A Quantitative Measurement of Child Costs in Vietnam During High Inflation Period

Nghiem Thi Van *

Abstract

This research provided estimated costs of children in Vietnam for the period 2002-2006. The research adopted Barten's specification and used data of Vietnam Household Living Standard Surveys for 2002, 2004 and 2006. The results showed that cost of one child aged 0-6 was 22.5 percent that of a single adult. Likewise, cost of one child aged 7-17 was 40.3 percent of that of one adult. By considering child costs of families having different number of children at different ages, we found that child costs increased by age and by number of children. When looking more precisely into five income quintiles, child costs by percentage decreased as income increasing. However, when calculating in VND, the opposite trend occurred with child costs increasing as income increasing.

The research also examined additional child costs to maintain family utility under this high inflation period. This was a new idea which has never been done by any other researchers who utilized Barten's specification. We found that inflation did not always result in a proportional effect on child costs of families. Our investigation over the five income quintiles showed disproportional or rather regressive effects. During these five years, prices of all commodities increased by 29.4 percent. Meanwhile, child costs spent by the lowest income families rose by 32.9 percent. Facing the same inflation rate, child costs spent by the highest income families increased much lower than that of the lowest income families, by 27.6 percent.

Our research allowed us to propose recommendations to improve the current system of allowances for dependents of the Personal Income Tax payers. According to the present policy, the deductible amount for child-aged dependents is 1.6 millions VND per month for both young and old children. However, we suggested the amount of 1.2 millions VND per month for children aged 0-6 and 2.1 millions VND per month for children aged 7-17. This suggestion, if approved, would not only bring higher tax collection for the Government but also increase social welfare in Vietnam.

Key Words: *Child costs, high inflation, income.*

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1. Introduction

Measuring the costs of children was of interest to researchers for a number of reasons. One reason was to estimate equivalent scales used for demand systems. Another reason was that child costs can be utilized for analyzing income maintenance programs. Child costs could also be used for studies of welfare comparison and poverty.

Although the importance of measuring child costs was recognized in the literature, there was still (considerable) debate over how to measure these costs. Previous research offered various approaches for measuring child costs; however these weren't adequately applicable to the particular situation of Vietnam. Due to this perceived inadequacy, this study also attempted to find a suitable approach for measuring child costs in Vietnam. Two crucial questions that need to be addressed for Vietnam were: (i) whatthe costs are of one child as compared to those of one adult; (ii) what the additional costs are to maintain family utility underhigh inflation.

We started our examination by findingthe factors that determined child costs in general. From the point of view of macroeconomics, child costs were determined by the intersection of service-producing costs on the supply side and the market price of real wages, real assets as well as the number of children on the demand side. Theoretically, a suitable macroeconomics model with an adjustment in the labor market would lead us to an equilibrium value for child costs corresponding to some given levels of expected rate of inflation. Empirically, however, it was difficult to find sufficient macro-data for service producing costs. Due to this lack of sufficient data, we measured child costs from a microeconomic point of view and then examined the empirical results.

Browning (1992) reviewed a prominent body of research with a microeconomic approach on child costs prior to 1992. He identified four major questions that this research also attempted to address: the positive question, the needs question, the expenditure question, and the iso-welfare question. We believed that most research from 1992 to the present can also be placed in one of these four categories. In this study, we only discussed the iso-welfare question which relied mainly on three approaches:the Engel approach, the Rothbarth approach, and the complete demand system approach.

Engel (1895) stated that "the proportion of the outgo used for food, other things being equal, is the best measure of the material standard of living of a population". However, when measuring child costs, his approach showed three major weaknesses. The first weakness was the lack of plausibility (Deaton, 1986). The Engel approach (implicitly) assumed that the needs of children were proportional to the needs ofadults. Secondly, the economies of scale in consumption were the same for everycommodity.In reality, however, families with children tended to spend more on children's goods than on adults' goods as shown by Prais and Houthakker (1955). Thirdly,the Engel approach could only provide the exact measurement of child costs if the family had a relatively large food share (Nghiem, 2011).

Rothbarth (1943) measured family living standards on the basis of expenditures on adult goods. This view assumed that child costs were to maintain the level of adult goods as they werebefore the birth of a child. In reality, however, the presence of children can affect the parent's tastes in adult goods.Consequently, it was difficult to find adult goods that were not directly influenced by the presence of children.

