

**INTEGRATED TAX REFORM IN ECONOMIES
WITH AN ENDOGENOUS INFORMAL
SECTOR**

by

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Abstract

In light of the existence of an informal sector in most developing countries, economists are beginning to reconsider the integrated tax reform consisting of a reduction in tariffs with an increase in VAT that has been advocated by the IMF in recent years. This paper explores the welfare change of such a reform in an economy in which the size of the informal sector is endogenously determined. Assuming that products are nontraded, the levy of VAT distorts the aggregate output; allowing the size of the informal sector to be determined endogenously worsens the situation. This leads to a conclusion which tends to favor an integrated tax reform toward tariffs under some plausible conditions. This result may help to explain the slow adoption of VAT in many developing countries.

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Chapter 1

Introduction

Trade taxes play an important role in the tax systems of developing countries. The recent spread of value-added taxes (VATs), to some extent, enables these countries to gain revenue from taxing consumption and to reduce their dependence on tariffs. More and more developing countries have begun to shift from tariffs to a commodity tax as the primary source of government revenue. Table 1 displays those developing countries which have adopted VAT in recent years¹. During the last two decades, VAT adoption has increased in many Asian and African economies.

However, such an integrated tax reform of replacing tariffs with VATs has experienced slow progress in the small island countries in the Caribbean and the Pacific. Even in those developing countries with a VAT system, trade taxes still account for a large proportion of all tax revenue. The principle obstacles to VAT adoption may be concerns about the loss of welfare and government revenue resulting from tax adjustments. Much theoretical literature, responding to these concerns, has evaluated the welfare effects of this tax reform without reducing government revenue and has tried to establish sufficient conditions under which tax reforms improve welfare while

¹Source: Bird & Gendron "VAT Revisited: A New Look at the Value Added Tax in Developing and Transitional Countries." USAID. 2005. Fiscal Reform and Economic Governance Project. http://www.fiscalreform.net/best_practices/pdfs/VATR%20Final%20Report%20181005.pdf.

Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 6.1, Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002. Note: The category of developing countries defined as IMF's classification of 'emerging and developing economies'

Table 1.1: The spread of VAT in developing countries

Time Period	Countries Adopting VAT			Average Import/GDP
1960-1969	Brazil	Côte d'Ivoire	Uruguay	14%
1970-1979	Argentina Colombia Honduras Peru	Bolivia Costa Rica Nicaragua	Chile Ecuador Panama	26%
1980-1989	Dom. Rep. Hungary Mexico Philippines Turkey	Guatemala Indonesia Morocco Senegal	Haiti Malawi Niger Tunisia	28%
1990-1999	Albania Azerbaijan Belarus Burkina Faso China Czech Rep. Estonia Georgia Jamaica Kyrgyz Rep. Madagascar Mauritius Mozambique Pakistan Poland Samoa Sri Lanka Tanzania T. & Tobago Ukraine Venezuela	Algeria Bangladesh Benin Cambodia Congo Egypt Fiji Ghana Kazakhstan Latvia Mali Moldova Nepal P. N. Guinea Romania Slovak Rep. Suriname Thailand Turkmen. Uzbekistan Vietnam	Armenia Barbados Bulgaria Cameroon Croatia El Salvador Gabon Guinea Kenya Lithuania Mauritania Mongolia Nigeria Paraguay Russia S. Africa Tajikistan Togo Uganda Vanuatu Zambia	41% (excluding countries used to be planned economies)
2000-2005	Botswana Chad India Namibia	Cape Verde Eq. Guinea Laos Sudan	C. A. R. Ethiopia Lesotho Zimbabwe	data unavailable

maintaining revenue-neutrality. Early research focused on deriving possible coordinated reforms of tariffs and VATs in a standard economy with only formal sectors. A representative paper developed by Michael et al. (1993) identified conditions under which a reduction in tariffs associated with an increase in VATs improves welfare while keeping revenue-neutrality. That paper showed that reducing the highest tariffs rates on the goods which are also bearing the highest total tax burden, while compensating the lost revenue by an increase in the VAT rates on the goods receiving the lowest tax burden, improves the nation's welfare. Keen and Ligthart (2002) explored a practicable strategy for realizing this tax reform and extended the analysis by relaxing some strict assumptions in the previous research, such as allowing for non-tradable final goods and tradable intermediate goods. As long as the tariff cut improves production efficiency, they demonstrated that a reform which cuts trade taxes by some amount and increases consumption taxes by an exactly offsetting amount is welfare-improving.

One weakness of these studies is that they ignore the existence of the informal sector a significant feature of developing countries. It is theoretically true that the integrated tax reform of VAT and tariffs improves welfare in an economy with only a formal sector, where the VAT can apply to all commodities without distorting consumption between tradable goods and nontradable goods. This makes the VAT less distortionary than the tariff, which is only collected on a limited tax base. With an informal sector, this conclusion may not hold since VATs may distort production between formal sectors and informal sectors. For example, Piggott and Whalley (2001) analyzed the effect of VAT base broadening with an underground economy and pointed out that this expansion of the VAT base reduces welfare. Emran and Stiglitz (2005) placed the coordinated reform of VAT and tariffs in an economy with an informal sector. As a result of the incomplete coverage of VATs, welfare-worsening tax reforms with a revenue-neutral increase in VATs may occur under plausible conditions. In response, Keen (2007) argued that this model ignores a distinctive feature of the VAT, that is, informal firms can't claim refunds on either their imported inputs or purchases from formal sectors. Such a feature makes the VAT function as an input tax, in which case informal firms are subject to VAT. Furthermore, Keen (2008) constructed a simple model with an informal sector that explores this feature and

showed that efficiency-improving tariff cuts combined with an increase in VAT and withholding taxes still improves welfare with the existence of informal sector. This result, nevertheless, is controversial as it is derived from the assumption that the size of the informal sector is fixed.

