Chapter 5

The Welfare Impacts of Price Equalisation in Energy Market Integration

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September 2014

This chapter should be cited as
Widodo, T. and R. Millanida H. (2014), 'The Welfare Impacts of Price Equalisation in Energy Market Integration', in Han, P. and F. Kimura (eds.), *Energy Market Integration in East Asia: Energy Trade, Cross Border Electricity, and Price Mechanism*, ERIA Research Project Report FY2013, No.29.Jakarta: ERIA, pp.111-133.

CHAPTER 5

The Welfare Impacts of Price Equalisation in Energy Market Integration

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This research analyses the welfare impact of price equalisation in energy product prices in ASEAN. For this analysis, an econometric model and the Compensating and Equivalent Variation under Linear Expenditure System (CV and EV under LES) are applied. This research uses data import value and price of energy products under SITC 3 digits. Some conclusions are drawn. First, the price equalisation process occurs until a certain level of price variation for all energy products is reached as variation coefficients converge monotonically and in oscillatory manner toward a positive steady state in ASEAN. Second, the simulation using the average annual increases of energy prices for 1980-2012 shows that price equalisation will bring positive total welfare (both direct and indirect) impacts of US$77,06 trillion (CV) or US$81,32 trillion (EV) per year for ASEAN.

Keywords: energy products, price equalisation, welfare impact, energy market integration.
JEL Classification: Q04, F3, I3.

Introduction

The first solid effort toward regionalism in the East Asian region was the Association of South East Asian Nation (ASEAN) Free Trade Area (AFTA) launched in 1992 by the ASEAN. The AFTA aims to promote further cooperation in the region's economic growth by accelerating the liberalisation of intra-ASEAN trade and investment after the success of the ASEAN in maintaining international and political stability in the region. For 2015, ASEAN countries are eager to establish a more advanced level of economic integration—the ASEAN Economic Community (AEC)—through the "ASEAN way", which is a little bit different from the theoretical stages of economic integration by Balassa (1961), i.e., Free Trade Area (FTA), Customs Union (CU), Common Market (CM), European Union (EU), and Complete Economic Integration (CEI). With the free movements of skilled labour and capital, the AEC has parallel characteristics with the Common Market (CM) in the theoretical successive stages of economic integration. The issue of rule of origin (ROO) may occur in the AEC since individual members still maintain their own tariffs against non-member countries. Consequently, the flow of production factors (capital and labour), trade diversion, and trade creation could not be optimised in the AEC due to the absence of common external tariffs. However, with the "ASEAN way", the governments of ASEAN member countries still want to realise the AEC in 2015 as scheduled. Energy is needed in supporting distribution, consumption, and production activities in the AEC, thus, the community needs to consider the ASEAN Energy Market Integration (AEMI).

ASEAN is one of the fastest-growing economic regions in the world and has a fast- rising energy demand driven by both economic and demographic growth. The region's economic and population growth had resulted in a consequential increase in final energy consumption. With the assumed gross domestic product (GDP) growth rate of 5.2 percent per annum from 2007 to 2030, the final energy consumption was estimated to increase to 427 million tons of oil equivalent (MTOE) in 2010 and grow to 1,018 MTOE in 2030 at an average annual rate of 4.4 percent (3rd ASEAN Energy Outlook, 2011). This growth is very much higher than the world's average growth rate of 1.4 percent per year in primary energy demand over 2008-2035 (IEA World Energy Outlook, 2010). In view of the high economic growth and need of

energy supply, the challenge to ensure a secure supply of energy is a prevailing concern for the AEC.

This research basically aims to answer two main research questions. *First*, has price equalisation in energy product prices occurred in the ASEAN? Theoretically, under the assumption of perfect competition, regionalism and market integration in ASEAN postulates the existence of energy price equalisation. *Second*, how do the potential welfare impacts of the ASEAN affect energy market integration?

Literature Review

Regional economic cooperation is an essential locomotive for raising the economic development of ASEAN member states, to enable them to utilise efficiently their full economic potential resources. Energy infrastructure is, therefore, a key pillar supporting the participating countries' drive for development through regional cooperation (Chang, *et al*., 2013). Several factors are driving the move toward regional energy cooperation. The uneven distribution of energy resources among member countries, suboptimal level of energy interrelationships, least-cost solutions to energy constraints, and rocketing prices of global energy boost the attractiveness of large hydropower project options (CAREC, 2008).

