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Retail Electricity Subsidy in Vietnam:
Review and Welfare Effect Under Reform

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RETAIL ELECTRICITIY SUBSIDY IN VIETNAM: REVIEW AND WEFFARE EFFECT UNDER REFORM

Truong Phuong Lam Do[1]

Abstract

This paper examines the subsidy in the retail electricity market from two perspectives: cash transfer and quantity–based subsidy. The cash transfer is measured by three dimensions: benefit incidence, beneficiary incidence, and materiality; The quantity-based subsidy is established under the increasing block rate pricing. Overall, both subsidies are not efficient in supporting the poor. To improve the quantity–based subsidy, three proposals, along with the proposal from the company running the market are examined. The welfare effect under these plans is measured by the change in consumer surplus. Findings from this paper show that the reform should let the first blocks reflect the full marginal cost. Moreover, the price structure should be changed in both marginal price and the intervals. To mitigate the reduction in the quantity–based subsidy, the government should improve the cash transfer by reducing the extortion and targeting more efficiently, especially to poor households who live in rented houses.

Keywords: Vietnam retail electricity market, block rate pricing, welfare effect, electricity externalities, demand function, cash transfer, quantity-based subsidy

JEL codes: D12, D63, Q41, Q48

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1. Introduction

Retail electricity in Vietnam is the monopoly market since the state-owned company Vietnam Electricity (EVN) serves the whole market. To prevent EVN from exploiting its market power, the government heavily controls the market. In particular, the tariff is remained unchanged for around 2 years (Lương Bằng, 2020). Moreover, if EVN wishes to change the tariff, he must propose his new plan to the Ministry of Industry and Trade. The authority then considers, modifies (if necessary), and approves the final price structure.

Since the government plays an important role in managing the residential electricity market, the performance of both EVN and the authority gains large attention from the public. From the perspective of EVN and the government, the electricity market in Vietnam is effective as all residents are able to access electricity (World Bank) with the tariff being among the lowest in the world (Global Petrol Prices, 2020). On the other hand, the public believes that EVN and the government do not do enough to provide affordable electricity, especially for the poor.

To understand the performance of EVN and the government in the residential electricity market, this paper investigates the electricity subsidy from two perspectives using the framework proposed by Komives, Foster, Halpern, and Wodon (2005). The first aspect is the direct subsidy by cash transfer from the government to the eligible, and the second one is the indirect subsidy under the current price structure - increasing block rate tariff.

The latter part of this paper studies the welfare effect under different price structures to propose suggestions that improve the equity distribution. Three tariffs are examined, along with the proposal to modify the 2021 tariff from EVN (this plan is suspended due to COVID – 19). The first one is to increase the subsidised quantity. The second plan inherits the same idea as the first one but the threshold in the higher block is also changed so that higher quantity faces higher marginal price. The last proposal removes the subsidy in the first two blocks along with a better marginal price that reflects the external cost of health and the environmental effect from electricity production.

The data in this paper comes from the 2015 Vietnam Household Registration Study (World Bank, 2015), which is the most recent microdata in Vietnam. This survey collected responses in

different topics from a random sample of 5,000 households in five cities in Vietnam (Ha Noi, Ho Chi Minh, Binh Duong, Da Nang, and Dak Nong).

The structure of this paper is shown as follows. Section 2 reviews a framework to examine the performance of the cash subsidy. Section 3 applies the work from section 2 to the context of Vietnam. Section 4 explores the model specification of the electricity demand function in order to measure the welfare effect. Section 5 discusses the estimation results of the demand function. Section 6 measures the welfare effect under four proposals. Section 7 suggests some policy recommendations, related to both the price structure and the subsidy. Section 8 concludes the paper and proposes some topics for further research.

2. The electricity subsidy assessment framework

According to Wodon, Komives, Foster, Abdullah, and Halpern (2006), utility subsidies can be distributed to the community in two types, directly through the cash transfer, or indirectly through the increasing block – rate pricing.