According to Rauch (1991), the choice of firms operating between formal sectors and informal sectors is determined endogenously by the talent of entrepreneurs and there is no significant difference between formal goods and informal goods. If the boundary between the two sectors is flexible, the discussion of welfare-improving or welfare-worsening selective tax reforms in VATs and tariffs becomes more complicated. Despite the difficulty, relaxing the constraint of an immobile boundary between informal sectors and formal sectors pushes the discussion further. The latest research by Boadway and Sato (2009) is based on a model which considers the endogeneity of the size of the informal sector. By comparing the social welfare of an open economy with an informal sector between a full VAT regime and a full trade tax regime, they tried to derive the conditions under which one regime is preferred to the other. An important implication of this paper is that the endogenous choice of sector by producers may affect the choice of preferable tax system. However, there is a missing piece in this paper. Since they followed the assumptions of Emran and Stiglitz (2005) that all commodities are tradable, the discussion of nontraded goods in developing countries was ruled out. Including nontraded goods induces a more realistic consideration of the welfare effect of an integrated tax reform when the size of the informal sector is determined endogenously, especially when this reform occurs in developing countries with a large nontraded sector.

In this paper, a simple economy with an imported good is established which aims to analyze the welfare impact of a selective revenue-neutral reform in VATs and tariffs while the formal sector and informal sector emerge endogenously. To capture the effects of VAT on the size of informal sector and the production efficiency more precisely, the domestic good is assumed to be nontradable such that even the producer's price is determined endogenously. In the case of a given world price, the VAT doesn't affect the production efficiency in the formal sector since the producers receive the same price. When the producer's price varies, the VAT may distort the production

of the formal sector as well as change the size of the informal sector. While trade taxes have a disadvantage in reaching the nontraded sector, the VAT has another disadvantage in the nontraded sector by distorting its production. The effect of an integrated reform on welfare is ambiguous in this situation.

I begin with an analysis of the impact of VAT on the size of the informal sector and find that the increase in the VAT may stimulate the growth of the informal sector while reducing the registered firms simultaneously. Then I raise a comparison of the tariff regime and the VAT regime without an informal sector and derive a possible condition under which tariffs are preferred. By adding a flexible informal sector, this condition is unambiguously strengthened. Finally, I generate the condition under which an integrated revenue-neutral tax reform toward tariffs is welfare-improving.

The rest of the paper is organized as follows. The first part of Section 2 presents the basic model and the response of the size of the informal sector to a change in VAT. In subsection 2.1, a comparison between the VAT regime and the tariff regime is constructed. Then I analyze the influence of adding an informal sector on this comparison in the next subsection. The condition for a welfare-improving tax reform is derived in subsection 2.3 and some discussion about relaxing the restrictions is presented in subsection 2.4. Section 3 concludes.

Chapter 2

The model

The analysis is built on a simple model of a competitive small economy with the size of the population normalized to 1. There are two types of goods: good X is domestically produced and good Y is an imported commodity¹. The government collects commodity taxes from both goods while imposing a trade tax only on good Y . Each individual has an initial endowment w , which can be used to consume. In addition, they can gain extra income by producing one unit of good X , and they differ in the marginal cost θ , which is uniformly distributed on $[0, 1]$. A high marginal cost θ reduces an individual's willingness to start a business. All the individuals have an identical utility function $U = X^\gamma Y^{1-\gamma} + V(G)$, where $V(G)$ can be seen as the welfare obtained from public service². Here I adopt a specific Cobb-Douglas utility function, which has an implication that there are always demands for both goods. But using a different utility function may have an influence on final conclusions, especially when the alternative utility function eliminates the implication. This discussion is developed in subsection 2.4. Then let P , τ_t and τ_v denote the consumer price³ of good X , the tariff rate, and the VAT rate, respectively⁴. For simplicity, let the world price

¹Good X and good Y are divisible.

²Here for simplicity, assume that the government devotes all tax revenue to public service and that the utility gained from public service is $V(G)$. It is further assumed that $V(0) = 0$.

³This consumer price is the price paid by consumers, which includes VAT rate.

⁴Here VATs and tariffs are defined in specific forms. Since they can be rewritten in ad valorem forms, it is immaterial which form is used in expression.

of good Y be normalized to 1. Then the consumer price of good Y is $1 + \tau_t + \tau_v$. Individuals who choose to start a firm can operate it in the formal sector or the informal sector. It costs a firm in the formal sector θ to produce one unit of good X . The marginal cost of the firm in the informal sector is $(1 + e)\theta$, as the informal sector faces an expected sanction cost or a hiding cost $e\theta^5$. This setting is similar to that in Cuff et al. (2009). However, in Cuff et al. (2009), θ is defined as productivity and can represent the size of firms, which leads to the expectation that larger firms are easier to be detected and pay the sanction. While in this model, using the same definition of θ results in a fully operating economy in which a higher VAT is always preferred. So I turn to an alternative setting with the same implication that people with higher ability have higher profit. It leads to the outcome that people with higher ability have higher incentive operating in the informal sector, which seems not so convincing. Then the profit of operating a firm in the formal sector is $\pi_F(\theta) = P - \tau_v - \theta$. The profit of the informal sector is $\pi_I(\theta) = P - (1 + e)\theta$. Figure 1 shows the profits of the two types of firms. From Figure 1, it's obvious that individuals, who face a lower marginal cost, have a higher incentive to operate in the informal sector.

