**DEPARTMENT OF ECONOMICS**
**UNIVERSITY OF CYPRUS**

# TRADE AND TAX REFORMS IN A CASH-IN-ADVANCE ECONOMY

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**Discussion Paper 2009-01**

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# Trade and Tax Reforms in a Cash-in-Advance Economy

**April 2009**

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## Abstract

We examine the effects of coordinated trade-tax reforms and isolated tariff reforms on market access, government revenue and welfare for a small monetary economy, under the assumption that a certain fraction of purchases of each good must be financed with cash held in advance. Moreover, we allow for this fraction of purchases to vary across markets, in the sense that the required amount of money balances per unit of value is different for each good. We show that: i) a uniform radial reduction of tariffs has ambiguous effects on both welfare and market access ii) coordinated tariff-tax reforms are more efficient in improving market access and welfare than a reform that involves only tariffs and iii) export and production tax reforms that keep producer prices unchanged might be welfare deteriorating.

***Keywords:*** Tariff Reform; Tax Reform; Cash-in-Advance Constraint
***JEL Classification:*** F13; H20; E10

**Acknowledgments:** The authors are grateful to Panos Hatzipanayotou, and Leo Michelis for constructive comments. The usual disclaimer applies.

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## 1. Introduction

IMF's and World Bank's structural adjustment and stabilization programs often involve a reduction in trade taxes that is accompanied by an increase in consumption taxes.[1] For this reason, there has been a lot of attention paid to the welfare, revenue and market access effects of such trade-tax reforms. The results established in the trade and tax reform literature, noted below, have indubitably generated important policy implications. However, the theoretical work on these issues has so far been conducted exclusively within a non-monetary framework. A natural question therefore arises: How do trade–tax reform strategies affect welfare, market access, and government revenue when carried out in a monetary economy? The purpose of this paper is to re-examine these issues within a monetary framework. We consider isolated tariff reforms as well as two types of joint reform strategies that are very common in the literature: i) a reduction in import tariffs combined with an increase in consumption taxes so as to keep consumer prices unchanged, and ii) a reduction in export taxes combined with an increase in production taxes so as to leave producer prices unchanged.

In the existing trade and tax reform literature, the main result has been that reductions in import tariffs (export taxes) combined with increases in consumption taxes (production taxes) improve welfare and government revenue (see, among others, Michael et al. 1993, Hatzipanayotou et al. 1994, Keen and Ligthart 2002, and Emran 2005).[2] This occurs because a tariff-tax reform that leaves consumer prices unchanged improves production efficiency, by reducing the excessive production of the importable goods, and at the same time increases government revenue, by reducing the implicit production subsidies. Likewise, an export and production tax reform that keeps producer prices unaffected improves consumption efficiency, by reducing excessive consumption of the exportable goods, and at the same time increases government revenue, by reducing implicit consumption subsidies.

Since market access plays an important role in trade negotiations, the recent literature has also analyzed the market access effects of tariff changes.[3] For example, Ju and Krishna (2000) show that tariff reductions that improve welfare may hurt market access. Anderson and Neary (2007) and Falvey and Kreickemeier (2008)

[1] See, for example, IMF (2005) and Rajaram (1994).
[2] A notable exception is Emran and Stiglitz (2005), who show that in the presence of an informal sector coordinated trade-tax reforms may reduce welfare.
[3] Market access is defined as the value of imports at world prices.

identify tariff reform rules that ensure an improvement in welfare and market access. Finally, Kreickemeier and Raimondos-Møller (2008) (henceforth KR) consider the welfare and market access effects of combined tariff-tax reforms and show that such reforms are less efficient in improving welfare and market access than simple tariff reductions alone.

The importance of analyzing what may seem as purely international trade issues within a monetary environment has been demonstrated by Palivos and Yip (1997a,b), who derive the welfare effects of tariffs and import quotas, respectively, in a generalized cash-in-advance model. They show that the presence of a cash-in-advance constraint may alter standard results in the international trade literature, by introducing a wedge between the relative prices of goods faced by consumers and the world relative prices that are still relevant to the domestic producers. In a similar framework, Chao and Yu (1999) investigate the shadow price of foreign exchange, whereas Chao and Yip (2000, 2001) re-examine the optimal trade policy in the presence of sector-specific unemployment and non-traded goods, respectively. Palivos and Yip (2006) determine the optimal trade policies in a monetary economy with endogenous labor supply and learning by doing.