2.1 Cash subsidy for the eligible from the government

A cash subsidy for the poor from the government can be viewed as a form of social assistance since the government guarantee that they are able to access the utility. The performance of this is assessed in three dimensions: benefit incidence, beneficiary incidence, and materiality using the framework of Komives et al. (2005).

2.1.1 Benefit incidence

This dimension examines the performance of the subsidy in targeting poor households as compared to other households and is measured by the targeting performance indicator Ω (shown in formula (1)). If Ω is larger than 1, the subsidy is said to be progressive since the proportion of subsidy the poor receive is larger than the proportion of the poor in the population. If Ω is equal to 1, the subsidy is distributed neutrally.

$$\Omega = \frac{S_P/P}{S_H/H} \quad (1)$$

S_P is the value of subsidy that poor households receive

P is the number of poor households

S_H is the value of subsidy that all households receive

H is the total number of households

2.1.2 Beneficiary incidence

This dimension reflects the effectiveness of the subsidy in reaching the eligible with respect to the ineligible. Two indicators used are the errors of exclusion (the proportion of poor households are excluded from the subsidy), and the percentage of beneficiaries in each income quintile.

2.1.3 Materiality

This dimension evaluates the size of the subsidy relative to the households' income.

2.2 Quantity–based subsidies

Under the increasing block rate pricing, the marginal price of the first blocks is normally lower than the marginal cost, and the marginal price increases as the quantity consumed are in higher blocks. This tariff can be viewed as a form of subsidy if the fundamental assumptions are held, these are, the quantity consumed by poor households falls under the subsidized blocks, and also lower than average or high-income households. The main advantage of this tariff is that it guarantees that all households can access a limited quantity of utility (Komives et al., 2005).

3. The performance of subsidy in Vietnam

3.1 The eligible for the electricity subsidy

The Vietnamese government provides the electricity subsidy as a fixed amount of 50,000 VND each month for registered poor households (EVN, 2016). To be eligible for this subsidy, the members of the household must obtain the permanent residence status in the house they are residing in, and the monthly income of the household is not exceeded 1,100,000 VND (for rural areas) and 1,300,000 VND (for urban areas).

3.2 The performance of the subsidy

The beneficiaries of the subsidy are assessed in three perspectives: poor households (whose households' income is below the poor threshold), poor households recognised as poor (and hence,

are recorded in the authority poor list), and the recognised poor households who received the subsidy. The Households Residence Survey reveals that out of the whole sample, 15.51% of the households were eligible to be on the poor list, however, only 19.62% of them were recognised by the authorities. Of those recognised as poor households, 59.72% received the subsidy. Low rates in both identifying the eligible and distributing the subsidy show the ineffectiveness of the authorities in reaching and targeting the poor in the community.

3.2.1 Benefit incidence

The targeting performance for poor households regardless of their record in the poor list is $\Omega = 3.901$, while this number for recognised households is 1.689. These figures prove that the subsidy distribution in Vietnam is progressive, in which the percentage of subsidy value targets to the poor is larger than the proportion of the poor in the population. Moreover, it shows that under the current subsidy form, the poor receive more than when the subsidy is given to all households in the society.

3.2.2 Beneficiary incidence

The errors of extortion in Vietnam are significantly high, with 87.47% of the total poor households did not receive the subsidy. When considering the recognised poor households only, 40.28% of them did not receive the subsidy. Regarding the distribution across the income quintiles, the first quintile observed the highest proportion of receiving the subsidy, but other quintiles also had beneficiaries, even in the highest quintile (table 1).

Table 1: The subsidy distribution across income quintiles

	1st quintile	2nd quintile	3rd quintile	4th quintile	5th quintile
Distribution	10.47%	2.67%	1.17%	0.77%	0.74%

3.2.3 Materiality

The electricity subsidy, which is equivalent to 50,000 VND, is equal to about 1.27% of the average income of a poor household (which is 3,491,905 VND). The size of the subsidy is extremely small, thus, the support of this for the cost of living for a poor household is insignificant.