⁵The sanction cost is assumed to be non-monetary. Such that the government can't increase revenue by encouraging tax evasion.

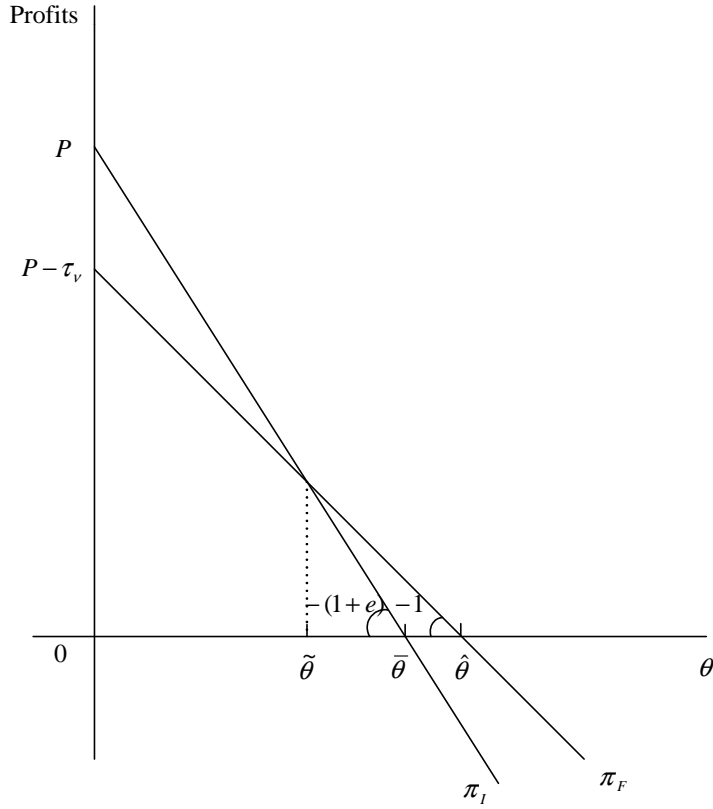


Figure 2.1: Profits of two types of firms

The income of individuals who don't start a firm is $R_0 = w$. For individuals who start a firm in the formal sector, earnings are $R_F = P - \tau_v - \theta + w$. And those who start a firm in the informal sector would receive income $R_I = P - (1 + e)\theta + w$. With budget constraints, individuals maximize their utility by consuming $\gamma R_i/P$ units of X and $(1 - \gamma)R_i/(1 + \tau_t + \tau_v)$ units of Y .

Define $\tilde{\theta}$ as the cost that makes an individual indifferent between operating a firm in the formal sector and starting a firm in the informal sector. Then $\tilde{\theta}$ can be obtained as:

$$P - (1 + e)\tilde{\theta} = P - \tau_v - \tilde{\theta} \iff \tilde{\theta} = \tau_v/e. \quad (2.1)$$

From the expression for $\tilde{\theta}$, the most important implication obtained is that the price of X doesn't influence individuals' choice of operating a firm in the informal sector. The VAT imposed on goods X and the expected sanction cost are the factors that

matter. A higher tax on the formal sector expands the scale of the informal sector; a higher expected sanction cost imposed on the informal sector reduce the number of illegal firms. The intuition is straightforward if we look at the value of τ_v/e . No one would operate in the informal sector with an extremely low VAT rate or an extremely high penalty.

Figure 2.2 shows the relation between P and $\tilde{\theta}$ explicitly. Everything else being equal, raising the price of X from P to P' doesn't move the location of $\tilde{\theta}$.

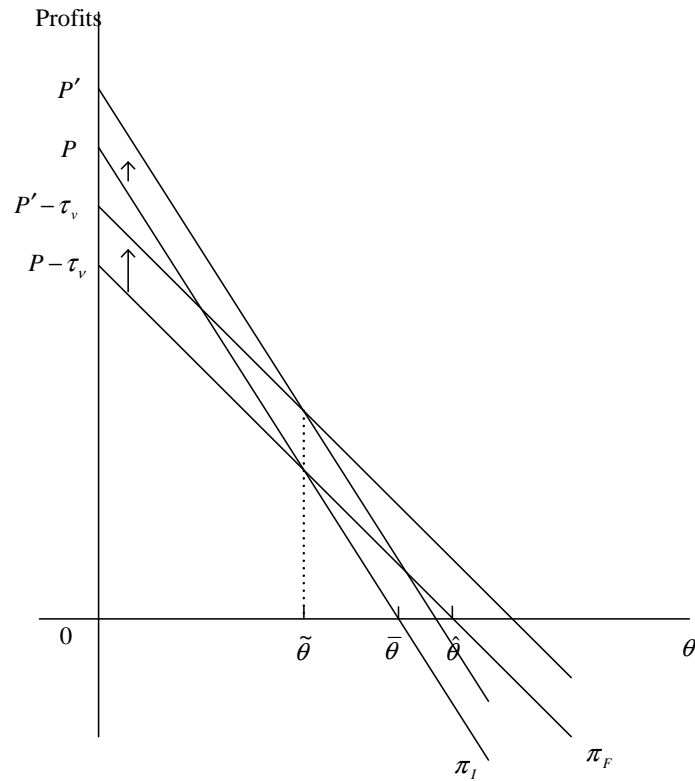


Figure 2.2: The relation between P and $\tilde{\theta}$

Define $\hat{\theta}$ as the marginal cost that makes an individual indifferent between operating a firm in the formal sector and not starting a firm at all. Then $\hat{\theta}$ can be obtained as:

$$P - \tau_v - \hat{\theta} + w = w \iff \hat{\theta} = P - \tau_v. \quad (2.2)$$

From the expression for $\hat{\theta}$, we know that for a given price P , increasing the VAT on

goods X results in a reduction of firms in the economy. This change in τ_v expands the scale of the informal sector, which comes from the implication of the expression for $\tilde{\theta}$. These two effects further diminish the number of legal firms.