Theoretical perspective provides a wide picture of the role of energy market integration (EMI) as a building block of regionalism, especially in economic development sector. However, evidence from empirical studies is still limited. Among the few, Bhattacharya and Kojima (2008, 2010) show support with their findings that there are more benefits from EMI than the costs required. The linking of electricity grids can create both economic and environmental benefits. In addition, Park (2000) concludes that free trade agreement, in which energy products included, may bring positive economic impact to member countries within the region. Lee, *et al.* (2009) and Chang, *et al.* (2013) evaluate the potential effects of the AEC on economic welfare, trade flows, and sectoral output of the member states using a dynamic computable general equilibrium (CGE) model and Global Trade Analysis Project (GTAP) model, respectively. The consequence of bearing arm-length characteristics is

near-complement to capital in the short run, but a substitute for capital in the long run. A similar suggestion came from Lee and Plummer (2010).

Sheng and Shi (2011) offer the economic convergence analysis (including both the σ- convergence and β-convergence approaches) to scrutinise the impact of EMI across countries with emphasis on East Asian countries between 1960 and 2008. Results show that in addition to trade, an integrated energy market may help to reduce economic development gaps among countries and accelerate the efforts for the least developing countries' (LDCs) income per capita to catch up. The positive impact of energy trade facilitation may play a more important role for the EU and the North American Free Trade Area (NAFTA) countries than for the East Asian countries. The study also finds that investment and capacity building may help to facilitate the catch-up and promote economic convergence across countries.

In addition to the previous study, Sheng and Shi (2012) observe that countries with relatively higher EMI level have, on average, higher energy consumption per capita than countries with a relatively lower EMI level. This implies that EMI (or its representing institutional arrangement) is an important factor affecting the relationship between energy consumption and income and price. Thus, EMI can help reduce such a pressure by improving the domestic energy supply and reducing the price elasticity. Yu (2011) takes a slightly different design in his study. It aims to build up an index system by using the principal component analysis approach. This paper provides such information by ranking the extent of EMI for 16 East Asian countries, including the ASEAN 10 countries, China, Japan, Korea, India, Australia, and New Zealand. Moreover, in this paper he infers that a further integrated energy market is good for each country. Countries in East Asia area should try every effort to foster their EMI. According to Shi and Kimura (2010), the next steps for further EMI in the region lie in three areas: (1) regional agreements on energy trade and investment, (2) energy infrastructure development and national energy market liberalisation, and (3) energy pricing reform and fossil fuel subsidies. Due to disparities in the level of economic development across countries, each country will have different abilities to participate in each dimension.

Methodology

Energy Products

This research applies the definition of "energy products" based on the Standard International Trade Classification (SITC). Under SITC, products are classified according to (a) the materials used in production, (b) the processing stage, (c) market practice and uses of the products, (d) the importance of the commodities in terms of world trade, and (e) technological changes. SITC is categorised as follows:

- *food, drinks and tobacco* (Sections 0 and 1 - including live animals),
- *raw materials* (Sections 2 and 4),
- ***energy products* (Section 3),**
- *chemicals* (Section 5),
- *machinery and transport equipment* (Section 7), and
- *other manufactured goods* (Sections 6 and 8).

This paper uses the 3-digit SITC Revision 2 and focuses on energy products, i.e., SITC Section 3.

Variation Coefficient and Econometric Model

Since the domestic energy market in ASEAN countries are commonly distorted or intervened by the government as one of the administrated goods. For example, with subsidy, energy prices do not obviously reflect the efficient competitive international market prices. Energy product prices vary among ASEAN countries. This paper uses variation coefficient to see the discrepancy of energy product prices, which is formulated as follows:

$$VC_i = \frac{\sqrt{\sum_{j=1}^{n}(P_{ij}-\bar{P}_i)^2 / (n-1)}}{\bar{P}_i} \qquad (1)$$

Where VC_i is variation coefficient of energy product i prices
P_i is energy product i prices
j is country
$\bar{p}_i$ is average of energy product i prices

The smaller the VC, the less variation exists in energy product prices among ASEAN countries. In contrast, the higher the VC, the more variation exists in energy product prices among ASEAN countries. In an extreme situation, VC equals zero (0); this implies that there are no price differences of energy products among ASEAN countries. To examine the existence of price equalisation, the simple autoregressive (AR[1]) model is applied as a representative of the first order linear autonomous difference equation:

$$VC_{i,t} = \beta_1 + \beta_2 VC_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

By looking at values and magnitude of β_1 and β_2, it is possible to examine whether energy product prices become more equal (less variation) or less equal (more variation) in ASEAN countries.