In summary, the electricity subsidy in Vietnam is progressive since the share of its value that objects to the poor is higher than the percentage of poor households in the population. However, it does not reach the households in need since the extortion is considerably high, and the value of the subsidy seems not to support the poor's cost of living.

3.3 Quantity–based subsidies

The first two blocks of the tariff are subsidised as their marginal price is lower than the retail electricity price, which equals 1,622.01 VND/kWh (Phan, 2015) (table 2). On average, 46.05% of the poor households enjoyed the subsidy for all their consumption since their quantity used is less than 100 kWh. The structure does not capture more than half of the poor households since their average consumption was 154 kWh per month.

Table 2: The retail electricity tariff in Vietnam

Block rate	Interval (kWh)	Marginal price (1,000 VND/kWh)	To the retail price
1	0 – 50	1.484	91.49%
2	51 – 100	1.533	94.51%
3	101 – 200	1.786	110.11%
4	201 – 300	2.242	138.22%
5	301 – 400	2.503	154.31%
6	401+	2.587	159.49%

Source: Ninh Thuan's Department of Industry and Trade (2015)

4. A review of retail electricity demand function and welfare effect measurement

4.1 The block rate tariff

Block rate tariff charges different marginal prices for different blocks of consumption. Formula (2) demonstrates the marginal price in a block rate tariff structure, which p_j is the marginal price of block j, q_1 is the quantity consumed, and q_{1k} $(1 \leq k \leq n)$ is the thresholds. If $p_1 < p_2 < \cdots < p_n$, it denotes an increasing block rate tariff. In contrast, if $p_1 > p_2 > \cdots > p_n$, the structure is decreasing block rate.

$$p_j = \begin{cases} p_1 \; if \; 0 \leq q_1 \leq q_{11} \\ p_2 \; if \; q_{11} \leq q_1 \leq q_{12} \\ \dots \\ p_n \; if \; q_{n-1} \leq q_1 \leq q_n \end{cases} \quad (2)$$

4.2 Identification in the econometric model for block rate tariff

The retail electricity demand function follows the standard demand model, which P_i is the price, Q_i is the quantity demand, and X_i is the vector of exogenous variables.

$$Q_i = \alpha_1 P_i + \alpha_2 X_i + \varepsilon_{di} \; (3)$$

Equation (3) expresses the impact of the change in price on the quantity demanded, but economic theory also proves that quantity affects the price. This phenomenon is more significant in the block rate tariff structure, where the quantity decides the marginal price. Since price and quantity are jointly determined, the ordinary least square regression will lead to biased and inconsistent estimation.

Two econometric models are usually applied to tackle this issue. The first one is applied specifically for the block rate tariff, which is the discrete/continuous choice with two-error model. This model was first proposed in the paper studying the impact of the tax rate on labour supply (Burtless & Hausman, 1978), and then has been widely used in studying the demand function of the water block rate pricing (Hewitt & Hanemann, 1995), (Rietveld, Rouwendal, & Zwart, 2000). This model assumes the demand function is linear within a block but will be kinked when moving from a block to another.

The second model is the instrument variables with two-stage least square estimation. This model does not separate the specific problem of the block rate tariff from the typical joint determination in the demand function but treats them as the problem of simultaneity, or in other words, the problem of endogeneity, as a whole. In studying the utility demand, this model is usually used in studies about electricity (Halvorsen, 1976), (Taylor, 1975).

4.3 The choice of price in the model

The type of price chosen is one of the earliest questions when studying the block rate tariff (Hewitt & Hanemann, 1995). The answer is mixed among researchers. Early studies used marginal price, but since the work of Taylor (1975) and Nordin (1976) has been published, a variable that

reflects the lump sum transfers in the block rate tariff structure are included, along with the marginal price (Hewitt & Hanemann, 1995).