Also define $\bar{\theta}$ as the marginal cost that makes an individual indifferent between operating a firm in the informal sector and not starting a firm at all. Then $\bar{\theta}$ can be obtained as:

$$P - (1 + e)\bar{\theta} + w = w \iff \bar{\theta} = \frac{P}{1 + e}. \quad (2.3)$$

To ensure the existence of a formal sector and an informal sector, which is the case discussed in the model and shown in Figure 1, we must have $0 < \tilde{\theta} < \bar{\theta} < \hat{\theta} < 1$, that is

$$0 < \tau_v/e < \frac{P}{1 + e} < P - \tau_v < 1, \quad (2.4)$$

Rewriting it yields

$$\frac{1 + e}{e}\tau_v < P < 1 + \tau_v, \quad (2.5)$$

where e is an exogenous variable⁶. This constraint has a completely intuitive interpretation. First it requires that $P < 1 + \tau_v$, which means that the price should be less than the highest cost to operate in the formal sector. If the requirement is not satisfied, that is, $P \geq 1 + \tau_v$, individuals always want to start a business and the levy of VAT has no impact on the production efficiency. In this circumstance, analyzing the welfare loss caused by the levy of VAT seems meaningless. Secondly it adds a constraint on the value of τ_v . The inequality $\frac{1+e}{e}\tau_v < 1 + \tau_v$ can be rewritten as $\tau_v < e$. This implies that the VAT should not exceed the expected sanction cost to guarantee the existence of legal firms. Given this condition, an equilibrium solution can be generated by clearing the domestic market. With the above conditions, the demand can be expressed as:

$$D = \frac{\gamma}{P}[\tilde{\theta}(P - (1 + e)\tilde{\theta}/2) + (\hat{\theta} - \tilde{\theta})(P - \tau_v - \frac{\hat{\theta} + \tilde{\theta}}{2}) + w]. \quad (2.6)$$

While the supply is:

$$S = \hat{\theta}. \quad (2.7)$$

⁶ e is fixed in this project. However, an interesting situation is been discussed in Cuff et al. (2009) when e is picked by the government to maximize the social welfare.

Solving the market clear condition $D = S$ yields:

$$(2 - \gamma)\hat{\theta}^2 + 2\tau_v\hat{\theta} - \gamma(2w + \frac{\tau_v^2}{e}) = 0. \quad (2.8)$$

Then the equilibrium quantity and equilibrium price are given as:

$$\hat{\theta} = \frac{-\tau_v + \sqrt{\tau_v^2 + (2 - \gamma)\gamma(2w + \frac{\tau_v^2}{e})}}{2 - \gamma} \left(\frac{\tau_v}{e} < \hat{\theta} < 1 \right), \quad (2.9)$$

$$P^* = \hat{\theta} + \tau_v = \frac{(1 - \gamma)\tau_v + \sqrt{\tau_v^2 + (2 - \gamma)\gamma(2w + \frac{\tau_v^2}{e})}}{2 - \gamma} \quad (2.10)$$

Moreover, the effect of an increase in VAT rate on the informal sector and the formal sector can be expressed as follows:

Proposition 1 *In an equilibrium of the economy consisting of an informal sector and a formal sector, an increase in VAT rate reduces the number of subsistent firms in the market. However, it stimulates the growth of the informal sector.*

Proof. Given the market clearing equation for $\hat{\theta}$, the value of $\partial\hat{\theta}/\partial\tau_v$ can be derived as $[(2 - \gamma)\hat{\theta} + \tau_v]\partial\hat{\theta}/\partial\tau_v = \gamma\frac{\tau_v}{e} - \hat{\theta}$. Since $(2 - \gamma)\hat{\theta} + \tau_v$ is positive, $\partial\hat{\theta}/\partial\tau_v < 0$ if $\gamma\frac{\tau_v}{e} - \hat{\theta} < 0$. This condition is satisfied when the basic condition $\frac{\tau_v}{e} < \hat{\theta} < 1$ is satisfied. That means that when the VAT rate goes higher, fewer firms would exist in the market as long as there are an informal sector and a formal sector. Since $\partial(\hat{\theta} - \tilde{\theta})/\partial\tau_v = \partial\hat{\theta}/\partial\tau_v - 1/e < 0$, that means that when the VAT goes up, more firms tend to operate illegally. ■

In an economy with a nontradable production sector, the VAT distorts production efficiency by raising the endogenous market price and reducing the number of firms in the market. It also increases the scale of the informal sector which actually hurts the tax revenue collected from the formal sector. Obviously, in this economy the government can't obtain the tax revenue with the lowest cost in social welfare by imposing the VAT. It's hard to tell whether a revenue-neutral integrated tax reform consisting of an increase in VAT and a decrease in tariffs is welfare-improving in such a circumstance. However, the analysis can be developed from an extreme comparison like that in Boadway and Sato (2009), by assuming a VAT regime and a trade tax

regime. First, through the comparison I show that if there is no distortion of the production and no informal sector, the VAT is always better than the tariff. But if we allow the presence of distortion, a possible sufficient condition is generated under which only tariffs would be better than only VAT. Furthermore, the later participation of the informal sector strengthens this condition.