This paper differs from the aforementioned literature in several aspects. First, it does not seek to characterize the optimal tariff or tax, which is the main concern of the money-trade literature; rather it takes as a starting point the existence of arbitrary levels of distortionary tariffs and/or taxes, as is the case in the trade and tax reform literature. Second, unlike the existing money-trade literature, it analyzes situations that involve more than one policy instrument. Third, it is concerned not only with welfare but also with the effects of trade and tax policies on government revenue and market access. Finally, the paper complements the tariff and tax reform literature in that it examines similar issues in the presence of liquidity constraints, which are important especially in developing countries.[4]

Our model examines tariff and tax reforms in the context of a small open monetary economy, where money is introduced in the economy via a generalized cash-in-advance (henceforth *CIA*) constraint, in such a way that cash requirements per unit of value purchased differs across goods. In this framework, we re-examine the effects of isolated tariff reforms and coordinated tariff-tax reforms on welfare,

[4] Evidence for the existence of liquidity constraints similar to the ones considered here can be found in, among others, Palivos and Yip (1997a, b).

government revenue, and market access. We show that, in a monetary economy, a uniform radial reduction of tariffs (a reduction of all tariffs by the same proportion) has ambiguous effects not only on market access but also on welfare. Moreover, in contrast with the results derived in KR, a reduction of import tariffs combined with an equal increase in consumption taxes may improve welfare and market access by more than an isolated tariff reduction. These results arise because the presence of a *CIA* constraint causes an extra monetary distortion in the economy, which is exacerbated under tariff reforms, whereas it remains constant under coordinated tariff-tax reforms. Also, we re-examine the welfare effects of another type of reform strategy, whereby a reduction in the export taxes is combined with an offsetting increase in production taxes so as to keep the producer prices unchanged.[5] In this case, we show that, again contrary to previous results, such a reform may lead to a decrease in welfare.

The remainder of the paper is organized as follows. Section 2 presents the theoretical model. Section 3 examines the effects of isolated tariff reforms and coordinated tariff-tax reforms on welfare and market access. Section 4 examines the welfare effects of export and production tax reforms. Section 5 concludes with a brief summary.

## 2. The model

Consider a small open monetary economy that produces and consumes $N+1$ tradable goods. Let one good indexed by zero ‘‘0’’ be the numeraire,[6] $p^w$ the vector of world prices of the $N$ non-numeraire goods, $t>0\,(<0)$ the specific import tariffs (export taxes), and $\varepsilon$ the production taxes, respectively. Then the vector of the domestic producer prices of the non-numeraire goods is given by $p = p^w + t - \varepsilon$. On the other hand, the vector of the domestic consumer prices is given by $q = p^w + t + \tau$, where $\tau$ denotes specific consumption taxes. There are no taxes applied on the numeraire good, i.e., $p_0 = q_0 = p_0^w$.[7]

[5] See Keen and Ligthart (2002), Emran and Stiglitz (2003), and Emran (2005) for this type of reform.
[6] Note that more than one goods can be untaxed and serve as a composite numeraire good (see Emran 2005, and Anderson and Neary 2007).
[7] The numeraire good can be an importable good as well (see Emran 2005). In fact, for reasons that will become transparent later, in Section 4 we assume that the non-numeraire goods are the exportable goods while the numeraire good is the importable.

Consumers maximize their utility function $u = u(D_0, ..., D_n)$, where $D_i$ is the consumption of the $i^{th}$ commodity, $i = 0,1,....,N$. A crucial element of this economy is that a certain fraction of purchases of each good must be financed with cash. More specifically, as in Palivos and Yip (1997a,b), we assume the following generalized cash-in-advance (*CIA*) or liquidity constraint

$$\phi_x q_0 D_0 + \phi_m q' D \leq M \ ,$$

where, in addition to the $q_0$ and $q$,[8] the cash-requirement ratios for purchasing the exportable and importable goods are denoted by $\phi_x$, $\phi_m$, respectively, and are positive scalars $(0 \leq \phi_i \leq 1, \ i = x, m)$, and $M$ is the total money demand. Palivos and Yip (1997a,b) offer empirical evidence regarding the existence of such a generalized *CIA* constraint.