Barten (1964) proposedan idea for measuring the costs of children based on complete consumer demand systems. Later,this ideawas developed by other researchers such as Gorman (1976), Muelbauer (1977), Ray (1983), Jorgenson and Slesnick (1987), Nelson (1988), and Michelini (2000). In the Barten approach, the changes in family demographic were assumed to affect relative prices. For example, if there were children, then ice-cream, milk, and soft drinks became relatively more expensive, and cigarettesand alcohol become relatively cheaper. It was also assumed that there were mathematical relationships between consumption of a good and the number of family members, their ages, and the level of family utility. On the other hand, the costs of children were assumed to be indifferent at the same income levels (see Lewbel 1989, Blackorby and Donalson 1993).

Among these three approaches, we judged thecomplete consumer demand system approach to be the most appropriate for estimating child costs. This approach considered not only the effect of a family demography on the budget shares, but also other factors such as prices and number of children.

This research had three objectives. The first objective was to devise a suitable model to estimate child costs of families in Vietnam during the period 2002-06. The second objective was to examine the effects of high inflation on the costs of children to maintain a family utility level. The third objective was to propose recommendationsfor an appropriate income tax deductible for dependents in the Personal Income Tax policy

This paper was organized intofour sections. Following this introductory section, section 2 describedthe model used to estimate child costs for Vietnam. Section 3 was devoted to the data selection method and empirical results. Finally, section 4 provided concluding remarks and policy implications.

2. The Model

Theoretical model:

In general, the complete demand system approach considered factors affecting the demand function of a specific good. For example, demand of good i was a function of its price, total expenditures of consumer family, demography of consumer family and other possible factors. If the consumer was rational, he would try to spend minimum expenditure on good I to reach

maximum utility level. This was the basic economic problem of the consumer. By solving this problem, he would know his demanded quantity on good i.

In reality, however, economists faced difficulty when collected data of quantity demanded of the consumers, because consumers usually remembered the value spent on good i better than the consumed quantity. Therefore, a better way was to measure the share of that good i which was observable through household surveys.

Barten (1964) proposed the way family demography determined taste differences between families. Basically, his method also derived from the complete demand system approach. Instead of considering the quantity demanded as usual, however, he introduced the subjective demand function. The subjective demand was an imaginable demand function which reflected the ratio of quantity demanded in reality over family demographic.

In mathematic terms, the subjective demand function was assumed to be

$$\frac{q_i}{m_i} = q_i^* \tag{1}$$

where q_i was aconsumed quantity in reality; q_i^* was a subjective quantity; m_i was a parameterdepending on family demography. $m_i > 1$ if these were below average economies of scale relative tofamilies without children in consuming this good and vice versa for $m_i < 1$.

All families were assumed to have the same direct utility function after deflating demanded quantity over demography as of

$$U = g\left(\frac{q_i}{m_i}\right) = g\left(q_i^*\right) \tag{2}.$$

He also assumedthat subjective prices varied with family demography which was defined as$p_i^* = p_i.m_i$. Here, the assumption of one commodity with one price still held for the families with the same family composition. The budget constraint was

$$X = \sum_{i=1}^{n} p_i q_i = \sum_{i=1}^{n} \frac{p_i^*}{m_i} m q_i^* = \sum_{i=1}^{n} p_i^* q_i^* \tag{3}.$$

By solving equations (1), (2) and (3), the subjective budget shares would be as of

$$W_i^* = \frac{p_i^* q_i^*}{X} = W_i = f(p_i, m_i, X) \tag{4}$$

Equation (4) showed that the subjective budget share W_i^* was exactly equal to the budget share W_i in reality.

Empirical model:

Muellbauer (1977) used the PIGLOG (Price Independent Generalized Logarithmic)expenditure function to derive the share function of good i. At first, he assumed the minimum expenditure function in Cobb-Douglas type as of

$$X_h(u,p) = \beta_h^u \alpha_h^{1-u} \tag{5}$$

Where $X_h(u,p)$were the minimum expenditures of the family with some demographic characteristics to attain a given level of utility. In this Cobb-Douglas form, the expenditure function was decomposed into 2 expenditure parts which were $\beta_h(p)$ and $\alpha_h(p)$. Utility was used as weight in this form. Roughly speaking, we imagined that total expenditures of a family $X_h(u,p)$can be decomposed by using 2 other families with total expenditures $\alpha_h(p)$and total expenditures $\beta_h(p)$.

The PIGLOG was introduced by Muellbauer in 1975. In the expenditure function $X_h(u,p)$. prices would not appear directly in the Cobb-Douglas form. It only appeared directly after taking log-natural. The alpha function wass assumed to take the form of $\alpha_h(p) = \sum_{i=1}^{n} \alpha_i m_i p_i$ which was linear homogenous and concave of price. The beta function took the form of $\beta_h(p) = e^{\beta_0} \prod_{i=1}^{n} (m_i p_i)^{\beta_i}$ which was linear homogenous, and concave of price.