2.1 The Extreme Comparison between Tariff and VAT

In this comparison, I keep the basic setting but remove the informal sector from the economy. Consider that e goes to infinity, that is, the expected penalties for illegal firms are so high that no one can afford to operate in the informal sector. As a result, the economy only has a formal sector. Compare the social welfare when tax revenues all come from VATs with that when tax revenues are all collected by tariffs. To get rid of disturbances from consumers' preference, let's assume $\gamma = 1/2$, which means that consumers have the same attitudes toward these two goods.

In the tariff regime (add a subscript t to distinguish from VAT), market clearing yields $\hat{\theta}_t = \frac{\sqrt{6w}}{3} = P_t$, which is the optimal output without distortions as the tariff doesn't affect the production sector. Then total income is $2\hat{\theta}_t P_t = \frac{4w}{3}$. This is the maximal income that can be obtained. Tax revenue is

$$G_t = \tau_t[\hat{\theta}_t P_t / (1 + \tau_t)], \quad (2.11)$$

and social welfare is

$$U_t = \left(\frac{\hat{\theta}_t^2 P_t}{1 + \tau_t}\right)^{1/2} + G_t. \quad (2.12)$$

In the VAT regime (add a subscript v to distinguish from tariffs), from the market clearing condition the maximized output and the price are derived as

$$\hat{\theta}_v = \frac{-2\tau_v + \sqrt{4\tau_v^2 + 6w}}{3}, \quad (2.13)$$

$$P_v = \frac{\tau_v + \sqrt{4\tau_v^2 + 6w}}{3}. \quad (2.14)$$

Then the total income is

$$2\widehat{\theta}_v P_v = \frac{4\tau_v^2 + 12w - 2\tau_v\sqrt{4\tau_v^2 + 6w}}{9}; \quad (2.15)$$

the distortion caused by VATs is

$$\frac{4\tau_v^2 - 2\tau_v\sqrt{4\tau_v^2 + 6w}}{9} < 0; \quad (2.16)$$

and a higher VAT rates leads to a greater distortion as

$$\partial\left(\frac{4\tau_v^2 - 2\tau_v\sqrt{4\tau_v^2 + 6w}}{9}\right)/\partial\tau_v < 0. \quad (2.17)$$

Tax revenue is $G_v = \tau_v[\widehat{\theta}_v + \widehat{\theta}_v P_v/(1 + \tau_v)]$, which consists of taxes from domestic goods and imported goods. The social welfare is $U_v = (\frac{\widehat{\theta}_v^2 P_v}{1 + \tau_v})^{1/2} + G_v$.

Letting $G_v = G_t$, compare U_v with U_t . That is, compare $(\frac{\widehat{\theta}_v^2 P_v}{1 + \tau_v})^{1/2}$ with $(\frac{\widehat{\theta}_t^2 P_t}{1 + \tau_t})^{1/2}$ while holding

$$\tau_v[\widehat{\theta}_v + \widehat{\theta}_v P_v/(1 + \tau_v)] = \tau_t[\widehat{\theta}_t P_t/(1 + \tau_t)]. \quad (2.18)$$

The result is ambiguous considering the limited tax base of tariffs and the loss in production due to the levy of VAT. Supposing that there is no distortion caused by the VAT, that is, $\widehat{\theta}_v = \widehat{\theta}_t$, we can draw a straightforward conclusion:

Proposition 2 *If $\widehat{\theta}_v = \widehat{\theta}_t$, $U_v > U_t$. That is, if the VAT doesn't affect the production efficiency, a full VAT system is always better than a full tariff system in optimizing social welfare while collecting the same tax revenues.*

Proof. If $\widehat{\theta}_v = \widehat{\theta}_t$, $P_v = \widehat{\theta}_v + \tau_v > \widehat{\theta}_t = P_t$. To collect the same tax revenue, it always holds that

$$\tau_t[\widehat{\theta}_t P_t/(1 + \tau_t)] = \tau_v[\widehat{\theta}_v + \widehat{\theta}_v P_v/(1 + \tau_v)] > \tau_v[\widehat{\theta}_v P_v/(1 + \tau_v)], \quad (2.19)$$

which can be rewritten as

$$\left(1 - \frac{1}{1 + \tau_t}\right)\widehat{\theta}_t P_t > \left(1 - \frac{1}{1 + \tau_v}\right)\widehat{\theta}_v P_v. \quad (2.20)$$

Since $\widehat{\theta}_v = \widehat{\theta}_t$ and $P_v > P_t$, we have $\tau_t > \tau_v$. The tariff rate is higher than the VAT rate. This enables the consumers bearing a VAT to purchase more units of Y than those with a trade tax. And since the consumption of X is the same for both regime, it's obvious that the VAT regime has a higher social welfare. ■

This result is consistent with the intuition which supports the spread of VAT: compared with tariffs, VAT has a wider tax base and as a result causes a smaller distortion in consumption, which reduces the deadweight loss of taxation. But with tax evasion in the informal sector, the tax base of VAT is weakened. Even without an informal sector, the adoption of VAT is arguable considering the distortion in the nontraded production sector caused by the VAT. By comparing the maximized outputs in these two regimes, a simple finding is shown as following:

Lemma 1 $\widehat{\theta}_v < \widehat{\theta}_t$. *The levy of VAT introduces production inefficiency. Total output in the full VAT system is smaller than total output in the full trade tax system.*

Taking the production inefficiency induced by VAT into account, the tariffs regime is preferred to the VAT regime under some plausible conditions, which is demonstrated in Proposition 3.

