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Regimes for Taxing Goods and Services in a Non-Uniformity Setting: Policy Implications for the ASEAN Economic Community

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Abstract

Since its inception in 2015, the ASEAN Economic Community (AEC) has reduced intra-regional barriers and opened a wide range of opportunities. However, the issue of taxation remains lagged behind and great differences in taxation yield complexity within the region. Member states differentiate their corporate tax rates to attract investment, repeatedly eroding tax revenue. Consequently, the state revenue needs to rely more on indirect taxes, such as the value added tax (VAT) or the goods and services tax (GST). As an extension to the previous literature, this paper presents models in which tax rates are non-uniform within and across countries, representing the AEC. The model and simulations yield new theoretical insights under the non-uniformity setting, illustrating that switching from destination to origin regime can lead to plausible welfare gains when the values of demand elasticity of the goods in the member countries are close to identical.

Keywords: Tax Regimes, Goods and Services Tax, AEC, Customs Union

1. Introduction

The Association of Southeast Asian Nations (ASEAN) was established in 1967 in Bangkok, Thailand, with five founding members: Indonesia, Malaysia, Philippines, Singapore and Thailand; known as the ASEAN-5. At a later stage, more countries within the region, namely Brunei Darussalam, Vietnam, Lao People's Democratic Republic (Lao PDR), Myanmar and Cambodia, joined, forming the present-day-10-member ASEAN. At the end of 2015, the ASEAN Economic Community (AEC) was officially established, further integrating the regional economies. One of the major aims of the AEC envisions a single market and production base, thereby, dismantling tariffs and other intra-regional barriers to movement of goods and services, capital and investment. This opened a wide range of opportunities in the region. Despite the progress of the integration, the issue of taxation remains lagged behind. The great differences of the tax structure in the 10 member states yield much complexity within the region. Amidst the variations in other types of taxes, member states differentiate their corporate tax rates to attract investment, eroding tax revenue. Consequently, the state revenue needs to rely more on indirect taxes, such as the value added tax (VAT) or the goods and services tax (GST). This inspires the objectives of the paper to construct a model in which tax rates on goods and services are non-uniform within and across countries, representing the case of member states in the AEC. The model and its simulations aim at investigating the theoretical welfare effects when there is a regime switch from destination to origin tax. The results indicates some important policy directions and implications for the future consideration of tax harmonisation in AEC.

The paper is organised as follows. Section 2 sets the definition for the terminology in this paper. Section 3 briefly reviews the relevant literature. Consequently, Section 4 introduces a two-country, two-good model of non-uniform commodity tax structure within and across countries. The model, facilitated by a sample case presented in the form of simulations, exemplifies the previous findings under tax uniformity and yields new results under tax non-uniformity. Section 5 summarises and concludes.

2. Definitions

Throughout the literature of taxation on goods and services in an open economy, a wide range of terminology has been employed equivocally and interchangeably. Hence, by specifying a clear definition of the terms discussed in the following sections at the start may avert from possible ambiguities. To begin with, the term *border tax* refers to a tax imposed when goods cross an international frontier. The border tax is inimical to the desirable international trade governed by the principle of comparative advantage. A *border tax adjustment* is a measure that adjusts the tax imposed on a producer. This may involve an addition to or a subtraction from the taxes that the producer has already paid. The measure is imposed so as to counter the adverse effects on trade caused by border taxes and maintain a competitive environment.

The term *tax regime* in this context refers to a method or system of how a border tax adjustment should operate. The general rule, basis or foundation guiding the tax regime is termed as the *tax principle.* Thence, in practice, the authority chooses a tax regime to be regulated when goods cross an international border. A particular tax regime functions accordingly to the groundwork of its own underlying tax principle. This paper, therefore, utilises the term tax principle in theoretical discussions and tax regime in policy choice considerations.

There are two major tax principles underlying the tax regimes. The first, being assigned under the General Agreement on Trade and Tariffs (GATT) rules, is the *destination principle.* Under the destination principle, goods are taxed at the rate of the country in which the final consumption takes place. Domestically produced goods to be exported enjoy a tax rebate whilst imports are subject to full domestic taxation. A system of border tax adjustment following the groundwork of the destination tax principle is called the *destination regime*. The second major tax principle is the *origin principle*. Under the origin principle, domestic production of goods, whether exported or not, are taxed. Therefore, if border tax adjustment is defined by a parameter b, then $b = 1$ in destination principle and $b = 0$ in origin principle. When the origin tax principle is pursued, the regulated system of border tax adjustment is called the *origin regime*. A system, introduced by Shibata (1967), in which both the destination and origin principles are employed as the bases is called

the "mixed" or *restricted-origin regime*. Under such regime, origin principle is practised amongst member countries in the customs union and destination principle is followed in the trade with non-member countries.

As commonly regarded, *producer price* refers to a pre-tax price, which covers the costs upon the production of good. A *consumer price* denotes a price after tax. Tables 1 and 2 illustrate the formulations of consumer prices in destination and origin regimes, respectively. The illustration is based on similar assumptions as in Section 4 that there are two countries and two goods in the economy. Country A produces good 1 and country B produces good 2; t_{Aj} and t_{Bj}, and w_A and w_B denote the tax rates and wage rates in countries A and B, respectively.