Although the use of marginal price is popular when studying block rate tariff, the assumption behind this seems not to be realistic since consumers perfectly understand the marginal price when consuming the products. This argument is also proven in the study from Ito (2014) where he showed that consumers seem to respond to neither the marginal price nor the expected marginal price but the average price. Shin (1985) complemented this conclusion by showing that the average price should be derived from the bill, not the average of all the marginal prices that a consumer faces.

4.4 Model specification

A standard residential electricity demand function (equation 4) includes the price of electricity, the household's income, the price for electricity substitutes, and the temperature (Narayan & Smyth, 2005). The expected signs for all the variables except price are positive.

$$lnQ_i = \alpha_0 + \alpha_1 lnY_i + \alpha_2 lnP_i + \alpha_3 lnS_i + \alpha_4 lnTM_i + \varepsilon_i \quad (4)$$

lnQ_i is the natural log of quantity consumed

lnY_i is the natural log of income

lnP_i is the natural log of price

lnS_i is the natural log of substitute energy

$lnTM_i$ is the natural log of weather

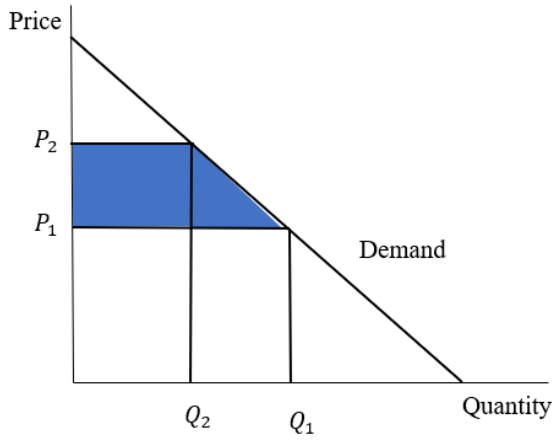
ε_i is the error term, and is assumed to be normally distributed, which is $\varepsilon_i \sim N(0, \sigma^2)$

4.5 Welfare effect measurement

The welfare effect under reform is measured by the change in the consumer surplus. To calculate this, two assumptions are made. Firstly, the demand function is linear. This assumption is appropriate since as shown above, the average price, not the marginal price, is used. Secondly, any change in the threshold is equivalent to the change in price, and thus, the equilibrium moves along the curve but the curve itself remains unchanged. Figure 1 demonstrates the loss in the

consumer surplus (the blue area) when the price increases to P_2 from P_1, which causes the quantity demand to reduce from Q_1 to Q_2. This approach is also used in a paper from BuShehri and Wohlgenant (2012) when they studied the welfare effect in Kuwait under the reform in residential electricity.

Figure 1: The welfare effect under the change in price



5. The residential electricity demand function in Vietnam

5.1 Econometric model identification

The instrument variables/two-stage least square is used to estimate the residential electricity demand function in Vietnam. This model is chosen because it is used in prior papers studying the electricity demand of many countries, including Vietnam (Phu, 2020), (Ha-Duong & Nguyen, 2018).

5.2 Model specification

The regression follows the standard model shown in equation (4) with some modifications:

$$lnQ_i = \alpha_0 + \alpha_1 lnP_i + \alpha_2 lnY_i + \alpha_3 lnS_i + \hbar_i + \eta_i + \varepsilon_i \quad (5)$$

Natural log of price (lnP_i)

The price used is the average price derived from the electricity bill. Although there is only one official residential electricity tariff in Vietnam, the unofficial system still exists. Regarding the official system, it is the increasing block rate pricing. Consumers who pay directly to EVN follow this structure. The second system is the flat price of an average of 2,884 VND (World Bank Group:

Vietnam Academy of Social Sciences, 2016). This later price is slightly higher than the marginal price at the highest block rate and is commonly used when consumers pay the bill to their landlords.

