ANALYSIS OF FACTORS AFFECTING DEMAND OF PORK CONSUMPTION IN VINH CITY, NGHE AN PROVINCE

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ABSTRACT

Demand for pork consumption highly fluctuates and depends on many factors. Thus, the estimation and analysis of the factors affecting pork demand would contribute to stabilize the market for pork in particular and the whole market for consumption goods in general. The study used econometrics model and ANOVA analysis to analyze key factors affecting the demand for pork consumption in Vinh city, Nghe An province. Results showed that key factors such as price of pork meat, fish, and chicken, as well as real income of household have affected the demand for pork consumption. On the other hand, some factors such as price of beef, personal background of consumers (like source of income, age, gender, and current living place of household) do not have any effect on the demand (of pork). In order to stabilize the market for pork, some measures are required such as controlling the supply of pork meat, developing the retail system (for pork), and planning for pig production in association with poultry and fish production.

Keywords: Influence factors, pork demand, Vinh city.

Phân tích các yếu tố ảnh hưởng đến cầu thịt lợn ở thành phố Vinh, tỉnh Nghệ An

TÓM TẮT

Cầu về thịt lợn hiện nay thay đổi phức tạp và bị chi phối bởi nhiều yếu tố. Việc ước lượng và phân tích các yếu tố ảnh hưởng đến cầu thịt lợn giúp phần ổn định thị thường thịt lợn nói riêng và thị trường hàng hóa tiêu dung nói chung. Nghiên cứu này sử dụng mô hình kinh tế lượng và phân tích ANOVA để phân tích các yếu tố ảnh hưởng đến cầu thịt lợn của người dân ở thành phố Vinh, tỉnh Nghệ An. Các yếu tố như giá thịt lợn, giá cá, giá gà, thu nhập của gia đình có ảnh hưởng đến cầu thịt lợn. Các yếu tố không ảnh hưởng đến cầu thịt lợn như giá thịt bò, nghề nghiệp của người của thu nhập chính, tuổi của người đi chợ, giới tính của người đi chợ và nơi sinh sống của hộ gia đình. Để ổn định thị trường thịt lợn cần thực hiện một số giải pháp như: kiểm soát nguồn cung thịt lợn, phát triển hệ thống bán lẻ thịt lợn, và quy hoạch chăn nuôi lợn thịt gắn với chăn nuôi gia cầm và chăn nuôi cá.

Từ khóa: Cầu thịt lợn, yếu tố ảnh hưởng, thành phố Vinh.

1. INTRODUCTION

Livestock plays an important role in agricultural sector, accounting for 20% of contribution to total agricultural GDP annually, and shows great potential development in the future. Therein, pig production is considered as main livestock industry of Vietnam (GSO, 2010). In some recent years, pig production in Vinh has been facing with several difficulties. Numbers of pigs and production of pig meat in the whole province and, particularly in Vinh city fluctuated

unpredictably. According to Ministry of Finance, pork price fluctuated significantly between VND 30,000 and VND 37,000 per kilogram in 2010, between VND 64,000 - 65,000 per kilogram in July 2011 and from VND 40,000 to 45,000 in 2012. This fluctuation negatively impacted on both of producers and consumers. There is, however, no research on demand for pork to recommend on policy. Most reviewed researches focus on developing pig production, pork supply chain, and economic efficiency of pig production or competitive advantage for pork production.

Stanton (1961) showed that the demand for pork in United States depends on pork price, beef price, broiler price and aggregate per capita consumer income. The author applied Cobb-Douglas model and used annual data from 1950 to 1959. Using annual data from 1950 to 1982 and Cobb-Douglas function, Braschler (1983) also estimated that demand for pork depends on these factors. Demese and Abenete (1997) also used Cobb-Douglas functions to analyse factors affecting demand for pork in Kenya in the period 1961-1991. The authors also figured out that factors affecting demand for pork are pork price and per capita income whereas beef, broiler and goat price have no clear effect on demand. Research about willingness to pay for certified safer pork using logit model to analyse impact factors concerning pork safety, Gay and Laurian (2001) found that among others, total household income was a major factor. Households having higher income also concern more about pork safety. Christopher and Biing-Hwan (2005) used 1960- 2003 annual data (but non-continuous) and classification-descriptive statistics (without test) to analyse factors affecting demand for pork in United States. They concluded that demand for pork in United States is affected by following factors: income of households, ethnicity of consumer, place buying pork, region, living area (rural or urban), age and gender.