Table 1: Consumer Prices in Destination Regime

	Good 1	Good 2
Country A	$(1+t_{A1})w_A$	$(1+t_{A2})w_B$
Country B	$(1+t_{B1})w_A$	$(1+t_{B2})w_B$

Table 2: Consumer Prices in Origin Regime

	Good 1	Good 2
Country A	$(1+t_{A1})w_A$	$(1+t_{B2})w_B$
Country B	$(1+t_{A1})w_A$	$(1+t_{B2})w_B$

Further terminology that requires an accurate definition is the term *uniformity* of the structure of tax rates. A uniform tax structure can be referred to that which exists *within* a country and/or *across* countries. When there is *tax uniformity within a country*, there is a single tax rate for all goods in that country. Nevertheless, it becomes more complicated when defining tax uniformity across countries since there can be various degrees of uniformity. The paper defines tax uniformity across countries in three classifications.

First, a *universally uniform tax structure across countries* refers to a situation in which the whole world is like one country having a uniform tax structure within a country. That is, all goods are taxed at the same rate in all countries. Second, a *selectively uniform tax structure across countries* exists when identical goods are taxed at the same nominal tax rate in all countries. Third, a *relatively uniform tax structure across countries* is defined as a tax structure in which the ratio of nominal tax rate of one good to that of other goods is equivalent in all countries. In such a tax structure, the nominal tax rates of identical goods, therefore, need not be the same as long as their relative rates are equivalent. It is to be noted that the definition of a universally uniform tax structure across countries incorporates those of the other two types. Thus, a universally uniform tax structure across countries, which is most unlikely to be the case in the real world, is also a selectively and relatively uniform tax structure. Table 3 shows the tax rates in the different tax structures according to the above explanations.

Table 3: Tax rates in different forms of uniform tax structures

Tax Structure	Tax rates
Uniform tax structure within Country	$t_{A1} = t_{A2}$, $t_{B1} = t_{B2}$
Universally uniform tax structure across countries	$t_{A1} = t_{A2} = t_{B1} = t_{B2}$
Selectively uniform tax structure across countries	$t_{A1} = t_{B1}$, $t_{A2} = t_{B2}$
Relatively uniform tax structure across countries	$t_{A1} / t_{A2} = t_{B1} / t_{B2}$; $t_{A1} / t_{B1} = t_{A2} / t_{B2}$

The next terminology to be mentioned in this Section is the term *distortion*. Distortion can be present in closed and open economy. In a closed economy, without lump-sum instruments, commodity taxation may lead to some welfare loss. The difference between producer price and consumer price causes an inequality of the marginal rates of substitution and the marginal rate of transformation. This situation constitutes what is called a *distortion within a country*.

Generally, in an open economy, under free trade and uniform tax rates across commodities in each country, there are possibilities that *distortions across countries* may exist in any tax regime. Hence, the alternative of choosing tax regime may be synonymous to the choice of having consumption or production distortion. In the destination principle, consumer prices are equalised within a country, although not necessarily across countries. Producer prices, on the other hand, are equalised across countries. From Table 1, if good 2 is identical to good 1 for simplicity, then, $w_A = w_B$ under free trade when there is a fixed supply of labour. Since $t_{A1} = t_{A2}$, $t_{B1} = t_{B2}$; hence, $q_{A1} = q_{A2}$, $q_{B1} = q_{B2}$ but not necessarily that $q_{A1} = q_{A2} = q_{B1} = q_{B2}$. There is efficiency in global production under this principle because producers are equating this price to the marginal rate of transformation between any two tradable goods. On the consumption side, within a country, consumers are indifferent to buy domestic or imported goods. However, *consumption distortion across countries* can exist as reasoned above.

Under the origin regime, taxes are levied by a country on all goods and services produced within its borders, irrespective of their final destination. Therefore, exports are taxed and imports are exempted. Free trade ensures that under the origin regime, producers are indifferent towards producing for home or foreign market. Referring to Table 2, free trade implies equality in consumer prices across countries, since consumers are maximising utility by equating the relative consumer price between any two tradable goods to the marginal rate of substitution between them. Still assuming for simplicity that good 1 and good 2 are identical, $q_{A1} = q_{A2} = q_{B1} = q_{B2}$. Hence, the marginal rates of substitution are equated across countries. However, if tax rates differ across countries, then, $w_A \neq w_B$ in order to keep $q_{A1} = q_{A2} = q_{B1} = q_{B2}$, which leads to production inefficiency. World production inefficiency arises because factor costs are not equalised across countries, and so the marginal rates of transformation are not equated. Production distortion across countries, then, arises.

To this end, theoretical findings such as Keen (1987, 1989, 1993) and Sinn (1990) suggest that tax uniformity across countries may eliminate trade distortions to a certain degree. There are several mechanisms leading to tax uniformity. *Tax harmonisation* is referred to a process worked out via formal

agreements so as to equalise tax rates across member countries. Uniformity can also be achieved through *tax competition*, which is a process led by market mechanisms. In tax competition, Nash equilibrium is reached as countries independently and strategically maximise their welfare functions. Alternatively, *tax co-ordination* occurs when countries jointly maximise their common welfare function and achieve co-operative outcome in which tax rates need not be uniform if countries differ in their preferences.