Proposition 3 *If $\frac{\tau_t}{\tau_v} < 2 < 1 + \frac{(1+\tau_v)}{P_v}$, an economy with a nontraded production sector always prefers a full tariff system to a full VAT system while maintaining the same tax revenue.*

Proof. Since $G_t = G_v$, that is,

$$\tau_v[\widehat{\theta}_v + \widehat{\theta}_v P_v / (1 + \tau_v)] = \tau_t[\widehat{\theta}_t P_t / (1 + \tau_t)], \quad (2.21)$$

rearranging the equation yields

$$\widehat{\theta}_t P_t / (1 + \tau_t) = \frac{\tau_v}{\tau_t} \widehat{\theta}_v [1 + P_v / (1 + \tau_v)], \quad (2.22)$$

U_t^2 can be expressed as $\frac{\tau_v}{\tau_t} \widehat{\theta}_v \widehat{\theta}_t [1 + P_v / (1 + \tau_v)]$. As $U_v^2 = \widehat{\theta}_v^2 \frac{P_v}{1 + \tau_v}$, a full tariff system is better than a full VAT system when

$$\frac{\tau_v}{\tau_t} \widehat{\theta}_v \widehat{\theta}_t [1 + P_v / (1 + \tau_v)] > \widehat{\theta}_v^2 \frac{P_v}{1 + \tau_v}, \quad (2.23)$$

that is

$$\frac{\tau_v}{\tau_t} \hat{\theta}_t [1 + (1 + \tau_v)/P_v] > \hat{\theta}_v. \quad (2.24)$$

Following Lemma 1, the VAT causes production distortion when the import tax has no effect on production efficiency, $\hat{\theta}_t > \hat{\theta}_v$. The inequality $\frac{\tau_v}{\tau_t} \hat{\theta}_t [1 + (1 + \tau_v)/P_v] > \hat{\theta}_v$ holds as long as

$$\frac{\tau_t}{\tau_v} < 1 + \frac{(1 + \tau_v)}{P_v}. \quad (2.25)$$

Because $P_v = \hat{\theta}_v + \tau_v < 1 + \tau_v$, this means that $1 + (1 + \tau_v)/P_v > 1 + 1 = 2$. $\frac{\tau_t}{\tau_v} < 2$. In other words, a full tariff system is always preferred to a full VAT system when $\frac{\tau_t}{\tau_v} < 2 < 1 + \frac{(1 + \tau_v)}{P_v}$. ■

The implication of Proposition 3 is straightforward. In an economy with a non-traded production sector, the disadvantage of VAT is the negative effect on the output. As long as this influence exceeds the higher consumption distortion from a narrower base trade tax, replacing the VAT with the trade tax improves social welfare. Compared with Proposition 2, which demonstrates that the VAT is always better than the tariff without considering the change in the output, Proposition 3 implies a possible circumstance in which the VAT is worse than the tariff taking the production distortion into account.

However, to simplify the analysis, all the comparisons above are based on an extreme circumstance which ignores the informal sector. By taking the informal sector into account, the sufficient condition generated in Proposition 3 is absolutely strengthened.

2.2 The Comparison with a Flexible Informal Sector

First consider the change in the tariff regime when an informal sector is added. Because in the tariff regime no tax is collected on good X , the formal sector is more profitable than the informal sector when they receive the same price. Figure 3 illustrates that the formal sector has a higher profit while receiving the same revenue as

the informal sector. There is no entrepreneur choosing to operate informally. Thus consideration of the informal sector has no effect on the tariff regime.

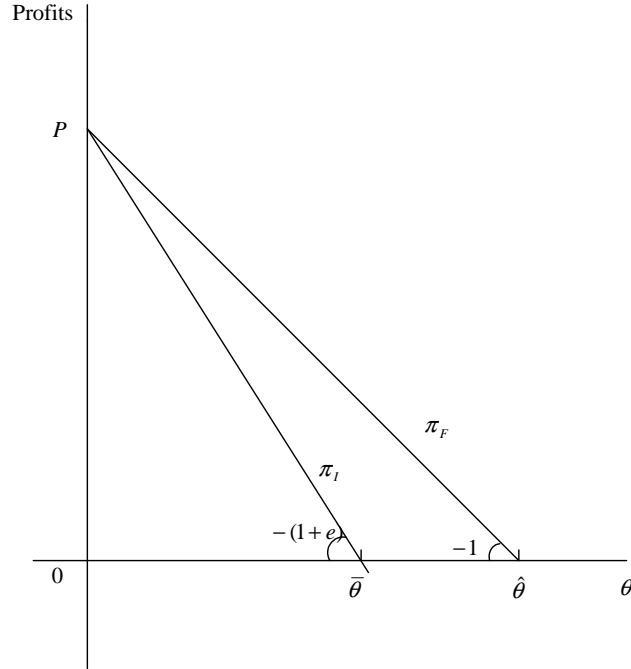


Figure 2.3: The costs of two type of firms facing the same price

However, the existence of an informal sector does change the social welfare of the VAT regime. Since the informal sector is able to evade paying tax, the tax revenue collected is

$$G_v = \tau_v [(\hat{\theta}_v - \tau_v/e) + \hat{\theta}_v P_v / (1 + \tau_v)], \quad (2.26)$$

less than the tax revenue

$$G_v = \tau_v [\hat{\theta}_v + \hat{\theta}_v P_v / (1 + \tau_v)] \quad (2.27)$$

that is collected in the economy without an informal sector. To maintain the same budget, the government has to raise the VAT rate. Following Proposition 1, this policy sharply diminishes the subsistent firms in the formal sector and enlarges the scale of the informal sector, and thus distorts the total output further. As a result, the social welfare in the VAT regime is worsened.

