, ** significant at 1 percent and five percent respectively

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