Utility function was derived by taking logarithm both sides of equation (5) as of

$$U = \frac{\log X_h - \log \alpha(p)}{\log \beta(p) - \log \alpha(p)} \tag{6}$$

Doing the same process in equations (1), (2), (3) and (4) for equation (5) and (6), we would easily get the form of share of good i from the expenditure function $X_h(u, p)$. In particular, the budget share of good i for the family h was

$$W_{ih} = U\left(\beta_i - \frac{\alpha_i m_i p_i}{\sum_{i=1}^{n} \alpha_i m_i p_i} \right) + \frac{\alpha_i m_i p_i}{\sum_{i=1}^{n} \alpha_i m_i p_i} \tag{7}.$$

Substituting equation (6) to equation (7), we would get a more detail budget share as of

$$W_{ih} = \left(\frac{\log X_h - \log_h \alpha(p)}{\log \beta_h(p) - \log_h \alpha(p)} \right) \left(\beta_i - \frac{\alpha_i m_i p_i}{\sum_{i=1}^{n} \alpha_i m_i p_i} \right) + \frac{\alpha_i m_i p_i}{\sum_{i=1}^{n} \alpha_i m_i p_i} \tag{8}.$$

Equation (8) was estimable by using data from household surveys. We would explain economic meanings of equations (7) or (8). Equations (7) or (8) showed the causal effect of total expenditures $X_h(u, p)$, price of commodity i, family demography m_i on the share of commodity i W_{ih}. In special cases, when $X_h(u, p) = \alpha_h(p)$ then $W_{ih\alpha} = \frac{\alpha_i m_i p_i}{\sum_{i=1}^{n} \alpha_i m_i p_i}$ and utility would be zero; when $X_h(u, p) = \beta_h(p)$ then $W_{ih\beta} = \beta_i$ and utility would be one. In economics, we can say that $\alpha_h(p)$ can be total expenditures of a family having the share of commodity i was $W_{ih\alpha} = \frac{\alpha_i m_i p_i}{\sum_{i=1}^{n} \alpha_i m_i p_i}$ with utility level at zero. The $\beta_h(p)$ can be total

expenditures of a family having the share of commodity i was $W_{ih\beta} = \beta_i$ with utility level at one.

We would have a special form of budget share as of

$$W_{ih} = U\left(W_{ih\beta} - W_{ih\alpha}\right) + W_{ih\alpha} \tag{9}$$

Equation (9) showed that the share of commodity i for family h can be equal to the share $W_{ih\alpha}$ of family with total expenditures $\alpha_h(p)$ plus the product of the difference between the shares of family with total expenditures $\beta_h(p)$ and family with total expenditures $\alpha_h(p)$ adjusted by utility level.

Moreover, the family with total expenditures $\beta_h(p)$ was richer than family with total expenditures $\alpha_h(p)$ because of having a higher utility. If we applied the Engel's Law, we also knew that if both families had the same demography, the share for food of family with $\alpha_h(p)$ would be higher than that of family with $\beta_h(p)$.

The parameters of function $\beta_h(p)$ had the restriction that $\sum_{i=1}^{n} \beta_i = 1$ This restriction was easily proved by simple algebras. The role of parameter β_0 was only as an adjustment multiplier.

To estimate the child costs of Vietnamese families, we applied the same procedure that Muellbauer (1977) used for British families. However, in our model, we divided children into 2 age groups. This specification was a new addition to the Cobb-Douglas expenditure function which had not been applied by Muellbauer or any other researchers.

In order to construct our model, weneeded to set up some assumptions for estimating child costs. The first assumption was that there was an absence of money illusion. The second assumption was that specific equivalence scales were greater than one. In other words, the average economies of scale of families without children were relativelylower than those of families with children in consuming the goods.The third assumption was that for families with a same number of children, the same commodity will have one same price. Fourthly, at the same level of income, the budget shares were identical between families regardless of areas or

regions Fifthly, preferences for commodities have not changed during this period. The sixth assumption was that the preferences of husband and wife did not differ. The last assumption was that families followed that Engel's Law. In particular, the family with a high total expenditure would have low food shares or vise versa.

Table 1. Definition of variables

Variable Codes	Variable names	Types	Definition
W_1	Food share	Dependent variable	The ratio of food expenditures over total expenditures.
W_2	Non-food share	Dependent variable	The ratio of non-food expenditures over total expenditures.
$\log X$	Log-natural of total expenditure	Independent variable	Sum of all kinds of expenditures, for example, expenditures for food, for education, for health, for durables goods, for transportation, ...
p_1	Food price	Independent variable	From published data of the CPI for the years 2002-06.
p_2	Non-food price	Independent variable	From published data of the CPI for the years 2002-06.
ych	Number of children aged 0-6	Independent variable	Sum of all number of children from 0-6 years old of a family.
och	Number of children aged 7-17	Independent variable	Sum of all number of children from 7-17 years old of a family.