3. Relevant Literature

Recalling the integration experience of the present-day European Union, as early as in 1985, when the Single Market programme was launched, the zero-rating exports were abolished. Without physical border control, under a destination system, importers reclaim the tax paid to the exporting country and pay the tax required in home country. As long as tax rate differentials exist across countries, a redistribution mechanism across jurisdictions is compulsory. Thus, some form of clearing-house arrangement was introduced and suggested in academic papers such as that of Keen and Smith (1996). If trades occur only amongst firms, a less complicated system would suffice. In reality, however, this is not the case as consumers travel and perform cross-border shopping activities. It is believed, though, that free movement reduces the sustainability of tax and duty rates differentials. In July 1996, a new VAT system was proposed along with a new procedure, SLIM (Simpler legislation for the internal market) to simplify administrative processes.

Throughout the literature of taxation in the customs union, the issue has been presented in two broad aspects. The first is the policy aspect involving analyses of tax competition (Mintz & Tulkens, 1986; de Crombrugghe & Tulkens, 1990, Sinn, 1990; Kanbur & Keen, 1993, Lockwood, 1993; Trandel, 1994, Haufler, 1998), tax harmonisation (Symons and Walkers, 1989; Keen, 1989; Guesnerie, 1977; Diewert, 1978; Feldstein, 1976; Hatta, 1986; Weymark, 1979; Cnossen & Shoup, 1987; Delipalla, 1997; Haufler, 1996; Keen, 1993; Keen & Lahiri, 1993; Lockwood, 1995, 1997; and Sinn, 1990). It is shown that a switch from the destination to origin regime causes no real effects under certain conditions (Lockwood, de Meza & Myles, 1994). The necessary conditions for the equivalence are that exchange rate be flexible and there be

uniform taxation of goods and services within countries. The benefit from this is that the customs union can abolish border controls without the need for tax harmonisation or incurring costs of increased cross-border shopping. The possibility for arbitrage which leads to trade deflection is avoided. Moreover, the revenue that member countries gain by taxing exports to the rest of the customs union is exactly offset, given the overall trade balance, by a revenue loss from not taxing its imports from the rest of the world. Nevertheless, as viewed by policymakers, this may present some drawbacks in the sense that, for example, AEC exports are taxed twice (AEC and the non-AEC importing country). Genser (1996) suggests that theoretical equivalence would still hold if such scheme is combined with export subsidies and import taxes, at an identical rate, at the custom union's border.

The second aspect comprises a more theoretical approach towards equity and efficiency. This is concerned with effects of welfare, resource reallocation and trade distortion under the two major tax principles, namely, destination and origin principles. The major existing literature includes European Coal and Steel Community (1953), Whalley (1979), Grossman (1980), Berglas (1981), Lockwood (1993), Lockwood, de Meza & Myles (1994, 1995), de Crombrugghe & Tulkens (1990), Kanbur & Keen (1993) and Mintz & Tulkens (1986). This paper's core analysis focuses on the second aspect.

It can be observed that a majority of policy discussion aims at achieving a uniform tax rate across countries by certain proposed measures. Despite some reservations made on the imposition of such tax structure, it is undeniable that tax uniformity across countries is treated as an important requirement for the desired integration of the member states with the existing economic settings. The presumption is evident as uniformity is one of the four principle objectives[1] announced by the European Commission accompanying its new tax system proposal in 1996 (European Commission, 2000b). The practicality of such a presumption is questionable as goods in the real world are non-homogenous and are taxed differently according to each individual country's preference. The presumption is perhaps the consequence of the nature of research

[1] The other principle objectives were simplification, modernisation and application.

methodology in the available literature. Established results show that, with tax rate uniformity across goods within a country and/or across countries, the destination and origin principles yield, or can be made to yield, equivalence results. However, in reality, tax rates differ across goods in a country as well as across member countries in AEC. For example, VAT ranges from 0% in Brunei to 7% in Singapore and Thailand, and 12% in the Philippines. Hence, an analysis under a more realistic setting under a non-uniform tax structure, which has not been adequately studied, is called for.

4. The Model

It has generally been accepted that destination and origin tax principles yield, or can be adjusted to yield, equivalent results in various settings when taxes are uniform across goods in a country. The equivalence results include such considerations as the relative prices, allocation of resources, terms of trade and changes in welfare levels. As an extension to the previous studies, a model is constructed to analyse the mechanisms of a change in tax regime when taxes are non-uniform across goods within each country. Non-uniform tax structures have not been adequately studied due to the difficulty in conducting an analysis when equivalence caused by a uniform tax rate is removed. When taxes are non-uniform, which is the actual case in the real world, the choice of principle does make a difference. Therefore, an investigation of the previous equivalence outcomes under tax non-uniformity shows more relevance in practice.

One possible rationale for tax non-uniformity is that a public authority of one country may discriminate against a certain good that is perceived to deteriorate the overall well-being of the population. As a result, the authority imposes a discriminatory higher tax rate on such a good as opposed to the country's general tax structure. The justification for tax rate setting is subjective and varies from one country to another. Therefore, if such a good is not similarly viewed the same way in another country, it may be taxed according to the general tax structure as per normal. In that case, the tax on the good in the first country becomes relatively higher than in the latter. Under the destination regime, the consumer behavioural pattern may indicate a rise in cross-border shopping as long as the cost of travelling does not exceed the

difference in tax payments. On the other hand, provided there are no constraints, there may be a reallocation of resources on the production side, which encourages movement of resources in the origin regime as it can be sold more cheaply in the lower tax country.