Encompassing the informal sector hurts welfare under the full VAT regime but has no influence on that under the full tariff regime. Recall that the trade tax system has a higher social welfare as long as $\frac{\tau_t}{\tau_v} < 1 + (1 + \tau_v)/P_v$ without an informal sector. Now with the consideration of an informal sector, the welfare of the tariff regime remains steady, but the welfare of the VAT regime decreases. This strengthens the conclusion of Proposition 3. Before we relax those strict assumptions, let's return to the main issue of this paper: what impact does an integrated tax reform have on an economy with a nontraded production sector? Based on the discussion above, it is possible to find some plausible conditions under which a tax reform inclined to tariffs is welfare-improving.

2.3 Integrated Reforms of Tariffs and VATs

According to the extreme comparison between the tariff regime and the VAT regime, a transition from the full VAT regime to the full trade tax regime tends to improve welfare under the condition defined in Proposition 3. The sufficient condition, which keeps the distortion from the VAT higher than the distortion from tariffs, is $\frac{\tau_t}{\tau_v} < 2$ or in a more generalized format $\frac{\tau_t}{\tau_v} < 1 + (1 + \tau_v)/P_v$. With a simple transformation, the condition can be derived as

$$\tau_t < \tau_v + \tau_v \frac{(1 + \tau_v)}{P_v}. \quad (2.28)$$

Multiplying Y^v by both sides, the condition is presented as

$$\tau_t Y^v < \tau_v \left[Y^v + \frac{Y^v(1 + \tau_v)}{P_v} \right], \quad (2.29)$$

where $\frac{Y^v(1 + \tau_v)}{P_v} = X^v$. Replacing $\frac{Y^v(1 + \tau_v)}{P_v}$ with X^v yields

$$\tau_t Y^v < \tau_v (Y^v + X^v) = \tau_t Y^t, \quad (2.30)$$

which reduces to $Y^v < Y^t$ ⁷. Y^t represents the distorted consumption of good Y in the trade tax system, and Y^v is the distorted consumption of good Y in the VAT regime.

⁷ X^v , Y^v and Y^t are the units of good X consumed in the VAT regime, the units of good Y consumed in the VAT regime and the units of good Y consumed in the trade tax regime, respectively.

The former only involves the distortion on consumption whereas the latter consists of the influences from the production and the consumption distortion. Provided that $Y^v < Y^t$, the welfare reduction in the VAT regime is always greater than that of tariffs. Thus under this condition the social planner prefers tariffs. This condition implies a requirement that the transition raises the consumption of good Y . From this comes a reasonable inference that any movement toward the full tariff regime during the process that cuts the VAT and increase the import tariff to maintain the tax revenue is welfare-improving as long as it increases the consumption of good Y . In other words, an integrated revenue-neutral tax reform combining a decrease in VAT with an increase in trade tax enhances welfare with this requirement. This leads to a corollary of Proposition 3:

Corollary 1 *A coordinated revenue-neutral tax reform involving an increase in tariffs and a reduction in VATs is welfare-improving if it enhances the consumption of good Y .*

Following Proposition 3, since a reduction in the VAT improves the production efficiency, which actually increases the units of good X consumed domestically, if the overall effect of the tax reform increases the consumption of good Y as well, this integrated tax reform benefits the economy. Corollary 1 reflects a circumstance in which the gain in the production efficiency by reducing the VAT is able to compensate the distortion in the consumption of imported goods due to a higher import tariff.

The result generated tends to favor a tariff over the VAT, which is unlike the conclusions in early outstanding papers concerned with tax reforms. The previous research on integrated tax reforms always selected as a study object a small open economy in which producers take prices as given. This approach obviously simplifies the analysis and to some extent preserves the main characteristic of many developing countries. As a result, the VAT doesn't affect the price received by domestic producers, while the tariff does cause differences between domestic prices and world prices. Thus in a small open economy model, tariffs are the reason for distortions of production rather than VATs. However, if prices are determined endogenously, the levy of VAT would distort the output as well as the gross income, which reduces the expenditure

of the country. That may explain why this model favors a tax reform toward the tariff regime and previous research preferred a tax reform toward the VAT regime. However, compared with the assumption of a small open economy, assuming that the economy has only a nontradable production sector seems to lose generality. Moreover, some basic settings in the model can be relaxed. To avoid any unnecessary misestimates, it is essential to reconsider the conclusion while relaxing some assumptions.

2.4 Further Discussion

In this section, further discussion about relaxing the strict constraints will be developed along several aspects.

First, the model assumes that the product of this country is nontraded, which makes the price of that good be endogenous. Although endogenous prices are often observed in most tertiary sectors, exogenous prices which are consistent with the trend of trade liberalization are more prevalent for a small developing country. There are two approaches to solve this problem. The first one is turning the production sector to be tradable which actually reverses the conclusion. Since this method saves the basic assumption of previous papers, it induces the circumstance in which tariffs, not the VAT, distort the production efficiency. If the VAT doesn't affect the production efficiency, from Proposition 2, it can be shown that the full VAT regime is always better than the tariff regime. Thus this change makes the VAT preferable. The second approach is to introduce another tradable production sector into the model. We have to define the extra sector carefully to evaluate an approximate social welfare change. According to different assumptions imposed on the tradable production sector, the results may vary in different directions. Basically, the change in the results would depend on the relative influences of the tradable sector and the nontradable sector on the economy. Supposing that the influence of the nontradable sector dominates that of the tradable sector, the results are maintained, as the impact of adding a tradable sector can be ignored. But if the tradable sector has a significant impact on the economy, a tax reform toward VAT may be welfare-improving under some conditions.