The consumer's utility maximization problem can be represented in terms of its dual of cost minimization. The expenditure function is defined as: $E\left[(1+\phi_x)q_0, (1+\phi_m)q, u\right] = \min\left[q_0 D_0 + q'D + M : u(D_0, D) = u \text{ and } \phi_x q_0 D_0 + \phi_m q'D = M\right]$. Assuming that the price of the numeraire good is equal to 1, we can write the expenditure function as $E(1, q(1+\delta), u)$ where $\delta = \left(\phi_m - \phi_x\right)/(1+\phi_x), \ |\delta| < 1,$ denotes the implicit price markup that the consumer must pay due to the monetary distortion introduced by the *CIA* constraint. We refer to $q_v = q(1+\delta)$ as the *virtual price* vector of the non-numeraire goods.[9] Note that the asymmetric cash requirements between exportable and importable goods generates a consumption distortion, measured by the size of $\phi_x$ relative to that of $\phi_m$. In the special case $\phi_x = \phi_m = 0$ we have a barter economy, where no cash is required for the purchase of a good, whereas when $\phi_x = \phi_m > 0,$ and hence $\delta = 0,$ the cash-requirement ratios are the same across all goods in the economy.[10]

[8] A prime denotes transposition of a vector.

[9] Notice that $\delta$ captures the proportional increase or decrease in the domestic consumer prices, depending on whether $\phi_x$ is greater or smaller than $\phi_m$, owing to the monetary distortion (*CIA* constraint).

[10] Palivos and Yip (2006) show that if there exists an endogenous labor-leisure choice, then the results in the case where $\phi_x = \phi_m > 0$ are still different from the ones obtained in a barter economy, simply because, contrary to other goods, leisure is not subject to a liquidity constraint.

Let $R(p_0, p)$ denote the revenue function; it gives the maximum value of domestic production given the domestic producer prices ( $p_0, p$ ). The equilibrium of this economy requires that total spending $E(q_v, u)$ on goods and money holdings be equal to the income from production of private goods $R(p)$, plus the money supply $\bar{M}$, plus all tax revenue $G$, which we assume that the government redistributes in a lump-sum fashion to domestic households, that is,[11]

$$E(q_v, u) = R(p) + \bar{M} + G. \tag{1}$$

The government tax revenue is generated from three forms of taxes, namely trade, consumption and production taxes. We often refer to the last two forms as "domestic" taxes. Thus,

$$G = t'(E_{q_v} - R_p) + \tau' E_{q_v} + \varepsilon' R_p = \gamma' E_{q_v} + \lambda' R_p, \tag{2}$$

where $\gamma = t + \tau$ denotes the total tax burden rate on consumption, and $\lambda = \varepsilon - t$ is the total tax burden rate on production. Also, the partial derivatives of the expenditure function with respect to $u$ and $q_v$, $E_u$ and $E_{q_v}$, denote respectively, the reciprocal of the marginal utility of income and the compensated demand vector. The derivative of the revenue function with respect to $p$, $R_p$, on the other hand, denotes the supply vector in the economy. We follow standard assumptions in the literature and assume that $E_{q_v q_v}$ and $R_{pp}$ are negative and positive definite, respectively.

Market access is defined as the value of imports at world market prices (Ju and Krishna 2000)

$$A = p^{w\prime}\left[E_{q_v}(q_v, u) - R_p(p)\right]. \tag{3}$$

We conclude this section by deriving the effects of changes in trade and domestic taxes on government revenue, welfare and market access. Totally differentiating equation (2) we obtain

$$dG = \gamma' E_{q_v u} du + \left[(1+\delta)\gamma' E_{q_v q_v} + E'_{q_v}\right] dq + \left(\lambda' R_{pp} - R'_p\right) dp, \tag{4}$$

[11] Henceforth, to simplify the notation, we omit the price of the numeraire good from both the expenditure and the revenue functions.