The long-term equilibrium (steady state) VC_i is formulated as $SS = \frac{\beta_1}{1-\beta_2}$. Therefore, if there is equal price in the long run CV=0, then β_1 must be equal to 0. To investigate the process of price equalisation toward long-run equilibrium (steady state), this can be seen in β_2 (Hoy, *et al.*, 1996):

If $-1 < \beta_2 < 0$, oscillatory converge toward long-run equilibrium (steady state), there is price equalisation.

If $0 < \beta_2 < 1$, monotonically converge toward long-run equilibrium (steady state), there is price equalisation.

If $\beta_2 \leq -1 \; or \; \beta_2 \geq 1$, diverge toward long-run equilibrium (steady state), there is no price equalisation.

This research uses import prices of energy products, which are defined as the value divided by quantity of imported energy products.

Welfare Impact of Price Equalisation in Energy Market Integration

This research will simulate the potential welfare impact of price equalisation in energy due to the AEMI. The welfare impact analysis in this research is mainly derived from the country consumption (import) pattern of energy and other products. Theoretically, a country demand for goods and services is a function of prices and income (by definition of Marshallian demand function). Therefore, some changes in income and prices of goods and services will directly affect the number of goods and services and indirectly affect the welfare (Mas-Colell *et al.*, 1995). It is assumed that country a utility function follows the more general Cobb-Douglas. Stone (1954) made the first attempt to estimate a system equation explicitly by incorporating the budget constraint, namely the Linear Expenditure System (LES). The individual country's preferences defined on *n* goods are characterised by a utility function of the Cobb-Douglas form. Klein and Rubin (1948) formulated the LES as the most general linear formulation in prices and income satisfying the budget constraint, homogeneity, and Slutsky symmetry. Basically, Samuelson (1948) and Geary (1950), derived that the LES represent the utility function, as follows:

$$U(x_1 \ldots\ldots\ldots x_n) = \left(x_1 - x_1^o\right)^{\alpha_1}\left(x_2 - x_2^o\right)^{\alpha_2}\left(x_3 - x_3^o\right)^{\alpha_3} \ldots\ldots\ldots \left(x_n - x_n^o\right)^{\alpha_n}$$

In brief, it can be expressed as:

$$U(x_i) = \prod_{i=1}^{n}\left(x_i - x_i^o\right)^{\alpha_i} \qquad (3)$$

Where:

$\sum_{i=1}^{n}\alpha_i = 1$

$x_i - x_i^o > 0$

$0<\alpha_i<1$

Π is product operator

x_i is consumption of commodity *i*

x_i^o and α_i are the parameters of the utility function

x_i^o is minimum quantity of commodity *i* consumed

$i \in [1,2,3\ldots\ldots\ldots n]$

The individual country problem is to choose x_i that can maximise its utility $U(x_i)$ subject to its budget constraint. Therefore, the optimal choice of x_i is obtained as a solution to the constrained optimisation problem as follows:

$$\text{Max}_{x_i} \quad U(\mathbf{X_i}) = \prod_{i=1}^{n}\left(\mathbf{X_i} - \mathbf{X_i^o}\right)^{\alpha_i} \tag{4}$$

Subject to:

$$\mathbf{PX} \leq M$$

To solve the problem, the Lagrange method can be applied. The Lagrange formula for this problem is:

$$\text{Max}_{x_i} \quad \Omega = U(\mathbf{X_i}) = \prod_{i=1}^{n}\left(\mathbf{X_i} - \mathbf{X_i^o}\right)^{\alpha_i} + \lambda(M - PX) \tag{5}$$

Where: λ is the Lagrange multiplier. It is interpreted as the marginal utility of income showing how much the individual country's utility will increase if the individual country's income *M* is increased by \$1. The Marshallian (uncompensated) demand function for commodity x_i can be found through:

$$\mathbf{X_i} = \mathbf{X_i^o} + \frac{\alpha_i\left(M - \sum_{j=1}^{n} \mathbf{P_j X_j^o}\right)}{\mathbf{P_i}\sum_{i=1}^{n}\alpha_i} \text{ for all i and j} \tag{6}$$