Natural log of quantity (lnQ_i)

The quantity of electricity consumed, unfortunately, was not reported in the survey, so it is derived from the electricity bill instead. Regarding the households who pay the flat price, the quantity is simply the division of the expenditure by the flat price (2,884VND). For households who enjoy the block rate tariff, the quantity is calculated using formula (6), in which Q denotes the quantity consumed, and $P_1, P_2, \dots, P_6$ indicate the marginal price with respect to the block.

$$Monthly\ expenditure = \begin{cases} P_1 Q\ if\ 0 \le Q \le 50 \\ 50P_1 + (Q-50)P_2\ if\ 51 \le Q \le 100 \\ 50P_1 + 50P_2 + (Q-100)P_3\ if\ 101 \le Q \le 200 \\ 50P_1 + 50P_2 + 100P_3 + (Q-200)P_4\ if\ 201 \le Q \le 300 \\ 50P_1 + 50P_2 + 100P_3 + 100P_4 + (Q-300)P_5\ if\ 301 \le Q \le 400 \\ 50P_1 + 50P_2 + 100P_3 + 100P_4 + 100P_5 + (Q-400)P_6\ if\ Q \ge 401 \end{cases} \quad (6)$$

Natural log of income (lnY_i)

The households' income was not reported; however, the components of income were available. Therefore, the households' income is the sum of all the sources of income. There are two main sources: The first source is the monthly salary (if households members work in a company and receive monthly income); The second source is from households' business, house/asset leasing, and agriculture services.

Natural log of price of substitutes (lnS_i)

Two situations that electricity can be substituted, cooking and lighting, are examined. Since the price of substitutes was not available, this paper uses the expenditure for gas and other fuels (oil, wood, coal) as a proximation of the price of substitutes.

Households – related variables ($\hbar_i$)

These variables include households' specific characteristics, including the number of households' members, and the list of dummy variables reflecting appliances using electricity in these households.

Area – related variables (η_i)

The area – related variables include the indicators for areas (urban/rural), and the province in which the house is located. Since the data is from the collected in 5 provinces, the dummy variables for these variables also capture the effect of temperature.

Instrument variables

A good instrument variable must satisfy three conditions. First, it does not have a direct effect on the outcome variables, therefore, it does not appear as an explanatory variable. Secondly, it does not correlate with the error term, or in other words, any unobservable factors that explain the outcome variables. Finally, it must have a correlation with the endogenous variable.

This paper applies the choice instrument variables from Phu (2020), which is specifically defined for Vietnam. These are "the company/person whom the household pays the electricity bill to", and "the residence status". As a requirement of good instrument variables, they should affect the price only. Moreover, they should not associate with the quantity nor correlate with any unobserved factors in the model.

- The person whom the households pay the electricity bill to

As mentioned earlier, households who pay directly to EVN enjoy the block rate tariff, while those who pay to their landlords are more likely to pay the flat price. The Household Registration Survey shows that all the households pay the bill to their landlords pay the flat price.

- Residence status

The Law on Residence of Vietnam states that a residence status of an individual is granted in the property that he or his parents own. The rental property is also accepted in very limited circumstances, and a formal agreement between him and his landlord is required (The Vietnamese National Assembly, 2020). As a result, temporary residents are more likely to live in a rental house, and thus, enjoy the flat price. In contrast, permanent residents live in their own houses and pay the block rate price. From the survey, out of the households who pay the flat price, only 1.86% are permanent residents, the rest are temporary residents.

5.3 Estimation results

The estimation results are shown in table 3. Key variables have expected signs and are statistically significant. Regarding the price, the elasticity of demand is -1.152, which indicates that on average, holding other variables constant, a 1% increase in price will lead to a decrease in the quantity by -1.152%. The absolute value of elasticity higher than 1 shows that the electricity quantity demanded is sensitive to the change in price. Moreover, the demand change with respect to income is inelastic since its elasticity is less than 1.

Standard hypothesis tests in instrument variables/two-stage least square model are examined. The Wu – Hausman test for endogeneity concludes that the model is endogenous. Different tests to examine the strength of the instrument variables are also conducted. The results from the weak instrument test and the instrument validity (the Sargan test) both indicate that at a 5% significance level, both the instrument variables are strong and jointly valid.