where $dq_v = (1+\delta)dq = (1+\delta)(dt + d\tau)$ and $dp = dt - d\varepsilon$. Moreover, differentiating equation (1) and using equation (4), we have

$$\Omega du = \left[ (1+\delta)\gamma' E_{q_v q_v} - \delta E'_{q_v} \right] dq + \lambda' R_{pp} dp , \tag{5}$$

where $\Omega = \left( E_u - \gamma' E_{q_v u} \right) > 0,$ assuming that goods are normal in consumption. Finally, differentiation of equation (3) results in

$$dA = (1+\delta)\, p^{w\prime} E_{q_v q_v} dq - p^{w\prime} R_{pp} dp + p^{w\prime} E_{q_v u} du . \tag{6}$$

Equations (4), (5) and (6) are the main equations of the model and are used to examine the effects of trade-tax reforms on government revenue, welfare and market access.

**3. Tariff -Tax Reforms**

In this section we examine reforms that involve i) only tariffs and ii) tariff and consumption taxes. We are interested in the effects of such reforms on welfare, government revenue and market access for the small open monetary economy, described in Section 2 above.

*3.1. Tariff Reform*

Consider a uniform radial reduction of all import tariffs, i.e., $dt = -\theta t$, where $\theta$ is a small positive scalar, while consumption and production taxes remain zero (i.e., $\tau = 0,\ \varepsilon = 0$). Then, with only tariffs $dq = dt$, $dp = dt$, $\gamma = t$, and $\lambda = -t$, where it may be recalled that *q* and *p* denoted domestic consumer and producer prices, whereas $\gamma$ and $\lambda$ are the total tax burden rates on consumption and production, respectively. Using equation (4), the effect of a radial reduction of all import tariffs on welfare is

$$\Omega du = \left( t'S - \delta E'_{q_v} \right) dt = -\theta (t'S - \delta E'_{q_v}) t , \tag{7}$$

where $S \equiv (1+\delta)E_{q_v q_v} - R_{pp}$ in equations (7) and (8) is a negative definite matrix.[12] Furthermore, using equations (4) and (7), we obtain

$$dG = t'E_{q_v u}du - \theta\left(E'_{q_v} - R'_p\right)t - \theta t'St = E_u du - \theta\left[(1+\delta)E'_{q_v} - R'\right]t\,. \tag{8}$$

Equation (7) shows that a uniform radial reduction of all import tariffs affects welfare through two effects. The first term on the RHS, $-\theta t'St,$ is positive and denotes the standard welfare effect of a change in tariffs. The second term on the RHS, $\theta\delta E'_{q_v}t,$ represents the indirect effect of a radial reduction of imports tariffs on welfare, and is due to the asymmetric cash requirements. In a barter economy, where a financial constraint is absent, i.e., $\phi_x = \phi_m = 0$ and hence $\delta = 0,$ a uniform proportional decrease in all tariffs increases welfare unambiguously. This is a standard result in international trade literature within a barter economy context.[13] The same result also holds in a monetary framework in the special case where $\phi_x = \phi_m > 0$ and hence $\delta = 0$ again, i.e., the cash requirements are the same for the consumption of the exportable and the importable goods. Nevertheless, in a monetary economy where $\phi_x \neq \phi_m \neq 0$ the indirect effect owing to the asymmetric cash requirements is present. The sign of this effect depends on the magnitude of $\phi_x$ relative to that of $\phi_m$. In particular, if the exportable good requires more cash balances per unit of value than the importable goods, i.e., $\phi_x > \phi_m$, and hence $\delta < 0$, then the monetary distortion affects welfare negatively; that is, the direct and indirect effects work in opposite directions. Thus, if the adverse monetary distortion is sufficiently large to outweigh the direct welfare-improving effect, then a uniform proportional cut in tariffs decreases a country's welfare.

Equation (8) indicates that a radial reduction of import tariffs has an ambiguous effect on government revenue. On the one hand, holding the level of imports constant, a radial reduction of tariffs reduces tariff revenues. On the other hand, a radial

[12] The substitution matrix will be negative definite provided there is some substitutability between the numeraire good and at least one other good (see Neary 1998).

