Do Developing Countries Possess any Built-in Mechanism that Copes with External Terms-of-trade Shocks?

Chaudhuri, Sarbajit

University of Calcutta

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Sarbajit Chaudhuri

Dept. of Economics

University of Calcutta

56A, B.T. Road

Kolkata 700 050

India.

Address for communication: Sarbajit Chaudhuri, 384/1 M.B. Road, Nimta, Belgharia, Kolkata 700049, India. Tel: (0)98305-30963 (M), 91-33-557-5082 (C.U.); Fax: 91-33-2844-1490 (P); E-mail: sarbajitch@yahoo.com

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ABSTRACT: This theoretical note shows that developing countries possess an inherent shock-absorbing mechanism that stems from their peculiar institutional characteristics that can lessen the gravity of detrimental welfare consequence of exogenous terms-of-trade disturbances in terms of a two-sector, full-employment general equilibrium model with endogenous labour market distortion. The analysis leads to a couple of important policies that should be adhered to preserve this in-built system. Finally, it offers an important statistically testable hypothesis, empirical validation of which might have an important bearing on formulation of development policies in these countries.

Do Developing Countries Possess any Built-in Mechanism that Copes with External Terms-of-trade Shocks?

1. Introduction and motivation

That developing countries are much more vulnerable to external terms-of-trade (TOT) (the price of its exports relative to the price of its imports) shocks relative to countries in the northern part of the world has been pointed out by several empirical studies. Such fluctuations are undesirable because they contribute to significantly increased volatility in the growth of output and hence social welfare. Studies e.g. Baxter and Kouparitsas (2006), Broda (2004), Mendoza (1995) and Kose (2002) have found that TOT fluctuations are twice as large in developing countries as in developed nations. Baxter and Kouparitsas (2006) have attributed this pattern to the heavy reliance of developing countries on commodity exports, whose prices are more volatile vis-à-vis those of manufactured goods. They also assert that sharp swings in the TOT affect many of the southern economies because they generally have a high degree of openness to foreign trade. According to Broda (2004) developing countries are also very exposed to terms-of-trade fluctuations because they have little influence over their export prices. World markets dictate the price of the goods which the developing economies export. On the contrary, developed countries and oil exporters can exert a substantial control on export prices. So, TOT shifts in developing countries are largely determined by forces outside the control of these nations which led Mendoza (1995) and Kose (2002) to conclude that TOT movements can account for most of the output volatility in these countries.

Switching from fixed to flexible exchange rate regime and export diversification policies have often been advocated to minimize the negative effects resulting from international TOT disturbances.[1] However, possibly nowhere it has been pointed out that these economies have an inbuilt shock-absorbing mechanism that arises due to their peculiar

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[1] See for example, Hoffmann (2007), Tornell and Velasco (2000), Broda (2004), Broda and Tille (2003), Mendoza (1995) and Kose (2002) and Haddad et al. (2011).

institutional characteristics and hence the necessity for designing development policies so as to keep this mechanism unaffected has never been emphasized. In this short theoretical note without undermining the efficacy of other suggested measures, we have demonstrated by using the simplest and possibly the most widely used Heckscher-Ohlin-Samuelson (HOS) trade model for a small open economy with endogenous labour market distortion how the existence of labour market imperfection can lessen the gravity of the detrimental TOT shocks on welfare of these economies. Furthermore, we have shown that policies aimed at deregulating the labour market hurts the effectiveness of the inherent shock-absorbing capacity while trade reforms e.g. lowering the tariff rates on importables produce the opposite effects. Hence, the developing countries are advised to think twice before going for labour market reformatory policies and to enthusiastically implement trade reforms and lower their tariff rates on their importables for shielding themselves at least to a certain extent from detrimental consequence of exogenous volatile price movements in the international market.

Finally, the present analysis suggests an important statistically testable hypothesis. With the help of cross-country data it can easily be examined whether the developing nations with comparatively unregulated labour market characterized by lesser trade unionism and/or lower intersectoral wage differential have been less affected during the last worldwide economic recession vis-à-vis some other countries with relatively higher wage dispersion and trade union activities.

2. The Model

We consider the standard HOS model with labour market imperfection in sector 2 for a small open economy. In sector 2 (a formal sector) workers receive the endogenously determined unionized wage, $W*$, while their counterparts in sector 1 (an informal sector) receive the competitive wage, W. Capital is perfectly mobile between the two sectors and its economy-wide return is r. All other standard assumptions of the HOS model are retained. Sectors 1 and 2 are the export and import-competing sectors, respectively. Commodity prices, P_is are given by the small open economy assumption. Factor

endowments are also exogenously given. There is a tariff at the ad-valorem rate, t on the import of commodity 2 so that its domestic price is P_2^*, where $P_2^* = (1+t)P_2$. Finally, commodity 1 is taken to be the numeraire.