Table 3: The estimated results

	Dependent variable
	Natural log of quantity (lnQ_i)
Natural log of price (lnP_i)	-1.152^{***}
	(0.053)
Natural log of income (lnY_i)	0.046^{***}
	(0.053)
Natural log of price of substitutes (lnS_i)	0.043^{***}
	(0.007)
Constant	5.608^{***}
	(0.113)
Households – related variables $(\hbar_i)$	Yes
Area – related variables (η_i)	Yes
Adjusted R^2	0.677

*significant at 10% level; ** significant at 5% level; *** significant at 1% level

6. The change in the welfare effect under four proposals

6.1 An overview of four proposals

Proposal 1

In 2020, EVN proposed a new price structure to the Ministry of Industry and Trade to replace the existing price structure that has been used since 2015. Under the new plan, the number of blocks was reduced to 5 from 6. The marginal price was also higher to reflect the rise in the retail marginal cost. The new marginal cost is 1,864.44 VND/kWh, rising from 1,622.01 VND/kWh in 2015 (Ngọc Linh, 2020). The new price structure is shown in table 4, along with the proportion to the marginal cost as well as the marginal price when inflation is excluded. Under the new structure, only the first block is subsidised. Moreover, if inflation is taken into consideration, the 2020 price, on average, is only 1% higher than the 2015, therefore, it can be viewed as redistributing the welfare but not gaining producer surplus.

Table 4: The tariff under the proposal from EVN

Block rate	Interval (kWh)	Marginal price (1000 VND/kWh)	To the retail price	Marginal price (exclude inflation)
1	0 – 100	1.678	90%	1.474
2	101 – 200	2.014	108%	1.769
3	201 – 400	2.629	141%	2.309
4	401 – 700	2.983	160%	2.620
5	701+	3.132	168%	2.751

Proposal 2

This proposal modifies the interval of the 2015 price structure in order to cover more poor households. On average, a poor household consumes about 154 kWh per month, while this figure for a non – poor household is 200 kWh. The proportion of poor households enjoying the full subsidised block is about 46.05%. If the subsidised block is extended from 100 kWh to 150 kWh, 60.5% of the poor households will be fully covered. This paper chooses the new threshold as 150 kWh instead of 155 kWh since it is more convenient for the public and policymakers to announce,

and the proportion of poor households who are fully subsidised only rises by 0.82%. Table 5 summarises the new structure of the tariff.

Table 5: The tariff under proposal 2

Block rate	Interval (kWh)	Marginal price (1000 VND/kWh)
1	0 – 50	1.484
2	51 – 150	1.533
3	151 – 200	1.786
4	201 – 300	2.242
5	301 – 400	2.503
6	401+	2.587

Proposal 3

Proposal 3 is the extension of proposal 2 in the sense that the interval for block 4 is narrowed to 201 – 250 to cover part of the loss from increasing the subsidised interval. The threshold chosen is 250 since the average electricity usage of a high-income household is 240 kWh.

Table 6: The tariff under proposal 3

Block rate	Interval (kWh)	Marginal price (1000 VND/kWh)
1	0 – 50	1.484
2	51 – 150	1.533
3	151 – 200	1.786
4	201 – 250	2.242
5	251 – 400	2.503
6	401+	2.587

Proposal 4

Proposal 4 sets the marginal price for the first two blocks equal to the marginal cost. The subsidy is removed, however, consumers still receive benefits since they do not pay the markup for their first block consumption. Moreover, this proposal captures the negative externalities

caused by the impact of electricity production on health and the environment, which vary across different sources of electricity. The structure proposed by Biegler (2009) is used with the modification to the 2015 price. Regarding the structure of the production in Vietnam, data from IEA (2021) is used. In summary, the external cost of electricity production in Vietnam is 336 VND/kWh, which brings the marginal cost to 1,958 VND/kWh. Table 7 summarises the new tariff which reflects the change in the subsidy, and the marginal cost. The number of blocks is decreased from 6 to 5.