[13] For the intuition of this welfare-enhancing result of uniform proportional cuts in tariffs see footnote 2 in Ju and Krishna (2000). They also provide intuition for another popular tariff reform rule, the so-called concertina rule. According to this rule, the highest tariff is reduced to next highest level, while holding all other tariff rates constant.

reduction of import tariffs may increase tariff revenues, because the level of imports rises.

Next we examine the effects of a radial reduction of import tariffs on market access. Solving equation (7) for $du$ and substituting to equation (6) we obtain,

$$dA = (p^w + \beta t)'Sdt - \delta\beta E'_{q_v} dt \,. \tag{9}$$

where $\beta = p^{w\prime} E_{q_v u} \big/ (E_u - t' E_{q_v u})$ is the marginal propensity to spend on importable goods and is assumed to be strictly between zero and one. If we set $\phi_x = \phi_m = \delta = 0$ and $dt = -\theta t$ in equation (9), we derive equation (15) in Ju and Krishna (2000), which in terms of our notation is written as $dA = -\theta(p^w + \beta t)'St$. Accordingly, the effect of an isolated tariff reform has an ambiguous effect on market access. Nevertheless, in a monetary framework, when $\phi_x \neq \phi_m \neq 0$ there is a second (indirect) effect due to the asymmetric cash requirements, which is represented by the second term on the RHS of equation (9). The sign of this term is also ambiguous since it depends on the sign of $\delta$.

Ju and Krishna (2000) also consider a rule of the form $dt = -\theta(p^w + \beta t)$ (the "Ju-Krishna rule"). They show that such a rule increases import value for a small open economy.[14] In a monetary environment, however, as it can be seen after direct substitution in (9), this reform rule has ambiguous effects on market access. The following proposition summarizes our results in this sub-section.

**Proposition 1.** *In a small open monetary economy, a proportional reduction of only tariffs has an ambiguous effect on welfare and will decrease it if: i)* $\phi_x > \phi_m \Rightarrow \delta < 0$, *and ii) the indirect effect (monetary distortion) outweighs the direct effect. Under the same conditions, a proportional reduction of tariffs alone according to the "Ju-Krishna rule" reduces market access.*

[14] Note that even though the "Ju-Krishna rule" increases market access, it cannot ensure welfare improvement. This result can be derived in terms of our notation by substituting $dt = -\theta(p^w + \beta t)$ in equation (7) and setting $\phi_x = \phi_m = \delta = 0$; moreover, it remains valid in the current monetary framework as well.

*3.2 Tariff-Tax Reform*

Next we examine the implications of coordinated tariff and consumption tax reforms that leave all consumer prices unchanged, i.e., $dq = 0$, holding production taxes constant. In the present context of domestic taxes and import tariffs, a radial reduction of all tariffs combined with an increase of all consumption taxes so as to leave the consumer prices unchanged, is $dt = \theta\lambda$, where $\lambda$ is the vector of net production subsidies on the imported goods. Using equation (5) and that $dt = \theta\lambda$ we obtain,

$$\Omega du = \lambda' R_{pp} dt = \theta\lambda' R_{pp}\lambda > 0 . \tag{10}$$

Furthermore, using equations (4) and (10), we obtain

$$dG = \gamma' E_{q_v u} du + \lambda' R_{pp} dt - R_p' dt = E_u du - \theta R_p' \lambda > 0 . \tag{11}$$

Hatzipanayotou et al. (1994), Keen and Ligthart (2002) and KR have shown, within barter frameworks and with no production taxes, that a coordinated tariff-tax reform increases welfare and government revenue. Equations (10) and (11) indicate that this result is valid even in the presence of asymmetric cash requirements between the exportable and importable goods. Intuitively, since a coordinated tariff-tax reform leaves consumer prices unchanged, the monetary distortion introduced by the asymmetric cash requirements is neutralized. However, in the present context of production taxes in addition to import tariffs and consumption taxes, this result holds under the assumption that all imported goods are burdened with a net production subsidy.