Most previous studies used time series data to estimate demand for pork in a country. One important limitation of these is that inflation can not be excluded. Nominal prices of pork and related goods and nominal income vary each year instead of the fact that real value may level out. Moreover, dependent variable is measured in quantity, which is not affected by inflation. This means that those, in reality, make non-sense on demand function for pork, however, demand function estimation results conversely. This paper uses another approach to estimate demand for pork which uses scenarios to estimate personal demand function. This approach allows to exclude inflation and estimating price elasticities during survey period. From those personal functions, this research will deduce demand function for whole society. Building demand function (Vinh city) for further policies recommendation to stabilize the (pork) market and to contribute to the development of pig production is therefore necessary at current stage. This study aimed to (i) analyze the situation of pork consumption in Vinh city; (ii) analyze factors affecting the demand for pork consumption in Vinh city; (iii) recommend policies for development of pork market in Vinh city.

2. METHODOLOGY

2.1. Data collection

Available information of livestock industry and pork consumption at province and city level through related documents and reports were used as secondary data.

To generate primary data semi-structured interview and stratified random sampling were used with sample size of 120 respondents. To estimate demand function for pork, we interviewed two locations ensuring by scenario for each consumer. Therefore, we deduce the estimated demand function based on those individual demand curves.

2.2. Data analysis

The current consumption of pork in Vinh city was analyzed using descriptive statistics

Regression analysis: Apply mathematical model to analyze the factors affecting the demand for pork consumption. Within the context of this study, the demand function was described as below:

$LnQ = \beta_0 + \beta_1 LnP + \beta_2 LnP_1 + \beta_3 Ln\,P_2 + \beta_4 Ln\,P_3 + \beta_5 LnI + \alpha_1 W + \alpha_2 T + u_i$

Where

Q: Quantity of pork demanded per person per month (kg/month)

P: Retail price of pork per kilogram (1000VND/kg)

P_1, P_2, P_3: Retail price of beef, poultry (chicken), fish per kilogram (1000VND/kg)

I: Disposable income per person per month (1000VND/month)

W: Main income source of household owner

W = 1 if main income source is from office work

W = 0 otherwise

T: Taste of consumer.

T = 1 if consumer prefers pork most.

T = 0 if consumer prefers other food.

β_0: parameters. β_i: coefficient of elasticity of demand (i=1.5), α_1, α_2: coefficient of dummy variables (occupation and taste), u_i: error terms.

3. RESULTS AND DISCUSSION

3.1. Situation of pork consumption in Vinh, Nghe An

3.1.1. Characteristics of surveyed households

Majority of respondents (70) were forty years old and above accounted for 58.33% of total respondents. Normally housework is carried out by female; however, as surveyed 23.33% of male respondents said they were responsible for shopping.

Household size is one of the factors affecting pork consumption. According to survey, household size ranged from one to seven persons per household, of which small household, with not more than 2 persons, was about 17%. Medium household with three (3) to four (4) persons was at the highest proportion of 58% while large household, with 7 persons only accounted for 4% of total surveyed households.

Job of respondents showed direct impact on demand for pork consumption. Group of respondents with high income and stable job usually had higher demand than other groups. As surveyed, there were seven sub-groups according to source of income of respondents, of which private employers, government officers, and businessman were considered as high income jobs. The results were showed in Table 1.

Table 1. Job categories of surveyed household owners

Job categories	Number (Persons)	Percentage (%)
Private employers	15	12.50
Government officers	12	10.00
Businessman	25	20.83
Retirement	22	18.33
Agriculture	11	9.17
Housewife	9	7.50
Others	26	21.67
Total	120	100.00

Source: Household survey, 2012.

3.1.2. Income of surveyed households

Income is the key factor that highly influences the consumption of household. Households with high and stable income tend to consume more meat and fish than others. According to the survey, most of households (81%) had income of more than VND 5 million per month. Only three surveyed households (2.5%) had low income with less than VND 3 million per month (Table 2). This means that consumption for meat and fish in general is high and stable.

3.1.3. Pork supply

Pork supply. Retail system is the final stage of distribution process, thus it plays important role in circulating goods flow faster or slower.

According to survey, main sources of pork supply were wet markets and supermarkets. However, most respondents said they only purchased pork meat at wet market (71.67%) (Table 3). Only three respondents mentioned meat shop (1) and street vendors (2) as their source of pork supply.

Regular source of pork supply. Pork is important food to our daily life. However, consumers are high concerned about supply origin and quality of pork, thus they tend to purchase from regular suppliers. According to

Table 2. Income of surveyed household per month

Income group	Number (persons)	Percentage (%)
Less than 1 million VND	0	0.00
From 1 to 3 million VND	3	2.50
From 3 to 5 million VND	20	16.67
From 5 to 8 million VND	49	40.83
More than 8 million VND	48	40.00
Total	120	100.00

Source: Household survey, 2012.