Where: $i \in (1,2,\ldots\ldots.n)$

$j \in (1,2,\ldots\ldots.n)$

A restriction that the sum of parameters α_i equals to one, $\sum_{i=1}^{n}\alpha_i = 1$, is applied thus the equation (7) becomes:

$$\mathbf{X_i} = \mathbf{X_i^o} + \frac{\alpha_i\left(M - \sum_{j=1}^{n} \mathbf{P_j X_j^o}\right)}{\mathbf{P_i}} \text{ for all i and j} \tag{7}$$

Equation (10) can be also reflected as the Linear Expenditure System, thus,

$$\mathbf{P_i X_i} = \mathbf{P_i X_i^o} + \alpha_i\left(M - \sum_{j=1}^{n} \mathbf{P_j X_j^o}\right) \text{ for all i and j} \tag{8}$$

In the context of Linear Expenditure System (LES), the Equivalent Variation (EV) and Compensating Variation (CV) is formulated as follows (Widodo, 2006):

$$EV = \left(\prod_{i=1}^{n} \left(\frac{p_i^o}{p_i'} \right)^{\alpha_i} - 1 \right) M^o - \prod_{i=1}^{n} \left(\frac{p_i^o}{p_i'} \right)^{\alpha_i} \sum_{i=1}^{n} p_i' x_i^o + \sum_{i=1}^{n} p_i^o x_i^o + (M' - M^o) \quad (9)$$

$$CV = \left(1 - \prod_{i=1}^{n} \left(\frac{p_i'}{p_i^o} \right)^{\alpha_i} \right) M^o - \sum_{i=1}^{n} p_i' x_i^o + \prod_{i=1}^{n} \left(\frac{p_i'}{p_i^o} \right)^{\alpha_i} \sum_{i=1}^{n} p_i^o x_i^o + (M' - M^o) \quad (10)$$

for all *i* and *j*

Where: P^o is commodity prices pre-AEMI

P' is commodity prices post-AEMI

p_i^o is commodity *i* prices pre-AEMI

p_i' is commodity *i* prices post-AEMI

U^0 is level of utility (welfare) pre-AEMI

U' is level of utility (welfare) post-AEMI

M^0 is income pre-AEMI

M' is income post-AEMI

The Equivalent Variation (EV) can be defined as the dollar amount that the country would be indifferent to in accepting the changes in energy prices and income (wealth). It is the change in country wealth that would be equivalent to the prices and income change in term of its welfare impact (EV is positive if the prices and income changes would make the country better off). The Compensating Variation (CV) measures the net revenue of the planner who must compensate the country for the food prices and income changes, bringing the country back to its welfare (utility level) (Mas-Colell *et al.*, 1995). In this research, the database UN-COMTRADE is used to derive the coefficients of LES. The minimum energy or other products expenditure *i* is formulated as follows:

$$x_i^o = Min[x_{ij}] \text{ where } j \; \forall \; all \; data \; base \quad (12)$$

while the marginal budget share for energy or other products expenditure *i* is formulated as:

$$\alpha_i = \frac{x_i}{\sum x_i} \quad (13)$$

The welfare impacts of price equalisation in EMI impacts are divided into two: (i) direct impact (solely due to price equalisation in a specific energy price), and (ii) indirect impact (due to price changes of other goods as responses of price equalisation in a specific energy price). To measure the price changes of other goods with respect to price equalisation in a specific energy price, this research applies price elasticity, which is formulated as follows (Elasticity of change ΔP_j with respect to change ΔP_i):

$$\varepsilon_{ij} = \frac{\partial ln P_j}{\partial ln P_i} = f(\propto_i, \propto_j, \Delta P_i) = \frac{\propto_j}{\propto_i} \Delta P_i \qquad (14)$$

The positive elasticity means the increase in a specific energy price leads to increase in the price of other non-energy products or other energy products. In contrast, the negative elasticity means the increase in a specific energy price leads to decrease in price of other non-energy products or other energy products. Chang, *et al.* (2013) simulated only the direct impact of AEMI, but in the research, both direct and indirect impacts of AEMI were considered.