A model of a tax regime switch in an economy with non-uniform tax structure within each country is presented in this section. Sub-section 4.1 portrays the theoretical framework of the destination and origin tax regimes. The symmetric simulation of switching from the destination to the origin regimes is performed in sub-sections 4.2.

4.1 Theoretical Framework of Destination and Origin Tax Regimes

The study begins with the analysis of the destination regime and then goes on to compare its outcome with that resulting from a switch to the origin regime. The setting is built on a simple two-country, two-good economy, in which all goods produced are consumed. A small-country assumption is employed such that wage rate is equal to that of the world. Country A produces good 1, exports good 1 and imports good 2; whereas country B produces good 2, exports good 2 and imports good 1. The tax rates are calculated in the theoretical framework using the inverse elasticity rule. Hence, in this model, non-uniformity of the tax structure exists because of consumers' evaluations. Alternatively, it can be interpreted using utilities as social welfare. Each good is valued differently by the public authority in each country. If the set of criteria in the decision-making on tax rates is based on how goods are valued by the public authority, then a non-uniform tax structure would result in this setting.

The individual utility function of each country is expressed in (1).

$$U^i = \sum x_{ij}^{\,g_{ij}} - \frac{L_i}{K} \tag{1}$$

where i identifies the country (A, B), j represents the good (1, 2), x_{ij} represents the demand for good j in country i, g_{ij} determines the degree of inelasticity of demand x_{ij}, L_i (labour) represents the fixed labour capacity in country i and K is a constant. It is to be noted that the higher the value of g_{ij}, the lower is the optimal tax rate for destination regime as the nature of the tax in this regime is similar to a tax on consumption. It is assumed that labour is

the only factor of production in both countries and is taxed at zero-percent rate. The budget constraint imposed is that of (2).

$$w_i L_i = \sum \tilde{q}_{ij} x_{ij} \tag{2}$$

where w_i is the wage rate in country i and $\tilde{q}_{ij}$ is the consumer price for good j in country i. That is, $\tilde{q}_{ij} = w_i(1+t_{ij})$ for the destination regime where t_{ij} is the tax rate for good j in country i since it is assumed that the country is small, the wage rate adjusts to be equal to that of the world. The consumer in each country chooses their demand to maximise the unconstrained utility function in (3).

$$U^i = {x_{i1}}^{gi1} + {x_{i2}}^{gi2} - \frac{\tilde{q}_{i1}}{w_i K_i} x_{i1} - \frac{\tilde{q}_{i2}}{w_i K_i} x_{i2} \tag{3}$$

Maximising the utility function, U^i, in (3), the optimal demand for good x_{ij} can be obtained in (4).

$$x_{ij} = \left(\frac{K_i w_i g_{ij}}{\tilde{q}_{ij}} \right)^{\frac{1}{1-g_{ij}}}. \tag{4}$$

An indirect utility function, V^i , can be derived by substituting the optimal x_{ij} from (4) into the original utility function in (3). Thus, (5) is obtained.

$$V^i = \left(\frac{K_i g_{i1}}{\tilde{q}_{i1}} \right)^{\frac{g_{i1}}{1-g_{i1}}} + \left(\frac{K_i w g_{i2}}{\tilde{q}_{i2}} \right)^{\frac{g_{i2}}{1-g_{i2}}}$$

$$- \frac{\tilde{q}_{i1}}{K_i} \left(\frac{K_i g_{i1}}{\tilde{q}_{i1}} \right)^{\frac{1}{1-g_{i1}}} - \frac{\tilde{q}_{i2}}{w K_i} \left(\frac{K_i w g_{i2}}{\tilde{q}_{i2}} \right)^{\frac{1}{1-g_{i2}}}. \tag{5}$$

Given the indirect utility function in (5), it is now possible to determine the tax rates in the destination regime. By identifying the wage rates in the two countries, w_A is normalised, that is, $w_A = 1$; and wB adjusts to attain equilibrium, $w_B = w$. Wage rate adjustment is possible due to the small country assumption. Table 4 shows the consumer prices of the two goods relative to the wage rate in each country, that is, the ratio $\frac{\tilde{q}_{ij}}{w_i}$. Henceforth, unless indicated, q_{ij} is $\frac{\tilde{q}_{ij}}{w_i}$ in the discussion.

Table 4: Consumer Prices relative to Wage ($\frac{\tilde{q}_{ij}}{w_i}$) in destination regime

	Good 1	Good 2
Country 1	$1+t_{A1}$	$(1+t_{A2})w$
Country 2	$\frac{(1+t_{B1})}{w}$	$1+t_{B2}$

In the destination regime, each country maximises its utility function separately and obtains Nash equilibrium. Both countries view w_i as fixed. Substituting q_{ij} from Table 4 and rearranging (5), the indirect utility function for country A is shown in (6).

$$V^A = \left(\frac{K_A}{1+t_{A1}}\right)^{\frac{g_{A1}}{1-g_{A1}}}\left[g_{A1}^{\frac{g_{A1}}{1-g_{A1}}} - g_{A1}^{\frac{1}{1-g_{A1}}}\right] + \left(\frac{K_A}{(1+t_{A2})w}\right)^{\frac{g_{A2}}{1-g_{A2}}}\left[g_{A2}^{\frac{g_{A2}}{1-g_{A2}}} - g_{A2}^{\frac{1}{1-g_{A2}}}\right] \quad (6)$$