Table 3. Source of pork supply

Types of Retailers	Number (persons)	Percentage (%)
Wet market	86	71.67
Street vendors	2	1.67
Supermarkets	31	25.83
Meat shop	1	0.83
Total	120	100.00

Source: Household survey, 2012

Table 4. Regular source of pork supply of surveyed households

No. of regular suppliers	Number (persons)	Percentage (%)
One supplier	32	35.96
Two suppliers	15	16.85
Many suppliers	12	13.48
No regular source of supply	30	33.71
Total	89	100.00

Source: Household survey, 2012.

survey, more than 50% of respondents said that they only purchased pork from one to two regular suppliers. In contrast, 33.71% of respondents answered that they did not purchase pork meat from regular source. It might increase the risk of food safety and hygiene for pork consumption.

3.1.4. Price of pork cuts

Price. Price of pork meat highly fluctuated in recent years. As reported, price of one kilogram of

Table 5. Price of different parts of pork meat as surveyed ('000VND/kg)

Pork cuts	Classified by regions		
	Rural	Urban	Average
Ham	97.30	102.57	100.64
Leg (trotters)	97.24	95.44	95.98
Belly slices	83.34	99.13	94.46
Shoulders	93.13	98.63	97.34
Lean meat	98.89	118.12	112.54
Spare ribs	77.11	87.20	83.84
Others	52.00	111.05	97.63

Source: Household survey, 2012.

ham in two biggest cities of Vietnam (Hanoi and Ho Chi Minh City) was around VND100,000. Table 5 shows the prices of different parts of pork meat, with the highest price at VND 112,540 per kg for lean meat, and the lowest price at VND 83,840/ kg for spare ribs.

As shown in table 5, lean meat, ham, and leg (trotters) were at higher price while other parts of pork meat such as spare ribs, grease, bone, and internal organs had lower prices.

Source of information of pork supply. Pork is one of the most important consumption goods, so almost consumers know about its price before going to market. As surveyed, 52.5% of respondents usually update the price before buying. Only small number of respondents (8) answered that they never ask about price of pork.

Although majority of buyers knew about the price of pork, their source of information about price was provided by sellers (49.12%)

Table 6. Frequency of knowing price before buying

How frequently you know about price before buying?	Number (persons)	Percentage (%)
Usually	63	52.50
Occassionally	49	40.83
Never ask	8	6.67
Total	120	100.00

Source: Household survey, 2012.

Table 7. Source of information about pork price

Sources of information	Number (persons)	Percentage (%)
Known from the previous shopping	22	19.30
Provided by sellers	56	49.12
Other sources of information	36	31.58
Total	114	100.00

Source: Household survey, 2012.

Table 8. Price determination of surveyed households

Price maker	Number (persons)	Percentage (%)
Buyers	0	0.00
Sellers	67	56.30
Negotiation	52	43.70
Total	119	100.00

Source: Household survey, 2012.

and from previous shopping (19.30%). Other sources of information including relatives and neighbor, newspapers, radio, and television accounted for 31.58% only (Table 7). It showed that price of pork can easily be controlled by sellers. It might have negative impact on distribution system for pork in long-run.

In rural area, source of information about price mostly provided by sellers due to lack of information from mass media such as television broadcast, newspaper, and radio. Since price information provided by mass media only are updated and served for big cities, it might be inappropriate and inaccurate when used for rural area. Because most of respondents did not have enough information about market price, the price was determined by sellers (56.30%). The rest of respondents said that price was negotiated between buyers and sellers with small discount. In this case, the discount was from 1,000 VND to 1,500 VND/kg, or 1 to 1.5% of the current price.

3.1.5. Related concerns of consumers about pork supply

When asked about their most concerns for pork consumption, more than 70% of the respondents were more aware of quality of pork. In contrast, only sixteen (16) respondents, accounting for 13.33% of total respondents, replied that they were concerned about price alone (Table 9). As a result, pork consumers learnt how to recognize the pork with high quality, ensured food safety and hygiene. When asked about the criteria for selection of "safe" meat, some characteristics such as no finger print left on meat when touching (firmness); fresh color (not too red/dark); and out of bad smell (due to rancid meat).

3.1.6. Pork consuming situation of surveyed household

Table 10 is based on the purchasing frequency of different parts of pork meat and the average quantity consumption per person per month.