Table 7: The tariff under proposal 4

Block rate	Interval (kWh)	Marginal price (1000 VND/kWh)
1	0 – 100	1.958
2	101 – 200	2.156
3	201 – 300	2.706
4	301 – 400	3.021
5	401+	3.123

6.2 Calculation the change in the welfare

The methodology is described as followed. Consumers react to the change in the marginal price of the final block of consumption once a new price structure is announced. As a result, their quantity consumed changes and is calculated using the price elasticity of demand. However, when they receive the bill for that month, they make a judgment about the new average price, compare it with the original average price, and then change their quantity based on this price change. This is a final quantity. Since the final average price should be calculated from the bill, the consumption is re-calculated, and the final average price is derived from this.

The consumer surplus is calculated for each household, using the change in the average price and the quantity demanded. The total welfare effect is the sum of the change in the consumer surplus in the corresponding groups.

6.3 Results

Table 8 shows the revenue and the profit change of EVN in four proposals. In general, all proposals reduce the outcomes of EVN, with the greatest loss coming from the last proposal. The plan proposed by EVN also causes the loss.

Table 8: The change in EVN's revenue under four proposals (thousand VND)

	Original tariff	Proposal 1	Proposal 2	Proposal 3	Proposal 4
Revenue	2,063,602	1,866,517	1,909,031	1,904,339	1,303,657
Change in the revenue		-9.55	-7.59	-7.72	-36.83
Profit	587,709	361,018	366877	374903	212,603
Change in the profit		-38.57	-37.58	-36.21	-63.83

Table 9 explores the percentage change in price (considering inflation) of four proposals. In general, all the proposal is good (except proposal 1) as higher quantity consumed faced higher marginal price. In proposal 1, the price structure is not optimal because the decrease for the lower intervals is not significant. Furthermore, the price for the interval (201, 300) falls sharply, even though it is considered as high consumption, and is also above the average usage of a non – poor household (around 200 kWh).

Table 9: The comparison of the price of the four proposals with the original price structure

Block	Original structure	Proposal 1		Proposal 2		Proposal 3		Proposal 4	
		Absolute value	Change in price (%)	Absolute value	Change in price (%)	Absolute value	Change in price (%)	Absolute value	Change in price (%)
0 – 50	1.484	1.474	-0.67	1.484	-	1.484	-	1.958	31.94
51 – 100	1.533	1.474	-6.88	1.533	-	1.533	-	1.958	27.72
101 – 150	1.786	1.769	-0.94	1.533	-14.17	1.533	-14.17	2.156	20.72
151 – 200	1.786	1.769	3.01	1.786	-	1.786	-	2.156	20.70
201 – 250	2.242	2.309	-7.73	2.242	-	2.242	-	2.706	20.70
251 - 300	2.242	2.309	-7.73	2.242	-	2.503	-13.42	3.021	20.72
301 – 400	2.503	2.309	1.29	2.503	-	2.503	-	3.123	20.74
401 – 700	2.587	2.620	6.35	2.587	-	2.587	-	3.123	20.74
701+	2.587	2.751	6.35	2.587	-	2.587	-	3.482	20.74

The welfare effect is shown in table 10. Overall, all the proposals except proposal 4 increase the consumer surplus. The largest increase is from proposal 2, while the smallest increase is from proposal 1. When calculating the welfare effect per household, proposal 1 benefits the low-income households since they receive the most welfare. In the two latter proposals, though the absolute gain is higher than proposal 1, the benefit for poor households is lower than middle income and high–income households. Regarding proposal 4, it leads to a great loss of the consumer surplus with the largest loss coming from the high–income households, then middle–income households.