We classified all goods into two types of goods: food and non-food. Table 1showeda definition of variables which were estimated in our model. Due to lack of spaces, we were not able to show the final estimated equations here. The exact estimated equations were shown in the Appendix. STATA package was used to get the results. As seen, there were 2 dependent variables, of which food share was denoted as W_1 and non-food share was denoted as W_2

Independent variables included log-natural of the total expenditures ($\log X$), food price index (p_1), non-food price index (p_2), number of children aged 0-6 (ych), and number of children aged 7-17 (och).

Hypotheses:

In this study, we tested two hypotheses. The first hypothesis was that the costs of children aged 7-17 were higher than those of children aged 0-6. Second hypothesis was that high inflation had a higher effect on the child costs of the low income families than those of high income families.

3. Empirical results

Data:

The data utilized camefrom Vietnam Household Living Standard Surveys (VHLSS) for the years 2002, 2004, and 2006. Data was pooled simultaneously in a method thatwas called pooled time series and cross-sections data. We also used Consumer Price Index (CPI) for the years 2002, 2004 and 2006 published by the General Statistics Office of Vietnam.

From the whole database of the VHLSS for the years 2002, 2004 and 2006, our first job was to select nuclear families with or without children. To do that, we defined that a nuclear family was a family in which the spouses lived separately from their parents after getting married. The selected nuclear families had a number of children ranged from zero to three. We also divided the selected nuclear families by the number of children aged 0-6 and aged 7-17. Totally, we selected 12 thousand nuclear families classifying into 10 types of families that were available for running the model.

After running the model, we received some insignificantly negative values for parameters of the number of children aged 0-6 and number of children aged 7-17. We tried to diagnose the causes of this problem. One reason could be that therewere above average economies of scale relative to families without children in consuming the goods. Therefore, it was difficult to measure child costs under this circumstance.

Another problem was because we assumed families followedthe Engel's Law. This assumption wassupported by an observation from the published data of Vietnam Household Living Standard Survey from 2002-08. Accordingly, families with a higher total expenditure had a lower food shares on average. However, when we looked at data of all 12 thousand families, we found that many families with a low total expenditure had low food shares or vice versa. This meant that either living standard of those families varied greatly or data of some families wasmisreported. This problem may have a causal effect on the insignificantly negative values for parameters of

the number of young and old children. If we did not get a suitable observation, the model might fail to give reliable estimate results. To overcome these problems, we selected representative families from these 12 thousand nuclear families. The representative families must follow the Engel's Law. Finally, we had 919 families that were suitable for our model.

One might claim that 919 families was a small number of observations and the consistency property1 might not hold. However, in the PIGLOG model,the consistency propertystill held when using representative data or individual data. In his research, Muellabuer(1977) was also not concerned with the number of observations in the PIGLOG model. Indeed, there were only a little more than 100 observations for running the model.

We needed to conduct a hypothesis test to confirm that 919 selected families using the Engel Law method (hereafter called the small sample) can be representatives for12 thousand nuclear families (hereafter called the whole sample). The F test was used.

The null hypothesis was

$$W_{1s} - W_{1w} = 0$$

$$\log X_s - \log X_w = 0;$$

The alternative hypothesis was

$$W_{1s} - W_{1w} \neq 0$$

$$\log X_s - \log X_w \neq 0$$

where W_{1s} and W_{1w} were the food shares of the small sample and the whole sample, respectively. Meanwhile, $\log X_s$ and $\log X_w$ were log-natural of total expenditures of the families in the small sample and the whole sample, respectively.

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[1] For further understanding about the consistency property in the PIGLOG model, please read more on Muellbauer (1975a) "Aggregation, income distribution and consumer demand"*Review of Economics Studies*, Vol 42, pp 525-543

The test results showed that the value of Fwas 1.81 with probabilitythat null hypothesis falling in the critical region was 16.4 percent. This meant that the null hypothesis was not rejected. In other words, these two samples had some common characteristics, or the small sample can be the representative to the whole sample. We did not need to include non-food sharesin the test because of the adding-up restriction

Empirical results:

Table 2 showed the estimated results of food prices, non-food prices, total expenditures, number of children aged 0-6 and number of children aged 7-17 on food shares. As seen, all nine parameters were significant at 1% confidence level. Other things were constant, when total expenditures increased by 1 percent, food share decreased by 0.2 percent. Supposed that quantity consumed was unchanged, when price of food raised by 1 percent, food share increased by 0.7 percent. If non-food price increased by 1 percent, food share decreased by 0.5 percent. Having one more child aged 0-6 increased food share by about 2.3 percent One child aged 7-17 raised food share by about 4.5 percent.