Data

This paper uses data on import value and volume of energy products in 1979-2012 for ASEAN5 countries (Indonesia, Malaysia, Singapore, the Philippines, and Thailand) from the United Nations Commodity Trade Statistics Database (UN Comtrade), published by the United Nations (UN). This research uses the 3-digit SITC Revision 2. The imported products are classified into 10 groups, as follows:

- SITC 322: Coal, lignite and peat
- SITC 323: Briquettes; coke and semi-coke; lignite or peat; retort carbon
- SITC 333: Crude petroleum and oils obtained from bituminous minerals
- SITC 334: Petroleum products, refined
- SITC 335: Residual petroleum products, nes, and related materials
- SITC 341: Gas, natural and manufactured
- SITC 351: Electric current

- SITC 0-2
- SITC 4-8
- SITC 9

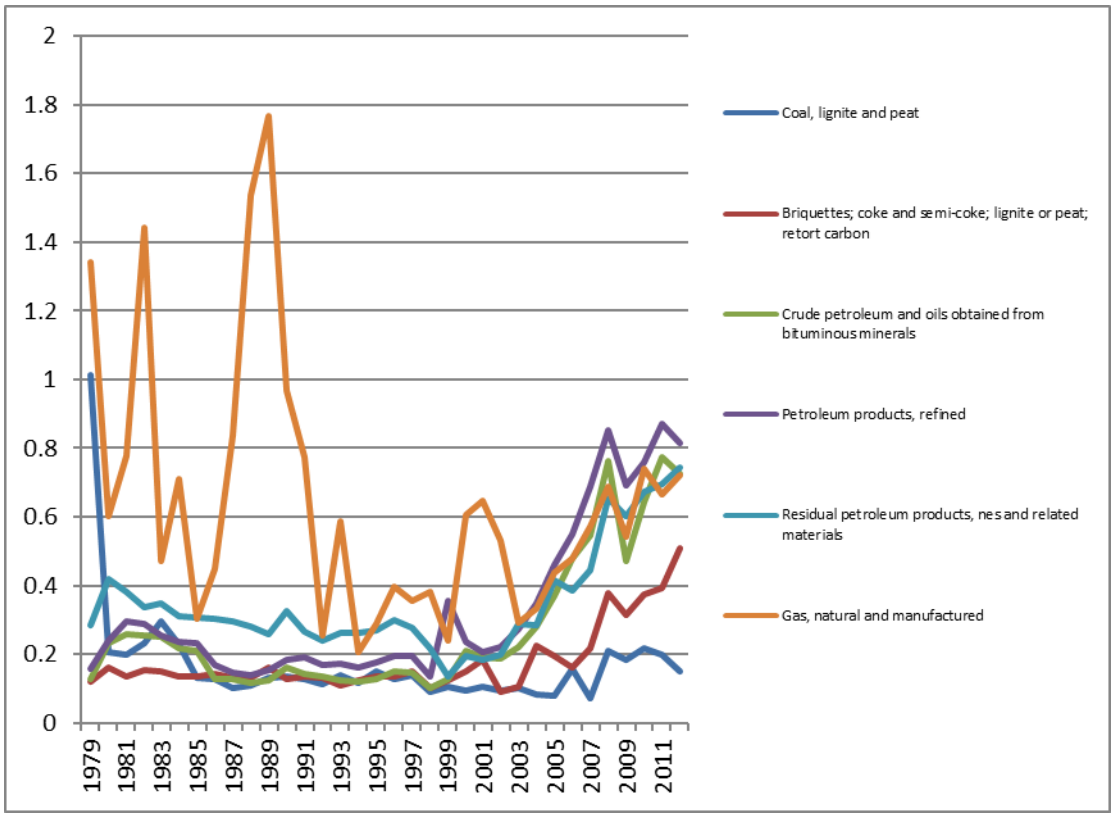
Results

Price Equalisation

Figure 5.1 shows the trend in average import prices of energy products in ASEAN5 for the period 1979-2012. Since the end of 2000s, there were positive trends in average import prices of energy products in ASEAN5. The subsidy policies for energy consumption are commonly implemented not only in developing countries but also in developed countries. There are many forms of energy subsidy, especially electricity subsidy policy, and fuel (kerosene, diesel, and LPG) subsidy policy (IEA *et al.*, 2010). In the Philippines, 94 percent of total subsidies are allocated to the energy subsidy while in Indonesia, it is 58 percent. Similar to Indonesia, Thailand and the Philippines also subsidise their energy sectors, especially oil and electricity. Both of them set the retail domestic oil price and electricity price paid by consumers. Those prices are lower than the world price. The governments of Thailand and the Philippines subsidise the difference between world price and their domestic price.