The unionized wage is determined as a solution to the Nash bargaining game between the representative firm and the representative labour union in the unionized formal sector (sector 2) industry. Assuming homogenous firms and labour unions in sector 2 we here directly borrow the simple unionized wage function as derived in details in Chaudhuri and Mukhopadyay (2009) which is as follows.

$$W^* = W^*(P_2^*, W, U) \; ; \; \text{with} \; (\frac{\partial W^*}{\partial U}), (\frac{\partial W^*}{\partial W}), (\frac{\partial W^*}{\partial P_2^*}) > 0 \qquad (1)$$

In equation (1) the parameter, U denotes the bargaining strength of the labour union in each formal sector firm.

Besides, $E_W = (\frac{\partial W^*}{\partial W} \frac{W}{W^*}) > 0$; $E_P = (\frac{\partial W^*}{\partial P_2} \frac{P_2^*}{W^*}) > 0$; and, $E_U = (\frac{\partial W^*}{\partial U} \frac{U}{W^*}) > 0$ denote

the elasticities of $W^*(.)$ with respect to W, P_2^* and U, respectively; and, $(E_W + E_P) = 1$.[2]

The general equilibrium set-up of the economy is given by the following set of equations.

$$Wa_{L1} + ra_{K1} = 1 \qquad (2)$$

$$W^*(P_2^*, W, U)a_{L2} + ra_{K2} = (1+t)P_2 = P_2^* \qquad (3)$$

$$a_{K1}X_1 + a_{K2}X_2 = K \qquad (4)$$

$$a_{L1}X_1 + a_{L2}X_2 = L \qquad (5)$$

where a_{ji} is the amount of the j th factor required to produce one unit of output of sector i for $j = L, K$; and, $i = 1, 2$. Here equations (2) and (3) are the two competitive zero-profit conditions for the two industries while equations (4) and (5) are the two full-employment conditions for capital and labour, respectively. Determination of factor prices and output levels are obvious.

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[2] See Chaudhuri and Mukhopadyay (2009) in this context.

We assume that sector 1 is more (less) labour-intensive (capital-intensive) than sector 2 in value sense i.e. $\dfrac{Wa_{L1}}{a_{K1}} > \dfrac{W^* a_{L2}}{a_{K2}}$. As $W^* > W$ it automatically implies that sector 1 is more (less) labour-intensive (capital-intensive) than sector 2 in physical sense.

The demand side of the model is represented by the following equations.

Let V denote social welfare that depends on the consumption of two commodities, denoted D_1 and D_2. The strictly quasi-concave social welfare function is depicted by

$$V = V(D_1, D_2) \tag{6}$$

The balance of trade equilibrium requires that

$$D_1 + P_2 D_2 = X_1 + P_2 X_2 \tag{7}$$

or equivalently,

$$D_1 + P_2^* D_2 = X_1 + P_2^* X_2 + tP_2(D_2 - X_2) \tag{7.1}$$

The volume of import of commodity 2, denoted M is given by the following.

$$M = D_2(\underset{(-)}{P_2^*}, \underset{(+)}{Y}) - X_2 \tag{8}$$

In equation (8), Y denotes national income at domestic prices and is given by

$$Y = X_1 + P_2^* X_2 + tP_2 M \tag{9}$$

In equation (9), $tP_2 M$ measures the aggregate tariff revenue of the government which is transferred to consumers as lump-sum payments.[3]

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[3] This is the standard assumption made in the theoretical literature on international trade. See Marjit and Beladi (1996), Chaudhuri and Mukhopadhyay (2009, 2014) among others.

3 Consequences of deterioration in TOT

Deterioration in TOT in the existing set-up is captured through an increase in the relative international price of commodity 2 i.e. P_2. Now if P_2 increases given the rate of tariff, t its relative domestic price (inclusive of tariff), P_2^* also increases.

Totally, differentiating equations (1) – (5), the following two propositions can easily be derived.

Proposition 1: Deterioration in the TOT leads to (i) a decrease in the competitive wage, W; (ii) an increase in the return to capital, r; (iii) an ambiguous effect on the unionized wage, W^*; (iv) decreases in wage-rental ratios, (W/r) and (W^*/r); (v) an expansion (a contraction) of sector 2 (sector 1); and, (vi) an increase in employment of labour in sector 2, $L_2(=a_{L2}X_2)$.

The consequences on W and r arise due to the *Stolper-Samuelson effect* while those on X_1 and X_2 occur following the subsequent *Rybczynski type effect*.[4] An increase in P_2^* produces a direct positive effect on $W^*(E_P>0)$ while the decrease in W produces an induced negative effect ($E_W>0$). As it is not possible to understand which of the two effects dominates over the other, the net effect on W^* is ambiguous. It depends on the magnitudes of different technological, institutional, and trade-related parameters. However, it can be easily shown that the (W^*/r) ratio surely decreases.[5] Consequently, producers in sector 2 substitute capital by labour that raises the labour-output ratio in this sector, a_{L2}. As sector 2 has expanded, the aggregate employment of labour in this sector, $L_2(=a_{L2}X_2)$ increases.

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[4] It is needless to point out that a *Stolper-Samuelson effect* is followed by a *Rybczynski type effect* if technologies of production are of variable-coefficient type.