Table 2. Nonlinear Parameters Estimates

Parameters	Coefficients	Std. Errors	t-value	Pr>|t|
$\widehat{\alpha_1}$	376.40	23.08	16.31	0.000
$\widehat{\alpha_2}$	314.65	39.44	7.98	0.000
$\widehat{\beta_0}$	7.28	0.10	70.98	0.000
$\widehat{\beta_1}$	0.41	0.02	21.66	0.000
$\widehat{\beta_2}$	0.59	0.02	31.66	0.000
$\widehat{\gamma_{11}}$	0.11	0.02	7.18	0.000
$\widehat{\gamma_{12}}$	0.21	0.02	13.43	0.000
$\widehat{\gamma_{21}}$	0.11	0.02	5.04	0.000
$\widehat{\gamma_{22}}$	0.19	0.02	8.83	0.000
Number Obs. = 919,		$R^2 = 0.99$,	Adjusted $R^2 = 0.99$	

Source: Author's calculation

Table 3 showed child costs by percent2as compared to a single adult at the 2006 price level for 9 family typed by 5 income quintiles. Before talking about the results of child costs, we would want to say something about the relationship between results of indirect utility and total expenditures. As seen, when total expenditures of the lowest income families were 530 thousand VND per month, their utility level was -0.58. But when total expenditures of the highest income families were 2298 thousand VND, their utility level was 1.43. These results showed that utility levels increased along with total expenditures.

Table 3. Child costs by percentages as compared to a single adult costs at the 2006 price level

Utility Level	Expenditure	ych=1[3]	och=1	ych=1; och=1	ych=2	och=2	ych=2; och=1	ych=1; och=2	ych=3	och=3
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Thous.VND	%								
-0.58	530	22.5	40.3	62.8	45.1	80.7	85.4	103.2	67.6	121.0
-0.04	788	22.5	39.9	62.4	44.9	79.9	84.9	102.4	67.4	119.9
0.35	1042	22.4	39.7	62.1	44.8	79.4	84.5	101.8	67.2	119.1
0.77	1422	22.3	39.4	61.7	44.7	78.8	84.1	101.2	67.0	118.2
1.43	2298	22.2	38.9	61.2	44.5	77.9	83.4	100.2	66.7	116.9

Source: Author's calculation

Looking at the lowest income families, we observed that the costs of one child aged 0-6 were 22.5 percent to those of a single adult; the costs of one child aged 7-17 were 40.3 percent. For

[2] The costs of one child by percent werecalculated by the formula child costs=$2^*(\alpha_h^{1-l} \cdot \beta_h^{l} \cdot -1)^*100\%$. U_0 was utility of family which was used for reference to calculate child costs. There were 5 utility levels l_n corresponding to utility of families of 5 income quintiles.

[3] Hereafter, we denoted ych=1for one child aged 0-6; och=1 for one child aged 7-17; ych=1; och=1 for one child aged 0-6 and one child aged 7-17; ych=2 for 2 children aged 0-6; och=2 for 2 children aged 7-17; ych=2; och=1 for 2 children aged 0-6 and one child aged 7-17; ych=1; och=2 for one child aged 0-6 and 2 children aged 7-17; ych=3 for 3 children aged 0-6; och=3 for 3 children aged 7-17, respectively.

the highest income families, the costs of one child aged 0-6 were 22.2 percent, while the costs of one child aged 7-17 were 38.9 percent. From this, we can say that child costs by percentage decreased from the lowest income quintiles to the highest income quintiles. Child costs increased when the child became older. When we considered the families with more than one child, we saw that the costs for 2 or 3 children of different ages were much higher than those of one child. In other words, child costs by percentages increased with the number of children and with their age.

Table 4 showed the child costs by VND at the 2006 price level for 9 family classified by 5 income quintiles. We kept utility levels and total expenditures of all family types the same with what we calculated in the table 3. As can be seen, child costs increased by number of children and by their age within and between 5 income quintiles. Indeed, for the lowest income quintile, one child aged 0-6 cost about 59.8 thousand VND per month while the number for one aged 7-17 was 107 thousand VND. For the highest income quintile, one child aged 0-6 consumed 255.4 thousand VND and one aged 7-17 consumed 447.7 thousand VND. These numbers showed that rich families spent much more on their children as compared to poor families. The trend was similar to other family types that had two or three children between other income quintiles.