Figure 5.1. Trend in Average Import Prices of Energy Product in ASEAN5 for 1979-2012 (in US$/kg)

Positive trend in import energy prices



Source: UN Comtrade, and authors' calculation.

Since the domestic energy market in ASEAN countries are distorted, energy prices do not obviously reflect the efficient competitive market price. With subsidy, domestic energy prices have been set below the efficient market. Energy product prices vary among ASEAN countries. This paper uses variation coefficient (VC) to see the discrepancy of energy product prices. The smaller the VC, the less variation exists in energy product prices among ASEAN countries. In contrast, the higher the VC, the more variation exists in energy product prices among ASEAN countries.

Table 5.1: Estimation Results

Price equalisation in energy product occurs until a certain level of price variation is reached in the long-term

No (1)	SITC (2)	Commodity Description (3)	Constant β_1 (4)	Coefficient β_2 (5)	Conclusion (Hypothesis: $\beta_1=0$ and $\lvert\beta_2\rvert\geq 1$) (6)	Conclusion (7)
1	322	Coal, lignite and peat	0.57***	0.50***	Converge monotonically toward positive steady state of variation coefficient	Price equalisation occurs until a certain level of price variation is reached
2	323	Briquettes; coke and semi-coke; lignite or peat; retort carbon	0.23***	0.42**	Converge monotonically toward positive steady state of variation coefficient	Price equalisation occurs until a certain level of price variation is reached
3	333	Crude petroleum and oils obtained from bituminous minerals	0.07***	0.22	Converge monotonically toward positive steady state of variation coefficient	Price equalisation occurs until a certain level of price variation is reached
4	334	Petroleum products, refined	0.28***	-0.15	Converge oscillatory toward positive steady state of variation coefficient	Price equalisation occurs until a certain level of price variation is reached
5	335	Residual petroleum products, nes and related materials	0.24***	0.41**	Converge monotonically toward positive steady state of variation coefficient	Price equalisation occurs with certain level of price variation
6	341	Gas, natural and manufactured	0.50***	0.40**	Converge monotonically toward positive steady state of variation coefficient	Price equalisation occurs with certain level of price variation

Note: SITC = Standard International Trade Classification.
*, **, and *** denote significance at 10%, 5%, and 1% level of significance, respectively.
Source: UN Comtrade, and authors' calculation.

Table 5.1 shows the estimation results of the econometric AR model that is applied to examine the long-term (steady state) of VC and the process of price equalisation. Column (4) and Column (5) confirm that the constants (β_1) statistically differ from zero and the relative values of the coefficient (β_2) are less than 1. The variation coefficients converge monotonically and oscillatory toward positive steady state. This implies that the price equalisation process occurs until a certain level of price variation for all energy products is reached.

Simulation of Welfare Impact

The EMI in the ASEAN will potentially lead to an increase in the domestic energy product prices in the member countries as shown in the following arguments. *First*, the existing domestic energy product markets in ASEAN are distorted by subsidies and other government interventions. With the subsidies, domestic energy product prices are relatively low. Subsidies are defined as any government intervention that lowers the cost of energy production, raises the revenue of energy producers, or lowers the price paid by energy consumers. These are socially acceptable if these subsidies could advance social welfare and job creation, and encourage the development of new sources of energy that will enhance energy security. However, excessive energy subsidies in many countries, like Indonesia, have to compete for limited resources that could otherwise be used to deliver other essential services, widen the scope for rent seeking and commercial malpractice, discourage both supply-side and demand-side efficiency improvement, promote noneconomic consumption of energy, and can make new forms of renewable energy uncompetitive (IEA, OECD, OPEC, and The World Bank, 2010). Table 5.2 shows the presence of energy subsidy in some ASEAN countries. In the Philippines, 94 percent of total subsidies are allocated to the energy subsidy while in Indonesia, such allocation is 58 percent.