Equation (6) is maximised by choosing t_{A1} and t_{A2} subject to the revenue constraint in (7).

$$t_{A1}x_{A1} + t_{A2}x_{A2}w = R_A \quad (7)$$

where R_A is the revenue to be collected in country A. Consecutively, the indirect utility function for country B can be represented in (8).

$$V^B = \left(\frac{K_B}{(1+t_{B1})/w}\right)^{\frac{g_{B1}}{1-g_{B1}}}\left[g_{B1}^{\frac{g_{B1}}{1-g_{B1}}} - g_{B1}^{\frac{1}{1-g_{B1}}}\right] + \left(\frac{K_B}{(1+t_{B2})}\right)^{\frac{g_{B2}}{1-g_{B2}}}\left[g_{B2}^{\frac{g_{B2}}{1-g_{B2}}} - g_{B2}^{\frac{1}{1-g_{B2}}}\right] \quad (8)$$

Equation (8) is maximised by the choice of t_{B1} and t_{B2} subject to the revenue constraint in (9).

$$t_{B1}x_{B1} + t_{B2}x_{B2}w = R_B \quad (9)$$

where R_B is the revenue to be collected in country B.

To obtain the relationship between t_{i1} and t_{i2}, in general, the inverse elasticity formula in Myles (1997, p.103) is employed. The solved optimal demand for good, x_j, from (4) is substituted into the formula for elasticity of demand for good 1 in (10).

$$\varepsilon_{i1}^{d} = \frac{\partial x_{i1}}{\partial q_{i1}} \cdot \frac{q_{i1}}{x_{i1}} = -\frac{1}{1-g_{i1}} \left(\frac{g_{i1} wK}{q_{i1}} \right)^{\frac{g_{i1}}{1-g_{i1}}} \cdot \frac{g_{i1} wK}{q_{i1}^{2}} \frac{q_{i1}}{\left(\frac{g_{i1} wK}{q_{i1}} \right)^{\frac{1}{1-g_{i1}}}}$$

$$= -\frac{1}{1-g_{i1}} \tag{10}$$

Consequently, the elasticity of demand for good 2 becomes that of (11).

$$\varepsilon_{i2}^{d} = -\frac{1}{1-g_{i2}}. \tag{11}$$

In (12), the notation, *Y*, symbolises the marginal utility of income and λ represents the Lagrangian multiplier. Under the inverse elasticity rule, the tax rates satisfy (12).

$$\frac{t_{i1}}{1+t_{i1}} = \frac{Y-\lambda}{\lambda} \cdot \frac{1}{\varepsilon_{i1}^{d}}, \frac{t_{i2}}{1+t_{i2}} = \frac{Y-\lambda}{\lambda} \cdot \frac{1}{\varepsilon_{i2}^{d}} . \tag{12}$$

Relating the elasticities for the two goods gives (13).

$$\left(\frac{t_{i1}}{1+t_{i1}} \right) \varepsilon_{i1}^{d} = \left(\frac{t_{i2}}{1+t_{i2}} \right) \varepsilon_{i2}^{d} \tag{13}$$

From (10) and (11), the equality in (13) becomes that of (14).

$$\left(\frac{1}{1+t_{i1}} \right) \frac{1}{1-g_{i1}} = \left(\frac{1}{1+t_{i2}} \right) \frac{1}{g_{i2}} \tag{14}$$

Rearranging (14), the relationship between t_1 and t_2 can be expressed as in (15).

$$\frac{1}{t_{i1}} = \left(\frac{1-g_{i2}}{1-g_{i1}} \right) \frac{1}{t_{i2}} - \left(\frac{g_{i2}-g_{i1}}{1-g_{i1}} \right) \tag{15}$$

Equation (15) does not give an explicit solution but only identifies the relation between the tax rates of the two goods in the two countries. However, when combined with the government revenue constraint, a solution can be found in the simulation conducted in sub-section 4.2.

4.2 Symmetric Simulation for a Regime Switch

A simulation of the two-country, two-good economy model is conducted. The first part of the simulation works on the effects of employing the optimal tax rates as expressed in (15) in the destination regime. The outcome considers the consumer price, consumption, terms of trade and welfare. In the second part, both countries switch to the origin regime. The results in Table 9a show the immediate effects after switching as countries do not re-optimise their tax rates instantly in the short-run and, hence, employ the same tax rates as in the destination regime. However, failing to consider the re-optimisation of tax rates in the new regime could distort welfare analysis. Therefore, the study also considers the long-run adjustments in which the countries re-optimise their tax rates in the origin regime and the results are reported in Table 9b.

The simulation assumes the symmetry conditions in (16).

$$g_{A1} = g_{B2}, g_{A2} = g_{B1},$$

In equilibrium, this implies that:

$$\begin{aligned} t_{A1} &= t_{B2}, t_{A2} = t_{B1} \\ x_{A1} &= x_{B2}, x_{A2} = x_{B1}. \end{aligned} \tag{16}$$

The symmetry is set in such a way that the degree of the demand inelasticity of the exported good of one country equals that of the exported good of another country. Similarly, the demand inelasticity of the imported good of one country equals the demand inelasticity of the imported good of another country. This symmetry also applies to the domestic demands and the tax rates. Furthermore, the equilibrium wage rate in country B must equal 1. These conditions are imposed to simplify the calculation.