Table 4. Child Cost by thousand dongs at the 2006 price level *Thous. VND*

Utility Level	Expenditure	ych=1	och=1	ych=1 och=1	ych=2	och=2	ych=2 och=1	ych=1 och=2	ych=3	och=3
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
-0.58	530	59.8	107.0	166.8	119.6	214.0	226.5	273.8	179 3	321.0
-0.04	788	88.4	157.4	245.8	176.9	314.7	334.2	403.2	265.3	472.1
0.35	1042	116.7	206 9	323.7	233.5	413.9	440.4	530.6	350 2	620.8
0.77	1422	158.8	280.2	439.0	317 5	560.3	597.7	719 1	476.3	840.4
1.43	2298	255.4	447.7	703.1	510.9	895.2	958.5	1150.6	766.3	1342.6

Source: Author's calculation

Hypothesis testing results:

The first hypothesis was not rejected with 95 percent confident interval. As shown in table 2, value of parameter $\widehat{\gamma_{11}}$ was smaller than that of parameter $\widehat{\gamma_{12}}$ which meant that children aged 7-17 consumed more food than that of children aged 0-6. Similarly, value of parameter $\widehat{\gamma_{21}}$ was smaller than that of parameter $\widehat{\gamma_{22}}$ showing that spending on non-food for children aged 7-17 was higher than that of children aged 0-6. These results supported our hypothesis that the costs of children aged 7-17 were higher than those of children aged 0-6.

The second hypothesis was not rejected as well. We confirmed that the effect of high inflation on children aged 7-17 was more serious than that of children aged 0-6. Also, families belonging to the lowest income quintile suffered from inflation more seriously than those of the highest income quintile. Indeed, during these 5 years, prices in Vietnam increased by 29.4 percent; of which food increased by 39.4 percent and non-food increased by 21.8 percent. We found that the effect of price increases on child costs was relatively higher than on total expenditures of families. Table 5 showed that to keep an unchanged utility level, a family with one child aged 0-6 at the lowest income quintile had to pay 32.9 percent more of total expenditures. Meanwhile, child costs of a family with one child aged 0-6 increased by 27.6 percent at the highest income quintile. For the lowest income family with one child aged 7-17, the child costs increased by 33.4 percent; for the highest income family with one child aged 7-17, the child costs increased by 27.5 percent.

Table 5. The effect of high inflation from 2002-06 on child costs

Utility Level	Expenditure	ych=1	och=1	ych=1 och=1	ych=2	och=2	ych=2 och=1	ych=1 och=2	ych=3	och=3
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Thous. VND					%				
-0.58	530	32.9	33.4	33.2	32.9	33.4	33.1	33.3	32.9	33.4
-0.04	788	31.5	31.8	31.6	31.5	31.8	31.6	31.7	31.5	31.8
0.35	1042	30.4	30.6	30.5	30.4	30.6	30.5	30.6	30.4	30.6
0.77	1422	29.3	29.4	29.3	29.3	29.4	29.3	29.4	29.3	29.4
1.43	2298	27.6	27.5	27.5	27.6	27.5	27.5	27.5	27.6	27.5

Source: Author's calculation

Other results:

For further consideration, we looked into price elasticity of demand as shown in table 6. As seen, in 2002, when price of food increased by 1 percent, demand for food decreased by 0.13 percent; and when price of non-food increased by 1 percent, demand for non-food decreased by 0.52 percent. The indexes showed that food was less elastic than non-food, or in other words,

food was normal goods and non-food was luxury goods. In 2006, when price of food increased by 1 percent, demand for food decreased by 0.07 percent; when price of non-food increased by 1 percent, demand for non-food decreased by 0.66 percent. Obviously, during these 5 years, price elasticity of demand decreased for food and increased for non-food which showed that food became less elastic and non-food became more elastic. It might be due to the effect of high inflation in this period.

Table 6. Price elasticity of demand

Year	Food	Non-food
2002	-0.13	-0.52
2004	-0.10	-0.58
2006	-0.07	-0.66

Source: Author's calculation

We also showed results of income elasticity of demandin table 7. As seen, when income increased by 1 percent, demand for food increased by 0.73 percent in 2002, however it increased by only 0.58 percent in 2006. In contrast, demand for non-food increased by 1.25 percent in 2002 and by 1.48 percent in 2006 for 1 percent increasing in income. This meant that behavior of consumers during these 5 years had changed. Vietnam consumers tended to consume luxury good more than necessity good when their incomes increased.