Table 9. Major concerns of surveyed respondents

Indicators	Number (persons)	Percentage (%)
I. Major concerns of repondent	120	100
Price	16	13.33
Quality	64	53.33
Both	40	33.33
II. Food safety concern	120	100.00
Knowledgable of food safety	75	62.50
Don't know about food safety	6	5.00
Not concerned of food safety	39	32.50

Source: Household survey, 2012.

Table 10. Household consumption of different parts of pork meat

Criteria	Unit	Average
Quantity consumed	Kg/person/month	2.05
Ham	%	75.00
Leg (trotters)	%	22.50
Belly slice	%	73.33
Shoulders	%	27.50
Lean meat	%	52.50
Spare ribs	%	21.67
Others	%	18.33

Source: Household survey, 2012.

The average pork consumption for a consumer in Vinh is 2.05 kg per person per month. This figure is slightly higher than the average consumption in the whole country (1.75 kg/person/month). Ham, belly slices and lean meat were the most favorite parts. Among the various parts of meat, ham was the most selected part as 90 surveyed households, accounting for 75% of total households, agreed that they frequently purchased ham. It was explained that ham was easy-to-cook, suitable for tastes of majority of consumers. Then, it was followed by belly slice, even it was not nutritious part, because of its cheap price, suitable with low income customers and agriculture farmers. In contradictory, leg (trotters), spare ribs, and internal organs were the parts of pig with less consumption of 22.5%, 21.67% and 18.33%, respectively, of surveyed respondents frequently purchased.

3.2. Analysing factors impacting demand for pork in Vinh city

3.2.1. Impact of price of pork and prices of related goods

To analyse factors affecting demand for pork, we use econometric model which has estimated demand function (Table 11) as follow:

$Ln(Q) = 7.6335 - 1.6865.ln(P) - 0.26936.ln(P_1) + 0.1623.ln(P_2) + 0.3724.ln(P_3) + 0.7293.ln(I) + 0.1542.T + 0.1551 W + u_i$

To achieve the best model, we tested collinearity by using variance inflation factor VIF and heteroskasticity. After realizing heteroskasticity, we use weighted least square method (WLS) to clear this phenomenon. The results showed that VIF index of all independent variables are smaller than 10, and the chi-value index is 0.5849 and it is non-significant at 10% significant level. That means that there is no collinearity and heteroskasticity.

Variables in model such as pork price, beef price, chicken price, fish price, household's income, consumer's preference and career of household's breadwinner explain about 67 percent of the variation in demand for pork in Vinh city. Moreover, at the 1% significant level, retail pork price impacts on demand for pork, i.e. when pork price increases by 1%, demand for pork decreases by 1.69% approximately. At 10% of significant level, beef price has no impact on demand for pork. Responses of consumers when being asked what you would buy in stead of pork: 100% would change to use chicken or fish, and there is no one buying beef. Because price of fish, chicken and pork is similar, and price of beef is higher than pork from 2 to 2.5 times. And responses of consumers when being asked what you would buy in stead of beef: most of surveyed people (83%) responsed that they would change to use seafood. Because consumers usually buy a small amount of beef each time they cook. If they did not buy beef, they would buy squid because of the same method of processing: stir-frying or hot-pot.

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Table 11. Estimated demand function of pork in Vinh city
(Weighted Least Square Method by STATA 8)

Value	Coefficient estimates	Variance inflation factor VIF
Intercept	7.6335[***]	
Pork price (P)	-1.6865[***]	1.16
Beef price (P_1)	-0.26936[ns]	1.54
Chicken price (P_2),	0.1623[*]	1.45
Fish price (P_3)	0.3724[***]	1.74
Income (I)	0.7293[***]	1.40
Preference (T)	0.1542[***]	1.44
Career (W)	0.1551[ns]	1.11
F_Value	69.82[***]	
R^2	0.6693	
Sample size	239	
Chi_value	0.5849[ns]	

Source: Survey 2012.
Note: [*], [**], and [***] are 10%, 5% and 1% significant level respectively; [ns] non-significant

Chicken and fish are two substitute goods for pork. At 10% significant level, we deduce that when chicken price rises by 1%, demand for pork rises by about 0.16%; and at 1% significant level, when fish price rises by 1%, demand for pork rise by around 0.37%.

3.2.2. Impacts of consumer's career and income

Consumer's income has a great impact on demand for pork. People in Vinh city have high income, thus demand for pork is higher than other areas. At 1% significant level, when income increases by 1%, demand for pork

increases by about 0.73% (Table 11). That reveals pork is not a luxury good for most of people, especially Vinh's people.