Still assuming that $w_A = 1$ and $w_B = w$, Table 5 shows the consumer prices (*not* in relative terms as shown in Table 4) in the destination regime and Table 6 shows the prices in the origin regime. Because of the assumed symmetry conditions of tax rates and demands in (16), the balance of trade in both regimes is always maintained at equilibrium without the need for factor price flexibility, or exchange rate flexibility in the case of money-economy. In other words, quantity and tax rate of exported good in one country is always equivalent to quantity and tax rate of imported good in another country.

Hence, if there was no symmetry, the role of factor price in maintaining the trade balance becomes more visible.

Table 5: Consumer Prices (q_{ij}) in Destination Regime

	Good 1	Good 2
Country 1	$1+t_{A1}$	$(1+t_{A2})w$
Country 2	$1+t_{B1}$	$(1+t_{B2})w$

Source: The authors

Table 6: Consumer Prices (q_{ij}) in Origin Regime

	Good 1	Good 2
Country 1	$1+t_{A1}$	$(1+t_{B2})w$
Country 2	$1+t_{A1}$	$(1+t_{B2})w$

Source: The authors

The simulation process works as follows. For an illustration, it assumes that the constant, say, K = 1,000 and the revenue requirement in both countries is 200 million units, that is, R_A=R_B=200,000,000. Initially, the equilibrium in the destination regime is calculated in the simulation. Then, the economy is switched to the origin regime. Changes in consumer price, consumption and welfare level are observed. The simulation is programmed to adjust the deficit in country B (to reduce to zero) by an adjustment of the wage rate, *w*. This is possible since the country is small and, thus, adjusts to attain the world wage rate. However, as mentioned earlier, the movement in wage rate is not obvious due to the symmetry assumptions which always causes a balanced trade. Thus, the wage rate in country B is always 1 in the simulation, whilst that of country A is fixed as a numeraire. Table 7a reports the *immediate* welfare gains at different combinations of the elasticity of demand for good 1 and good 2 in the country A before the *re*-optimisation of tax rates. It is symmetric for the case of country B. Table 9b, which follows, reports the outcomes after re-optimisation of tax rates and adjustments of wages in the long-run in both countries.

Table 7a: Simulation results of a switch from destination to origin regime before tax rates re-optimisation in the new regime

Reference point	Preferences		Tax Rates		Tax Revenue		Welfare gain (%)	Revenue and Utility in Origin
	g_{A1}	g_{A2}	t_{A1}	t_{A2}	Destination	Origin		
1	0.1	0.7	0.31439	0.08664	2.00E+08	3.85E+08	-35.85359	3.856E+08
2	0.7	0.1	0.0867	0.314666	2.00E+08	2.00E+08	2.33E-05	2.012E+08
3	0.2	0.7	0.27	0.08663	2.00E+08	3.71E+08	-30.50029	3.714E+08
4	0.7	0.2	0.0867	0.270254	2.00E+08	2.00E+08	2.33E-05	2.012E+08
5	0.3	0.7	0.2286033	0.086653	2.00E+08	3.51E+08	-24.9093	3.513E+08
6	0.7	0.3	0.0867	0.228745	2.00E+08	2.00E+08	4.65E-05	2.012E+08
7	0.4	0.7	0.1897026	0.086634	2.00E+08	3.24E+08	-19.05797	3.247E+08
8	0.7	0.4	0.0867	0.189863	2.00E+08	2.00E+08	1.63E-04	2.012E+08
9	0.5	0.7	0.1532	0.08661	2.00E+08	2.90E+08	-12.95533	2.911E+08
10	0.7	0.5	0.0867	0.153366	2.00E+08	2.00E+08	1.23E-03	2.012E+08
11	0.6	0.7	0.1183	0.08617	2.00E+08	2.49E+08	-6.5445	2.500E+08
12	0.7	0.6	0.0862009	0.118335	2.00E+08	1.99E+08	0.02055	2.010E+08
13	0.7	0.7	0.0371	0.0371	2.00E+08	2.00E+08	0	2.025E+08
14	0.7	0.8	0.0001	6.67E-05	2.00E+08	3.28E+10	0.013323	1.146E+11
15	0.8	0.7	0.0001	0.00015	2.00E+08	3.28E+10	0	1.146E+11
16	0.7	0.9	0.001	3.33E-05	2.00E+08	3.48E+25	0.06001297	7.354E+25
17	0.9	0.7	0.0001	0.0003	2.00E+08	3.48E+25	0	7.354E+25

Table 7b: Simulation results of a switch from destination to origin regime after tax rates re-optimisation in the new regime