Table 7. Income elasticity of demand

Year	Food	Non-food
2002	**0.73**	**1.25**
2004	**0.67**	**1.32**
2006	**0.58**	**1.48**

Source: Author's calculation

We now turned to a discussion regarding the present policy on tax deduction for child dependents of Personal Income Tax payers. Accordingly, the deductible amount for children dependents was equally 1.6 million VND per month regardless of age of children. Table 8 showed the deductible amounts for all type of taxpayers' families. As seen, the amount per child was set to be 1.6 million VND per month. For the families having more than one child, the amount was multiplied by number of children. For example, the amount would be 3.2 million VND for a family with 2 children and4.8 million VND for a family with 3 children, and so on. However, our research found that children aged 7-17 consumed 75 percent more compared to that of children aged 0-6. Moreover, inflation impacts on children aged 7-17 was also more

serious than it was to children aged 0-6. Therefore, we believed that the current policy of tax deduction was not appropriated in current situation of Vietnam, especially during the high inflation period.

Table 8. Tax deduction for child dependents of taxpayers *(Thousand VND)*

	ych=1	och=1	ych=1 och=1	ych=2	och=2	ych=2 och=1	ych=1 och=2	ych=3	och=3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Present policy	1600	1600	3200	3200	3200	4800	4800	4800	4800

Source: Tax Office of Vietnam

3. Concluding remarks and policy implication

Conclusions:

From the results shown the previous sections, we did not reject both hypotheses proposed in section 2. The costs of childrenaged of7-17 were higher than those of children aged of 0-6. The reason may be that older children consumed more food and required more education, transportation and entertainment than those of younger children in both absolute and relative terms One may argue that younger children consumed more quality food than that of older children. However, we believed that younger children consume more quality but less quantity of food as compared to older children. On average, total costs of older children wouldstill be higher than those of younger children.

High inflation did not always result in a proportional effect on total expenditures and child costs. High inflation posed disproportional, or rather regressive effects on total expenditures and child costs of families. If high inflation waspersistent, the difference in amounts necessary to maintain family utility became relatively larger between the lowest and the highest income families. As a result, the lowest income families became relatively poorer and the highest income families became relatively richer. In other words, high inflation redistributed wealth among families. This would create social inequality and deepen poverty.

The finding that child costs by thousand VND increased as income increased showed that living standard was simultaneously improved for both parents and children. This result supportedthe continuance of Vietnam's 2 child policy. According to the policy, families were recommended to have 1 or 2 children rather than more than 2 children. This would allow families to provide

their children with a better material life which would result in a better living standard. Therefore, when families became richer, their children also had access to a better spending.

On the other hand, older children seemed to be more sensitive to the effect of high inflation than younger children. During a long, high inflation period, the costs of older children tended to increase. If there was no additional amount of compensation, older children would have to settle down with a lower living standard, especially children of the poorest income families. Some children of the poorest income families may leave school and start working to compensate themselves and their family. This may make the problem of child labor more serious. Therefore, this problem should be considered carefully in the policies of income maintenance and poverty subsidy implemented by the Vietnam government.

Policy implication:

As a result of this research, we would like to suggest some improvements regardingthe allowance system for dependents of high income Personal Income taxpayers. We would suggest a deduction of about 1.2 million VNDto be applied to high income earners who have one child aged 0-6. High income earners who have one child aged 7-17 should be allowed a deduction of 2.1 million VND rather than the current 1.6 million VND. Similarly, the earners with one child aged 0-6 and one child aged 7-17 should be allowed a deductionof 3.4 million VND. For earners with different number of children, the proposed deductions were presented in columns 4-9 of table 9.

Table 9. Tax deduction for child dependents of taxpayers

(Thousand VND)

	ych=1	och=1	ych=1 och=1	ych=2	och=2	ych=2 och=1	ych=1 och=2	ych=3	och=3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Recommend policy	1235	2136	3371	2470	4271	4605	5505	3704	6404

Source: Author's calculation

Appendix

In our research, we assumed family demography with the presence of children of difference ages took the forms of

$$m_1 = 1 + \gamma_{11} ych + \gamma_{12} och \tag{10}$$

$$m_2 = 1 + \gamma_{21} ych + \gamma_{22} och \tag{11}$$

where m_1, m_2 were called the specific equivalence scales of food and non-food, respectively; ych, och were the number of children 0-6 years old and 7-17 years old, respectively; γ_{11}, γ_{12}, γ_{21} and γ_{22} were the parameters.We utilized the Cobb-Douglas cost function $X_h(u,p) = \beta_h^u \alpha_h^{1-u}$ where the alpha function was assumed to take the form of $\alpha_h(p) = \sum_{i=1}^{n} \alpha_i m_i p_i$ and the beta function took the form of $\beta_h(p) = e^{\beta_0} \prod_{i=1}^{n} (m_i p_i)^{\beta_i}$