Consider next the effect of coordinated tariff-tax reforms on market access. Using equation (6) and taking into account that $dq = 0$ we obtain,

$$dA = p^{w\prime} E_{q_v u} du - p^{w\prime} R_{pp} dt . \tag{12}$$

Using (10) to substituting for $du$ in equation (12), we have

$$dA = \left(\beta\lambda - p^w\right)' R_{pp} dt. \tag{13}$$

By setting $dt = \theta\lambda$ in equation (13) we obtain $dA = \theta\left(\beta\lambda - p^w\right)' R_{pp}\lambda$, and thus a tariff-tax reform that keeps consumer prices unchanged has an ambiguous effect on market access, regardless of the presence or not of asymmetric cash requirements. The explanation is once again that this type of reform keeps consumer prices constant and thus the monetary distortion is neutralized.

To complete this subsection, we consider now the effect on market access of a reduction of tariffs according to the "Ju-Krishna rule" combined with an equal increase of consumption taxes so as to leave consumer prices unchanged. According to the "Ju-Krishna rule" for the coordinated tariff-tax reforms, the reform is of the type $dt = \theta\left(\beta\lambda - p^w\right)$, appropriately modified to take into account the presence of production taxes in addition to import tariffs and consumption taxes. By substituting this formula in equation (13) we obtain $dA = \theta\left(\beta\lambda - p^w\right)' R_{pp}\left(\beta\lambda - p^w\right)$, and thus the "Ju-Krishna rule" increases import value in the present framework, under the assumption that all imported goods are burdened with a net production subsidy. We summarize these arguments in the following proposition.[15]

**Proposition 2.** *Consider a small open monetary economy where government revenue is financed by tariff and domestic tax revenues. Then, a radial reduction of import tariffs combined with an equal increase in consumption taxes that leaves consumer prices unchanged increases welfare and government revenue, if all imported goods are burdened with a net production subsidy. Under the same condition, a reduction of tariffs according to the "Ju-Krishna rule" accompanied by an equal increase in consumption taxes that keeps consumer prices constant increases market access.*

In the next subsection, we compare the welfare and market access effects of a tariff reform alone with those of a coordinated tariff-tax reform. This comparison is useful because it make obvious the difference between our results and those in KR.

[15] KR in their paper extend the "Ju-Krishna rule" in order to examine how a reduction of tariffs according to this rule affect market access, when is accompanied by an equal increase of consumption taxes (the "modified Ju-Krishna rule"). They show that the "modified Ju-Krishan rule" cannot ensure an increase in welfare. The same result obtains in the current framework as well.

*3.3 Tariff-Tax Reform versus Tariff Reform*

We compare the welfare effects of the two reforms in the case where the initial consumption and production taxes are zero. In this case it follows that $\gamma = t$ and $\lambda = -t$. Subtracting equation (10) from equation (7), setting $dt = -\theta t$, and substituting for $S = (1+\delta)E_{q_v q_v} - R_{pp}$ we obtain,

$$\Omega\left[ du\big|_{Tariff} - du\big|_{Tariff-Tax} \right] = t'\left[ (1+\delta)E_{q_v q_v} - R_{pp} \right] dt - \delta E'_{q_v} dt + t' R_{pp} dt$$
$$= -\theta(1+\delta) t' E_{q_v q_v} t + \theta\delta E'_{q_v} t \,. \qquad (14)$$

Setting $\phi_x = \phi_m = \delta = 0$ in equation (14), the second term on the RHS vanishes and we obtain the result in KR, namely that in a barter economy a proportional reduction in tariffs leads to a higher increase in welfare than a proportional coordinated tariff-tax reform that keeps consumer prices unchanged.

The same result emerges in a monetary economy if $\phi_x = \phi_m > 0$, since even in this case $\delta = 0$. Hence this extends the results of KR in the context of a trading monetary economy with the same cash-requirements for all goods.

Nevertheless, if $\phi_x \neq \phi_m \neq 0$, then, in addition to the standard direct effect (the first term on the RHS of 11), there is also an indirect effect, which is represented by the second term on the RHS of equation (11). In particular, if the exportable sector is more liquidity constrained, i.e., $\phi_x > \phi_m \Rightarrow \delta < 0$, then the term $\theta\delta E'_{q_v} t$ will be negative and thus the overall welfare effect resulting from a proportional reduction of tariffs alone, is ambiguous. Moreover, if this monetary distortion effect dominates the direct effect, then the result in KR that a coordinated proportional tariff-tax reform increases welfare by less than a proportional reduction of only tariffs is reversed.