Second, the assumption of import tariffs should be extended to include export tax.

However, this extension can't be achieved unless the product is tradable. Within the basic setting of the model, the consideration of export tariffs is meaningless. Instead of adopting an export tax, consider a similar type of trade tax: an import subsidy. If the imported good is subject to an import subsidy, any increase in the subsidy rate can be seen as a decrease in the import tariff rate, similarly, any decrease in the subsidy rate equals an increase in the import tariff rate. This affects the comparison between the tariff regime and the VAT regime, because in a tariff regime with import subsidies, no tax revenue can be collected. But ignoring the inability to collect tax revenue, this substitution has little effect on the final conclusion if we regard the import subsidy as the reverse of an import tariff.

Third, the most arguable setting of the model is the fixed output assumption. Normally producers are able to choose their output to maximize their profits. Allowing the output to be adjusted may affect the distortion impact of VAT on production efficiency. With an increase in VAT, illegal firms are earning a higher profit and expand their production scale while legal firms tend to operate illegally and cut their outputs. The change in the total output is ambiguous. When such an increase in VAT stimulates the total output, an integrated tax reform toward the VAT regime is welfare-improving. Otherwise, a tax reform toward the tariff regime is still preferable under the condition defined in Corollary 1. Also relaxing the assumption of fixed output enables the model to become more convincing. In the reality, informal firms often charge a lower price than formal firms do to gain a higher market share. But on the fixed output assumption, it is profitless for informal firms to sell in a lower price because the amount of products sold is fixed. Relaxing this setting enables the model to include the situation when informal firms lower their prices to sell more.

In addition, the consumer preference parameter γ may vary. To simplify the comparison, we set $\gamma = 1/2$, which means consumers have the same preference toward good X and good Y . If consumers value good Y higher than good X , a lower tariff is in favor. On the contrary, consumers preferring good X would expect a lower VAT. In other words, variation of γ may change the tax ratio in Proposition 3. Furthermore, if the specific Cobb-Douglas utility function is replaced by a more general one, the levy

of tariffs may diminish the demand for good Y, even prevent the economy from participating in international trade. In this circumstance, the extinction of imported sector excludes tariffs as an approach to raise tax revenue. It makes the VAT the better tax system. A strong empirical evident is that those early developing countries adopting VAT seldom have a huge import sector. The number shown in Table 1 represents the average share of import in those countries' GDP when they adopted VAT. It's obvious that the pioneers have a smaller import share than those later countries. That may explain why VAT has experienced slow progress in lots of developing countries.

Chapter 3

Conclusion

During decades of works on the integrated reforms of tariffs and commodity taxes, economists failed to reach an agreement on whether the adoption of VAT is welfare-improving. The controversy is concentrated on the disadvantage of VATs. In the presence of an informal sector, the efficiency loss of VAT due to an incomplete coverage is normally considered as a drawback. While some have argued that the informal sector is still subjected to VAT without the possibility to claim a tax refund, others have investigated the problems concerning the informal sector in depth. By allowing the scale of informal sector to be determined endogenously, the levy of VAT may have an impact on the size of the informal sector. For example, Boadway and Sato (2009) tried to use an optimal commodity tax approach to compare trade taxes and VATs while making the size of the informal sector endogenous.

This paper, following the conception in Boadway and Sato (2009) that the scale of the informal sector flexibly responds to the VAT, constructs a nontraded economy model to analyze the welfare effect of an integrated tax reform. Through comparing the VAT regime with the tariff regime without any informal sector, a plausible condition is generated under which the tariff system is favorable. The addition of an informal sector strengthens the conclusion. Then it is possible to show that an integrated revenue-neutral tax reform toward the tariff system is welfare-improving, as long as the consumption distortion resulting from a higher tariff can be compensated

by the production improvement due to a lower VAT. However, unlike the case presented in Boadway and Sato (2009), in which all goods are tradable and the advantage of VAT is maintaining production efficiency in the formal sector, in this paper the products are assumed to be nontraded and hence the VAT distorts the total output. As a result, the comparison in Boadway and Sato (2009) partially depends on the inability to tax profits of the formal sector, while the comparison of this model relies on the production inefficiency caused by the VAT. In the previous papers, one of the virtues of VAT is that it keeps the production efficiency of the formal sector as well as the collection efficiency, for those papers assumed a small open economy in which prices are fixed. But in an economy with a huge nontraded production sector, where the price is determined endogenously, the levy of VAT may affect the domestic equilibrium and distort the aggregate output. With the existence of a flexible informal sector, the distortion becomes more serious. In such a circumstance, the desirability of VAT is potentially weakened.

In developing countries, especially those heavily reliant on the domestic market, the existences of an informal sector and a nontraded production sector strongly prevent the country transforming from tariffs to VAT-type commodity taxes. The resistance comes from many concerns, of which the most important one can be explained by the distorting effect of VAT on the nontraded production. This may provide another reason to reconsider the adoption of VAT besides the incomplete coverage for developing countries.

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