Utility function now was of the form as

$$U = \frac{\log X_h - \log \sum_{i=1}^{3} \alpha_i (1 - \gamma_{i1} ych - \gamma_{i2} och) p_i}{\beta_0 - \sum_{i=1}^{3} \beta_i \log p_i - \sum_{i=1}^{3} \beta_i \log(1 - \gamma_{i1} ych + \gamma_{i2} och) - \log \sum_{i=1}^{3} \alpha_i (1 - \gamma_{i1} ych - \gamma_{i2} och) p_i} \tag{12}$$

The budget shares took the form of

$$W_{ih} = \left(\frac{\log X_h - \log \sum_{i=1}^{3} \alpha_i (1 + \gamma_{i1} ych - \gamma_{i2} och) p_i}{\beta_0 - \sum_{i=1}^{3} \beta_i \log p_i - \sum_{i=1}^{3} \beta_i \log(1 - \gamma_{i1} ych - \gamma_{i2} och) - \log \sum_{i=1}^{3} \alpha_i (1 - \gamma_{i1} ych - \gamma_{i2} och) p_i} \right) \times \left(\beta_1 - \frac{\alpha_i (1 - \gamma_{i1} ych - \gamma_{i2} och) p_i}{\sum_{i=1}^{3} \alpha_i (1 - \gamma_{i1} ych + \gamma_{i2} och) p_i} \right) + \frac{\alpha_i (1 - \gamma_{i1} ych - \gamma_{i2} och) p_i}{\sum_{i=1}^{3} \alpha_i (1 + \gamma_{i1} ych - \gamma_{i2} och) p_i} \tag{13}$$

where W_{1h} was the share for food and W_{2h} was the share for non-food. Due to lack of space to present the full formula, we used a summation notation to express alpha and beta functions. In these equations, $i = 1$ corresponded to food; $i = 2$ denoted non-food.Equation (13) and (14) were final equations for estimation. To obtain results shown in table 2, we used STATA package and created our own programming./.

References

1. Barten, A. P. (1964), "*Family composition, prices and expenditure patterns*", Butterworth, London.
2. Blackorby, C. and Donaldson, D. (1993), "*Adult-equivalence scales and the economic implementation of interpersonal comparisons of well-being*", Social Choice and Welfare,Vol. 10(4), pp. 335-361.
3. Browning, M. (1992), "*Children and household economic behavior*", Journal of Economic Literature,Vol. 30,pp. 1434-1475.
4. Deaton, A.and Muellbauer J. (1986), "*On measuring child costs with applications to poor countries*" Journal of Political Economic, Vol. 94(4),pp. 720-744.
5. Deaton A.and Muellbauer J. (1980a), "*Economics and consumer behavior*", Cambridge: Cambridge University Press.
6. Engel E. (1895), "*Die lebenskosten belgischer arbeiter-familien fruher and jetzt*", International Statistical Bulletin,Vol. 9(5),pp. 897-930.
7. Gorman, W. M. (1976), "*Tricks with Utility Functions*", Cambridge: Cambridge University Press.
8. Jorgenson, D.and Slesnick D. (1987), "*Aggregate consumer behaviour and household equivalence scales*", Journal of Business Economic Statistics,Vol. 5(2),pp. 219-232.
9. Lewbel, A. (1989), "*Household equivalence scales and welfare comparisons*", Journal of Public Economics, Vol. 39(3),pp. 377-391.
10. Michelini C. (2000), "*New Zealand consumption equivalence scales from quasi-unit record*", Australian& New Zealand Journal of Statistics,Vol. 42(2), pp. 127-144.
11. Muellbauer, J. (1975a), "*Aggregation, income distribution and consumer demand*" Reviewof Economic Studies,Vol. 42,pp. 525-543.
12. Muellbauer, J. (1977) "*Testing the Barten model of household composition effects and the cost of children*", Economic Journal, Vol. 87,pp. 460-487.

13. Nelson, J. (1988), "*Household economies of scale in consumption: theory and evidence*", Econometrica,Vol. 56(6),pp. 1301-1314.

14. Prais, S. J. (1955), "*The Analysis of Family Budgets*", Cambridge: Cambridge University Press.

15. Ray, R. (1983), "*Measuring the costs of children: an alternative approach*", Journal of Public Economics,Vol. 22(1),pp. 89-102.

16. Rothbarth, E. (1943), "Note on a method of determining equivalent income of families of different composition", Cambridge: Cambridge University Press.

17. Nghiem, T. V. (2011), "The estimation of child costs in Vietnam during the period of 2002-06", MA thesis, Tokyo International University.