Career of household's breadwinner also impacts on demand for pork. People working in different segments demand for pork differently. ANOVA analysis (Table 12) shows that people in various segments have different pork demand. However, this analysis has a disadvantage due to neglecting other factors. Therefore, for more accuracy, we added dummy explantory variable: career; with two values:

Table 12. Impact of career of main shopping person

Career of surveyee	Average consumption/capita/month
Companies' employee	2.12
Government Official	1.83
Trader/Merchant	2.09
Retirer	2.23
Agricultural Worker	1.20
Housework	1.93
Others	2.31
F-Value	2.565[**]

Source: Survey 2012.

agricultural and non-agricultural. The result shows that the difference is statistically insignificant; i.e. consumption for pork of agricultural households is not statistically different from non-agricultural households.

3.2.3. Impact of consumers' preference

In addition to price, income, and career, demand for pork is also affected by consumers' charateristics. Factors like age and gender of food buyer, living location and size of household also affect on demand for pork?

Do young people demand for higher quatity of pork than the olders? Which gender has higher demand for pork? From survey result, we reveal that age and gender make no impact on demand for pork. This demand, however, is affected by consumer's preference. Table 11 shows that at 1% significant level, consumer's preference

impacts on demand for pork. People who prefer pork to other meats have higher demand for pork than others. According to Table 13, at 10% significant level, factors like age and gender of food buyer and living location of household do not impact on demand for pork of households.

Does number of people in one household impact on demand for pork? To test the hypothesis, we use ANOVA to analyse demand for pork of three groups of households: small households (1 - 2 members), medium households (3 - 4 members) and large households (over 4 members). As result, size of households does impact on demand for pork, nevertheless, that making deep analysis on ANOVA reveals most of differences belong to small families. Those are young families whose members work or study far from their house, and then they have a higher demand for pork than others.

Table 13. Impacts by consumers

Age group	Number (people)	Average consumption/capita/month
Impacts by age of food buyer		
Under 25	19	2.26
25 - 40	31	2.07
41 - 55	52	1.94
Over 55	18	2.09
F-Value		0.618^{ns}
Impacts by gender of food buyer		
Male	28	2.07
Female	92	2.04
F-Value		0.013^{ns}
Impacts by living location of household		
Rural	28	1.95
Urban	92	2.09
F-Value		0.649^{ns}

Source: Surver 2012.

Table 14. Impact of number of people in surveyed households

Size	Number (people)	Average consumtion/capita/month
Under 3 people	21	2.75
From 3 to 4 people	70	1.97
Over 4 people	29	1.73
F-Value		10.121^{***}

Source: Survey 2012.

3.3. Recommendations of developing pork market in Vinh city

3.3.1. Strengthening control in pork supply

City and province government need clear solutions to control the supply quantity of pork to market. According to previous results, average consumption of pork per capita per month is 2.05 kilograms. Hence, Nghe An province demands 6,150 tons and Vinh city demands about 635 tons each month.

Government should execute pratices in control pork inflow and outflow from city to stablise supply. According to monthly consumption level, government needs to recommend people making appropriate production plan on order to fit market demand.

3.3.2. Developing pork retailing system

Allocating appropriately the pork distributing places such as market, store, and supermarket is needed in order to avoid price fluctuation due to unstable supply. According to research result from markets, those in students' area, workers' area, and officials' area have the higher demand for pork than others.

Government has to make policies to improve pork distributing system, like variety of retail stores, especially supermarket.

3.3.3. Planning to develop pig supply

Fish and chicken are two substitute goods for pork, hence that planning to develop pork production have to consider about fish and chicken production.

Demand for pork increases when people's income increases. Therefore, planning has to base on whole country and provincial economic development.

4. CONCLUSIONS

Pork consumers in Vinh city are characrerized by age, income levels and careers. Average pork consumption is 2.05 kilograms/capita/month, higher than the similar index of whole country in 2010. Most of people

demand for ham, side and lean. Price of different parts ranges between VND 83 - 112 thousand per kilogram. Most of people (56%) do not know about pork price. Consumers get price information from sellers. Pork price is usually fixed by sellers (70%).

Demand for pork is influenced by pork price, chicken price, fish price, income, preference and career, i.e. when price of pork rises, demand for pork decreases. Demand for pork goes up when price of chicken or price of fish increase. Demand for pork rises when income of consumers rises. And people who prefer pork have higher demand for pork. Beef price does not impact on demand for pork significantly.

There are a few solutions to improve pork market: control supply to fulfil demand in time and space; diversify retail system. In planning, factors like income of people in future, development of chicken and fish supply should be considered.

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