Reference point	Tax Rates in Destination		Tax Rates in Origin (after re-optimisation)		Tax Revenue		Welfare gain (%)	Revenue and Utility in Origin
	t_{A1}	t_{A2}	t_{A1*}	t_{A2*}	Destination	Origin		
1	0.31439	0.08664	0.226803	0.065714	2.00E+08	2.00E+08	-24.6441	2.0107E+08
2	0.0867	0.314666	0.0866	0.314664	2.00E+08	2.00E+08	4.651E-05	2.0107E+08
3	0.27	0.08663	0.196703	0.065687	2.00E+08	2.00E+08	-20.15936	2.0107E+08
4	0.0867	0.270254	0.0866	0.270251	2.00E+08	2.00E+08	2.31E-05	2.0107E+08
5	0.228603	0.086653	0.1680023	0.065694	2.00E+08	2.00E+08	-15.50245	2.0107E+08
6	0.0867	0.228745	0.0866	0.228745	2.00E+08	2.00E+08	6.97E-05	2.0107E+08
7	0.189702	0.086634	0.140601	0.065683	2.00E+08	2.00E+08	-10.69348	2.0107E+08
8	0.0867	0.189863	0.0867	0.18963	2.00E+08	2.00E+08	1.63E-04	2.0107E+08
9	0.1532	0.08661	0.1145014	0.06569	2.00E+08	2.00E+08	-5.739691	2.0107E+08
10	0.0867	0.153366	0.0867	0.153178	2.00E+08	2.00E+08	2.266E-02	2.0107E+08
11	0.1183	0.08617	0.08930	0.0655131	2.00E+08	2.00E+08	-0.646304	2.0108E+08
12	0.086200	0.118335	0.086100	0.1181934	2.00E+08	2.00E+08	0.0419915	2.0108E+08
13	0.0371	0.0371	0.03470	0.03470	2.00E+08	2.00E+08	0.0152077	2.0239E+08
14	0.0001	6.67E-05	0.0001	6.66E-05	2.00E+08	2.00E+08	0.013322	8.2099E+08
15	0.0001	0.00015	0.0001	0.00015	2.00E+08	2.00E+08	0.000219	8.2088E+10
16	0.001	3.33E-05	0.0001	3.33E-05	2.00E+08	2.00E+08	0.060002	3.8729E+25
17	0.0001	0.0003	0.0001	0.0003	2.00E+08	2.00E+08	0.0000191	3.870E+25

Note: Although it may seem that the figures in Table 7b are identical to those of Table 7a, particularly the tax rates in the last three reference points in the origin regime, they vary slightly at a decimal level.

The point at which the inelasticity of demand, g_{ij}, of both goods is equal resembles the case when the countries follow the general tax structure. This setting is synonymous to that of the classic example of a uniform tax structure in the previous literature. The results in reference point 13 of Table 7a show that once the g_{ij} of the two countries are identical, the welfare change of switching from one principle to another is nil. Table 7b's reference point 13 also show that it is close to nil. This is because, by the assumptions, the consumer prices, $q_{i1} = q_{i2}$ due to the fact that $w_A = w_B = 1$ and $t_{A1} = t_{B2}$. This follows the formulation of consumer prices in the origin regime in Table 6. The result obtained is in congruent with the earlier literature mentioning about the equivalence of destination and origin regime under tax uniformity. The case of equivalence under uniform tax rate has been formally proved. However, there had not yet been a formal proof for the situation under non-uniform tax rates due to the difficulty when the uniformity assumption has been removed. The former literature indicates further that it is required that the exchange rate must be flexible or the factor costs must be adjustable. In this simulation, due to the symmetry assumptions, there is never a trade deficit in both countries under the two regimes.

The results in Table 7a and Table 7b also show that there are cases in which welfare gain arises. It arises from the fact that both countries treat w as fixed when they optimise the utility function with respect to tax rates. This makes the initial Nash equilibrium inefficient. There are also cases in which there is a loss in welfare. An explanation based on a policy-oriented viewpoint may be reasoned as this: Welfare loss arises because consumer price increases when switching to the origin regime. Suppose the inelasticity of demand for good 2 in country B is relatively lower than in country A. Based on the above-mentioned assumption, the tax rate on good 2 in country B may be discriminated and, hence, country B's consumer price of good 2 is relatively higher than country A's in the destination regime. A shift to origin principle could, therefore, result in higher consumer price in country A since good 2 has to be originally taxed at country B's higher rate no matter where it is sold or consumed. This leads to a loss in welfare. The case otherwise leads to a gain in welfare.

Table 8: Consumer prices in destination, origin and co-operative destination regimes

Reference point	Preferences		Consumer prices in destination regime		Consumer prices in origin regime before tax rates re-optimisation		Consumer prices in origin regime after tax rates re-optimisation	
	g_{A1}	g_{A2}	q_{A1}	q_{A2}	q_{A1}	q_{A2}	q_{A1}	q_{A2}
1	0.1	0.7	1.314395	1.086639	1.314395	1.314395	1.226803	1.226803
2	0.7	0.1	1.086701	1.314666	1.086701	1.086701	1.0866	1.0866
3	0.2	0.7	1.270001	1.086631	1.270001	1.270001	1.196703	1.196703
4	0.7	0.2	1.086701	1.270255	1.086701	1.086701	1.0866	1.0866
5	0.3	0.7	1.228603	1.86653	1.228603	1.228603	1.1680023	1.168002
6	0.7	0.3	1.086701	1.228745	1.086701	1.086701	1.0866	1.0866
7	0.4	0.7	1.189703	1.086634	1.189703	1.189703	1.140601	1.140601
8	0.7	0.4	1.086701	1.189863	1.086701	1.086701	1.0867	1.0867
9	0.5	0.7	1.153202	1.086613	1.153202	1.153202	1.114501	1.114501
10	0.7	0.5	1.086701	1.153366	1.086701	1.086701	1.0867	1.0867
11	0.6	0.7	1.118301	1.086177	1.118301	1.118301	1.08930	1.08930
12	0.7	0.6	1.086701	1.118335	1.086701	1.086701	1.086100	1.086100
13	0.7	0.7	1.0371	1.0371	1.0371	1.0371	1.03470	1.03470
14	0.7	0.8	1.0001	1.000067	1.0001	1.0001	1.0001	1.0001
15	0.8	0.7	1.0001	1.00015	1.0001	1.0001	1.0001	1.0001
16	0.7	0.9	1.0001	1.000033	1.0001	1.0001	1.0001	1.0001
17	0.9	0.7	1.0001	1.0003	1.0001	1.0001	1.0001	1.0001