Table 5.2. Subsidies on Electricity, LPG, and Kerosene in Some ASEAN Countries

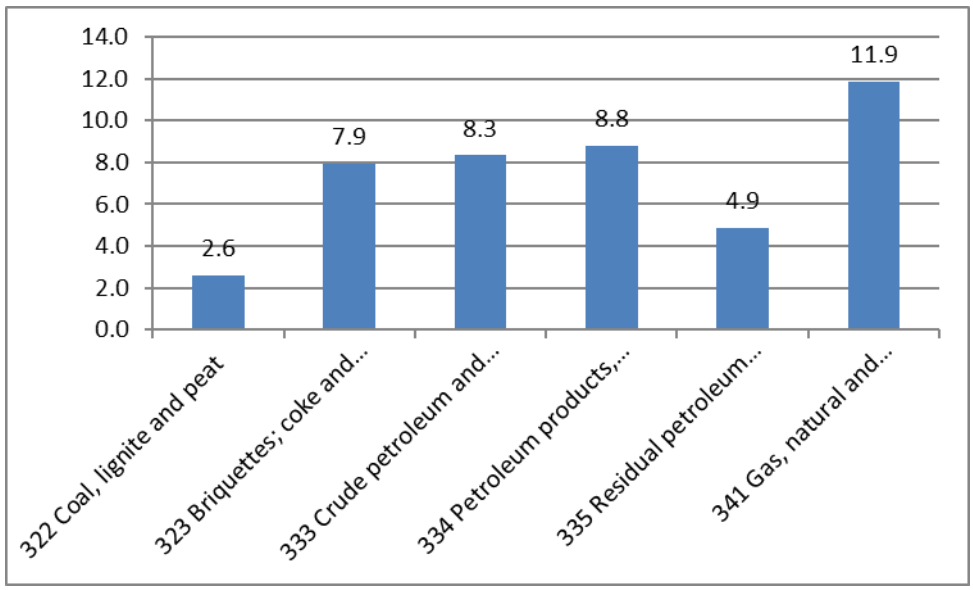
Goverments apply energy subsidies

Country	Presence of Subsidies			Electricity, LPG, & kerosene subsidies as a share in total subsidies (%)
	Electricity	LPG	Kerosene	
Indonesia	Yes	Yes	Yes	58
Philippines	No	Yes	No	94
Thailand	Yes	Yes	No	47
Viet Nam	Yes	No	No	39

Note: LPG = liquefied p

Sources: IEA (2010)

Figure 5.2. Average Annual Increase in Energy Product Prices for 1980-2012 (in %)



Source: UN Comtrade, and authors' calculation.

Second, the EMI would bring efficiency in resources allocation across the region, which in turn would lead to equalising the energy product market prices. Depending on the situation, it could lead to energy price increase in certain countries but decrease in the other countries. Most probably, all countries would experience increases in energy product prices differently. Figure 5.2 shows the average annual increase in energy product prices for 1980-2012. Gas recorded the highest annual increase, followed by petroleum and crude petroleum. Meanwhile, coal had the lowest annual increase.

Therefore, this research will use these figures to simulate the impact of price equalisation in EMI, i.e., energy price increases.

Table 5.3. Direct and Indirect Welfare Impact of Energy Product Increase in ASEAN5 (in US$/Year)

Measurement (1)	Coal, lignite and peat (2)	Briquettes; coke and semi-coke; lignite or peat; retort carbon (3)	Crude petroleum and oils obtained from bituminous minerals (4)	Petroleum products, refined (5)	Residual petroleum products, nes and related materials (6)	Gas, natural and manufactured (7)	Total increase in energy prices (8)
1. Direct Impact							
Compensating Variation	-55,933,359	-63,730,069	-11,182,685,413	-9,988,645,279	-117,183,840	-602,876,151	-22,068,387,330
Equivalent Variation	-55,930,664	-63,726,576	-11,121,207,424	-9,916,504,910	-117,172,649	-602,566,714	-21,773,051,304
2. Indirect Impact							
Compensating Variation	37,132,198,005	-10,059,582,396	-7,750,762,203	-6,357,719,212	-101,269,997,930	187,416,458,430	99,133,487,115
Equivalent Variation	38,123,844,357	-9,988,225,451	-7,522,478,059	-6,250,262,273	-94,531,521,626	215,654,843,725	103,098,426,091
3. Total Impact							
Compensating Variation	37,076,264,646	-10,123,312,465	-18,933,447,616	-16,346,364,491	-101,387,181,770	186,813,582,279	77,065,099,785
Equivalent Variation	38,067,913,693	-10,051,952,027	-18,643,685,482	-16,166,767,183	-94,648,694,276	215,052,277,011	81,325,374,787