Next we compare the market access effects of both reforms according to the "Ju-Krishna rule." Subtracting equation (13) from equation (9) and setting $dt = -\theta\left( \beta t + p^w \right)$ yields

$$dA\big|_{Tariff} - dA\big|_{Tariff-Tax} = (1+\delta)(p^w + \beta t)' E_{q_v q_v} dt - \delta\beta E'_{q_v} dt$$
$$= -(1+\delta)\theta\left( \beta t + p^w \right)' E_{q_v q_v} (\beta t + p^w) + \theta\delta\beta E'_{q_v} \left( \beta t + p^w \right). \qquad (15)$$

KR show that the reform of tariffs alone according to the "Ju-Krishna rule" increases market access by more than a reduction of tariffs according to the "Ju-Krishna rule" combined with an equal increase in consumption taxes. This can also be seen from equation (15) where by setting $\delta = 0$ we obtain $dA\big|_{Tariff} - dA\big|_{Tariff-Tax} = -\theta\left(\beta t + p^w\right)' E_{q_v q_v}(\beta t + p^w) > 0$. Nevertheless, in a monetary environment, there is an additional effect (captured by the second term on RHS of 15) due to the asymmetric cash requirements. The sign of this second term depends on the sign of $\delta$ and this renders the overall effect ambiguous. We summarize these in the following proposition.

**Proposition 3.** *In a small open monetary economy, a radial reduction of import tariffs combined with an equal increase in consumption taxes that keeps consumer prices constant increases welfare by more than a proportional reduction of tariffs alone if: i)* $\phi_x > \phi_m \Rightarrow \delta < 0$ *and ii) the indirect effect outweighs the direct effect. Under the same conditions, a reduction of tariffs according to the "Ju-Krishna rule" accompanied by an equal increase in consumption taxes that keeps consumer prices constant increases market access by more than a proportional reduction of tariffs alone.*

## 4. Export and Production Tax Reforms

In this section we examine how a reduction in export taxes with an offsetting increase in production taxes that keeps the producer prices unchanged ($dp = 0$) affects the welfare of a small open monetary economy, when government revenue is financed by export and domestic (production and consumption) taxes. To facilitate the analysis we now assume that the numeraire good is the importable one. The domestic consumer prices of the non-numeraire goods are given by $q = p^w + t + \tau$, where $t < 0$ is the vector of the export taxes. On the other hand, the domestic producer prices for the non-numeraire goods are $p = p^w + t - \varepsilon$. Note that since we denote export taxes by $t < 0$, a reduction of their size implies that, algebraically, $t$ rises. In the present context of domestic taxes and export taxes, a radial reduction of export taxes combined with an equal increase of production taxes so as to leave the producer prices unchanged, is $dt = -\theta\gamma$, where $\gamma$ is the vector of net consumption subsidies on the exported goods.

As shown by Keen and Ligthart (2002) and Emran (2005), a reform that keeps producer prices unchanged increases welfare and revenue.[16] Intuitively, this occurs because an export tax is simultaneously a consumption subsidy and a production tax. A reform strategy that leaves producer prices unchanged is equivalent to a reduction in the consumption subsidy at an unchanged production tax. Thus, the revenue increases because the cost of the subsidy has been reduced. In addition, this reform strategy is welfare-enhancing since it improves consumption efficiency by reducing excessive consumption of exportable goods.

However, in our framework of a monetary small open economy with a generalized *CIA* constraint, there is an additional distortionary effect. In particular, since this reform increases consumer prices, the monetary distortion is exacerbated when $\phi_x > \phi_m$ relative to the case $\phi_x < \phi_m$, and hence welfare is affected negatively. Thus, the overall welfare effect is ambiguous. To examine how a radial reduction of all export taxes combined with an equal increase in production taxes that keeps producer prices unaffected changes welfare and government revenue in the presence of a *CIA* constraint, set $dp = 0$ and $dt = -\theta\gamma$ in equation (5)

$$\Omega du = (1+\delta)\gamma' E_{q_v q_v} dt - \delta E'_{q_v} dt = -\theta(1+\delta)\gamma' E_{q_v q_v}\gamma + \theta\delta E'_{q_v}\gamma . \qquad (16)$$