From the simulation, holding g_{ij} of one good as constant, with higher g_{ij} of another good, the equilibrium tax rate of the second good tends to fall as the g_{ij} of the latter good becomes higher than the first. The points of welfare gains are the points where consumer price in the origin regime is less than that in the destination regime. These points can be observed in Table 8. The reported outcome is reasonable enough at a varying degree of discriminatory tax structure for the two goods and the two countries. The higher the difference

between the g_{ij} of one good and another good in the same country, the more discriminatory and non-uniform is the tax structure. Thus, there tends to be more welfare losses when g_{ij} of the two goods differ significantly. In addition, it can be observed that as the values of g_{ij} of both goods get closer, the change in regime tends to result in zero or positive welfare effect.

5. Summary and Conclusions

Physical border controls in the AEC play a less effective role as the member countries progress to further stages of economic integration. Despite an increasing number of common domestic reforms, tax affair remains one of the few areas in which the member states retain their sovereignty. Now that these states are unable to set their tariff rates against each other, there may be incentives for utilising domestic taxes as a tool for improving the government revenue and the country's trade benefits. There is a wide range of research on the policy aspects. This paper focuses on the theoretical aspects of the tax principles in the customs union, with particular focus on the AEC. The issues of considerations are welfare distribution, resource reallocations and trade balance.

The two major tax principles in discussion are the destination principle and the origin principle. As defined in Section 2, the destination principle implies that the consumer price of an imported final good incurs the importing country's tax. In the view of producers, goods produced domestically enjoy a tax rebate upon being exported. On the other hand, goods imported are subject to full domestic taxation. In the origin principle, domestically produced goods are taxed regardless of being exported or not. Therefore, the country of origin's tax accrues to the consumer price of the imported final good. Thus, the destination principle requires a border tax adjustment when foreign goods enter the country, whereas the origin principle does not require such adjustment since goods have already been taxed on production.

Section 4 provides extensions of the recent studies. A model is constructed in order to analyse the mechanisms of a change in tax regime when tax rates are non-uniform. This is more relevant in practice as the tax structure in the real world, particular among the member countries in AEC, is non-uniform. The theoretical framework of the model is built on a two-country,

two-good economy. One country exports one good and imports another good. By employing a modified version of Ramsey tax rule including equity consideration, goods that are less demand-elastic are taxed at a lower rate. The model is based on the assumption that the tax rates are calculated using the inverse elasticity rule. By such assumptions, a non-uniform tax structure arises because of evaluations by consumers.

In the first part of Section 4, each country maximises its own utility function independently subject to its revenue constraint. The optimal output and tax rates are then solved. The second part of Section 4 presents a symmetric simulation for a regime switch from destination principle to the origin principle. The symmetry is set in such a way that the inelasticity of demand for the exported good of one country equals that of another country. This is similar for the imports. The symmetry also applies to the domestic demands and tax rates.

The results of the symmetric simulation, in sub-section 4.2, show that there are cases of welfare neutrality, gains and losses. The point at which the inelasticity of demand of both goods is equivalent resembles the case when the countries follow the general tax structure. This is the classic example of a uniform taxation in which neutrality is obtained. Welfare gain arises from the fact that consumer price decreases in the origin regime. The vice versa is true for the opposite case. When the values of demand elasticity are close to identical and are at higher values, there tends to be welfare neutrality or gain due to the less discriminatory nature of the tax structure. The welfare gain arises from the fact that both countries treat wage as fixed when they optimise. This makes the initial Nash equilibrium inefficient. However, there is a loss in welfare as the values of elasticity of demand for the same good in the two countries differ greatly.

It is crucial that policy formulation in the real world takes into account the non-uniform nature of the tax structure. There are various possible factors responsible for the degree of tax non-uniformity. One of the factors employed in the analysis of this paper is the elasticity of demand. The theoretical framework and simulation in this paper suggest that, without realising the degree of non-uniformity of the tax structure, the predicted outcome of a regime switch may not be definite, even in symmetric cases.

The simulation shows that the wide gap between the values of inelasticity of demand, which leads to higher degree of tax non-uniformity, plays a great role in causing negative welfare effects. The model constructed yields a satisfactory set of results which agrees with the existing literature under tax uniformity and is extendable so as to capture the effects of varying degrees of tax non-uniformity. The analysis also reflects the importance of a careful study of the demand nature and other non-economic factors such as political influences and national characteristics contributing to the non-uniformity in the tax structure. This foreshadows a wide range of future research on tax regimes in Southeast Asia, which remains lagging both in theory and applications.

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