Notes:

Column 2: Scenario increase in price of SITC 322—Coal, lignite and peat 2.6%
Column 3: Scenario increase in price of SITC 323—Briquettes; coke and semi-coke; lignite or peat; retort carbon 7.9%
Column 4: Scenario increase in price of SITC 333—Crude petroleum and oils obtained from bituminous minerals 8.3%
Column 5: Scenario increase in price of SITC 334—Petroleum products, refined 8.8%
Column 6: Scenario increase in price of SITC 335—Residual petroleum products, nes and related materials 4.9%
Column 7: Scenario increase in price of SITC 341—Gas, natural and manufactured 11.9%
Column 8: Scenario increase in all energy product simultaneously

Source: UN Comtrade, and authors' calculation.

Theoretically, the impacts are divided into two direct impacts (solely due to the decrease of certain energy price) and indirect impact (through the other price channels, using cross price elasticity). Table 5.3 shows that price equalisations (increases) in SITC 322 (Coal, lignite and peat) and SITC 341 (Gas, natural and manufactured) will bring positive welfare impact to the ASEAN5. In contrast, price equalisations (increases) in SITC 323 (Briquettes; coke and semi-coke; lignite or peat; retort carbon); SITC 333 (Crude petroleum and oils obtained from bituminous minerals); SITC 334 (Petroleum products, refined); and SITC 335 (Residual petroleum products, nes and related materials) will cause negative welfare impact. The simulation using the average annual increase of energy prices for 1980-2012, will bring positive total welfare (both direct and indirect) impacts of US$77,065,099,785 (CV) or US$81,325,374,787 (EV) per year. Although the price (increase) equalisation will certainly bring direct negative welfare impact, it also will give bigger indirect welfare impact. Energy products SITC 322, which are coal, lignite and peat; and SITC 341 comprising gas, natural and manufactured contribute to positive total welfare impact of price equalisation (increase) in ASEAN5.

Conclusions and Policy Implications

Theoretically, EMI would bring efficiency in resources allocation across the region, and eventually lead to equalising the energy product market prices. Depending on the situation, it could result in energy price increase in certain countries but price decrease in other countries. Most probably, countries will experience increases in energy product prices differently. This research finds that price equalisation process occurs until a certain level of price variation for all energy products is reached as variation coefficients converge monotonically and oscillatory toward a positive steady state. A coordinated and gradual subsidy reduction in energy is, therefore, more preferable to abrupt (big-bang) subsidy reduction. To bind the commitments of individual ASEAN member countries in reducing energy subsidy, the “Common Effective Preferential Energy Subsidy Reduction” (CEPESR) is required. This is like the Common Effective Preferential Tariff in ASEAN Free Trade Area (CEPT-AFTA). The CEPESR consists of the commitments of each individual member in reducing energy subsidy with preferred rate and period.

The simulation using the average annual increase of energy prices for 1980-2012 showed results that will bring positive total welfare (both direct and indirect) impacts of US$77,065,099,785 (CV) or US$81,325,374,787 (EV) per year. Although the price (increase) equalisation will certainly bring direct negative welfare impact, it will also result in bigger indirect welfare impact. Energy products SITC 322 (coal, lignite and peat) and SITC 341 (gas, natural and manufactured) will contribute to positive total welfare impact of price equalisation (increase) in ASEAN5. If among energy products to be integrated in ASEAN the first priority is given to SITC 322 (Coal, lignite and peat) and SITC 341 (Gas, natural and manufactured), which will contribute to potential positive welfare impacts to the ASEAN society, then the "ASEAN Coal and Gas Community" has to be considered in AEC. In fact, the EU, which is the predecessor of economic integration, established the European Coal and Steel Community (or the Treaty of Paris of 1951) before it created the European Economic Community (EEC) and the European Atomic Energy Community (Eurotom) (or the Treaty of Rome of 1957).

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