Furthermore, using equations (4) and (16), we obtain

$$dG = -\theta E'_{q_v}\gamma - \theta(1+\delta)\gamma' E_{q_v q_v}\gamma + \gamma' E_{q_v u} du = E_u du - \theta(1+\delta)E'_{q_v}\gamma . \qquad (17)$$

Equation (16) indicates that a reduction in export taxes with an offsetting increase in production taxes, so that the producer prices remain unchanged, has an ambiguous effect on welfare in the presence of asymmetric cash requirements. The first term on the RHS of equation (16) denotes the standard direct effect that affects welfare positively, if all exported goods are burdened with a net consumption subsidy. The second term on the RHS denotes the indirect effect on welfare due to difference in

[16] Emran (2005) considers a selective reform strategy where a reduction in export tax on a given commodity is offsetting by an equal increase in production tax. Emran and Stiglitz (2003) examine how a radial uniform reduction of all export taxes that is accompanied with an equal increase of production taxes that leaves producer prices constant affects welfare. They show that this radial reform increases welfare and revenue unambiguously. However, in the presence of an informal segment in the economy, this radial reform may be welfare and revenue reducing.

cash requirements between exportable and importable goods. The sign of this term is ambiguous and depends on the size of $\phi_x$ relative to that of $\phi_m$. In particular, if the cash-requirement ratio for purchasing the exportable goods is higher than the cash-requirement for purchasing the importable good, i.e., $\phi_x > \phi_m \Rightarrow \delta > 0$, then this second term is negative. Thus, the overall welfare effect depends on the relative strength of the two opposing effects.

Equation (17) indicates that this type of reform raises government revenue even in the presence of asymmetric cash requirements. However, in the current context of consumption taxes in addition to export and production taxes, a sufficient condition for this type of reform to increase government revenue is that all exported goods are burdened with a net consumption subsidy.

**Proposition 4.** *Consider a small open monetary economy where government revenue is financed by export and domestic tax revenues. Then, a radial reduction in export taxes combined with an offsetting increase in the production taxes, so that the producer prices remains unchanged, has an ambiguous effect on welfare and will decrease it if the following conditions hold: i)* $\phi_x > \phi_m \Rightarrow \delta > 0$*, ii) the indirect effect dominates the direct one, and iii) all exported goods are burdened with a net consumption subsidy. Also, this reform increases government revenue if all exported goods are burdened with a net consumption subsidy.*

The results derived so far in the literature depend critically on the assumption that there are no financial constraints in the economy. Our results show that, when financial constraints are taken into account then the reduction of all export taxes combined with an equal increase in production taxes so as to leave producer prices unchanged may reduce welfare. Thus, the existence of 'win-win' reform strategies in a monetary economy depends crucially on the nature of the *CIA* constraint for purchasing goods.

## 5. Conclusions

A voluminous theoretical literature examines the welfare and revenue effects of coordinated tariff-tax reforms. Recently considerable attention has been paid also to the market access effects of reform strategies. Kreickemeier and Raimondos-Moller

(2008) have shown, within a barter economy, that coordinated tariff-tax reforms are less efficient to improve market access and welfare than reforms that involve only tariffs.

In this paper, we have extended the analysis of Kreickemeier and Raimondos-Møller (2008) for a generalized cash-in-advance economy. We have shown that the existence of a financial constraint weakens and may reverse the results in KR. Moreover, we show that if the exportable goods are more liquidity constrained then tariff-tax reforms that leave consumer prices unchanged increase welfare and may increase market access by more than the reforms of only tariffs. Also, in the presence again of a financial constraint, a reform strategy that leaves producer prices unchanged may be less desirable or even undesirable if the exportable goods are more liquidity constrained.

Trade and tax reform policies are among the conditions that are widely used in IMF's and World Bank's structural adjustment and stabilization programs for developing countries. This paper has shown that accounting for a financial constraint, a typical feature of developing economies, is not just a theoretical curiosity and can have profound implications regarding the effects of such programs.

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