Table 10: The welfare effect under four proposals

		Proposal 1	Proposal 2	Proposal 3	Proposal 4
Total consumer surplus change		7630	39567	30132	-204,703
	Low	2241	5223	4169	-25,363
	Middle	3217	25133	19599	-129,339
	High	2172	9211	6364	-50,001
Per household					
	Low	4.573	7.116	5.680	-34.554
	Middle	1.062	8.295	6.468	-42.686
	High	2.246	9.525	6.581	-51.707

7. Policy implications

7.1 A tariff reform is necessary

Results from proposal 2 and proposal 3 show that redistribution by changing the intervals only is not beneficial for low–income households, compared with the middle- and high–income households. This phenomenon is explained by the fact that high–income households are likely to use the most electricity, therefore, any quantity–based subsidy will be beneficial to this group the most. Besides, results from proposal 1 reveal that a change in both quantity and price is most preferable to achieve a better equity distribution.

Moreover, when the first blocks are no longer subsidised, the welfare distribution is more equal. As shown in proposal 4, although all households occur the loss, the loss of low–income households is the lowest while the high–income households is the highest.

To summarise, to gain better welfare distribution, the marginal price in the first blocks should reflect the full marginal cost, and both the interval and the marginal price should be modified. Furthermore, the new price structure should consider the elastic price elasticity of electricity demand in Vietnam to avoid the great loss (as shown in proposal 4).

7.2 Cash subsidy to the eligible should be continued

A price structure reform, as shown in the analysis above, removes the subsidised blocks as well as increases the electricity expenditure. Therefore, a cash subsidy for the eligible is necessary. This should be done by improving the efficient target to the poor. From the analysis in the first part, of all the subsidy values, about 20.24% of the amount is leaked to the ineligible. A reduction of the extortion can help redistribute to the eligible and thus, increase the value of subsidy of each eligible receives.

7.3 Poor households who rent houses should receive more support

Poor households who live in rented houses are the most vulnerable groups in society since they are excluded from the support from the increasing block rate. More than that, most of them are temporary residents who normally are not eligible for social assistance. The current flat price that they face is extremely high and even higher than the marginal price of the highest block. To compare, a poor household who pays the flat price uses 54.646 kWh with the expenditure is 173,400 VND, while a poor household living in their permanent registered house consumes 145.974 kWh and pays 277,300 VND. In other words, a poor household living in their house consumes 176.13% more but only pays 59.92% more.

These numbers show that the subsidy should target these households to assure that they are not left behind. Under the current legislation, social assistance is only paid for permanent residents. This problem arises since Vietnam has a heavy fiscal dencentralisation, and the expenditure for the subsidy is paid via the subnational budget. With the recent establishment of the national population database, this problem can be improved by transferring this burden from the subnational budget to the national budget (Do, 2021).

8. Conclusion and further research

This paper reviews the performance of electricity subsidy in Vietnam in two aspects: direct and indirect subsidy. Regarding the direct subsidy (cash transfer), targeting is not good since most of the poor households are ineligible for the subsidy, whilst the extortion is high. Regarding the indirect subsidy (subsidised block under the increasing block rate pricing), the performance is better, but still not highly efficient since under half of the poor population receive the full subsidy.

The later part studies the welfare effect under four proposals aiming to improve the equity distribution. The results show that a price reform is necessary, in which the first block should capture the full marginal cost, including the externalities. Moreover, a modification in both marginal price and intervals' thresholds should be conducted. However, since consumers are relatively sensitive to the change in price, the tariff should be carefully measured to avoid a great loss. Reflecting the lower subsidy in the indirect subsidy, the government should improve the cash subsidy by targeting the eligible more efficiently, especially poor households who live in rental properties.

This paper also put some interesting further topics to explore around the electricity price. Firstly, the optimal marginal price and block interval for the increasing block rate, along with the cash transfer, to support poor households and improve the equality distribution should be studied. Secondly, given that electricity demand is elasticity, the balance of assuring that every household can access the appropriate amount of electricity with a reasonable price structure but not overconsuming is important. To achieve that, operating an electricity market structure can be an option. Besides, other forms of tariff, for example, time–of–use, time–of–day, or real-time pricing can also be taken into consideration.

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