[5] Interested readers can easily derive these results.

Propositions 2: An exogenous TOT shock raises the intersectoral wage differential, $(W*-W)$.

Intuitions are fairly straightforward. As explained above an increase in P_2^* lowers W. On the other hand, $W*$ is increasing in both P_2^* and W. As $(E_W + E_P = 1)$, even if the net effect on $W*$ is negative it would be less severe than that on W due to the presence of the additional direct positive effect on the former. Consequently the $(W*-W)$ gap widens.

Let us now examine the welfare consequence of the TOT shock. Differentiating equations (1) – (6), (7.1), (8) and (9) the following expression can be derived.[6]

$$\left(\frac{1}{V_1}\frac{dV}{dP_2^*}\right) = v(W*-W)\left(\frac{dL_2}{dP_2^*}\right) - \left(\frac{vM}{1+t}\right) + tP_2 v\left[H - \left(\frac{dX_2}{dP_2^*}\right)\right]$$

$$\qquad\qquad (+)\quad (+)\qquad (+)\qquad\qquad (-)\quad (+)$$

(10)

where: $m = P_2^*(\partial D_2 / \partial Y)$ is the marginal propensity to consume commodity 2 (with $1 > m > 0$); $v = [(1+t)/\{1+t(1-m)\}] > 0$; and, $H = [(\partial D_2 / \partial P_2^*) + D_2(\partial D_2 / \partial Y)] < 0$ is the Slutsky's pure substitution term. We note that $v > 1$ when $t > 0$ because $1 > m > 0$. However, when $t = 0$, $v = 1$.

From equation (10) the following proposition readily follows.

Proposition 3: The presence of labour market imperfection can soften the blow of an exogenous TOT shock on welfare.

Proposition 3 can intuitively be explained in the following fashion. In the existing set-up an exogenous TOT shock can affect social welfare in three ways. First, as the relative price of the import good rises, the import-competing sector (sector 2) expands following a *Rybczynski type effect* at the cost of the export sector (sector 1) as the former sector is more capital-intensive vis-à-vis the latter. Note that sector 2 is the higher wage-paying sector relative to sector 1. The higher (lower) wage-paying sector now absorbs more

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[6] Proofs can be available from the author on request.

(less) workers than previously. So, the aggregate wage income rises. This we call the *labour reallocation effect (LRE)*, which produces a positive effect on welfare. Secondly, welfare deteriorates as the economy has now to pay more for importing a certain amount of commodity 2 from the international market as its relative price has increased. This may be termed as the *value of import effect (VIE)*. Finally, the consumers would substitute consumption of commodity 2 by commodity 1 as the relative domestic price of the former, P_2^* has increased. Therefore, the aggregate demand for the import good falls but its domestic production has increased. Consequently the volume of import falls. As a result, the tariff revenue of the government that the consumers receive as transfer payments falls. This also adversely affects welfare. This may be called the *tariff revenue effect (TRE)*. The magnitudes of *TRE*, *VIE* and *TRE* are captured by the first, second and the third terms of the right-hand-side of equation (10), respectively. Therefore, we find that social welfare improves due to positive *LRE* and worsens due to both negative *VIE* and *TRE*. So, even if the positive *LRE* cannot dominate over the combined negative effect of *VIE* and *TRE*, it indeed neutralizes at least a part of the aggregate detrimental effect of the latter two on national welfare. We have already noted that $v > 1$ when $t > 0$. Hence, from equation (10) it follows that the net negative effect of the TOT shock on welfare will be magnified.

In the absence of any tariff i.e. at $t = 0$, the tariff revenue is zero and hence the *TRE* does not exist. In this situation, the *LRE* would be more effective in nullifying the negative effect of the adverse TOT shock on welfare vis-à-vis the case with positive tariff. In (10), $v = 1$ when $t = 0$. So, in the absence of any tariff the net negative consequence on social welfare would not be magnified. On the contrary, in the absence of any labour market imperfection we have $W^* = W$. Hence, there is no positive *LRE*. In this situation, the adverse consequence of adverse TOT movements at the international markets on national welfare would completely be felt by the economy.

4. Concluding remarks and policy recommendations

Some recent empirical studies have found that developing countries are more vulnerable to external terms-of-trade shocks compared to developed nations. Policies like switching from fixed to flexible exchange rate regime and diversification of the export basket have been advocated in general to minimize the negative effects resulting from such international disturbances. However, possibly no attempt has been made to identify the inherent shock-absorbing mechanism in the developing countries which arises out of their typical institutional characteristics. Consequently, the importance of designing appropriate development policies for preserving this beneficial conduit has not so far been explored. In this short theoretical note, we have demonstrated how the existence of labour market imperfection can lessen the gravity of detrimental TOT shocks on social welfare of these economies. We have also shown that policies aimed at deregulating the labour market hurt the efficacy of the internal shock-absorbing capacity while trade reforms e.g. lowering the tariff rate produce the opposite effects. The policy prescriptions that readily follow from our analysis are as follows: (i) these countries should think twice before going for reformatory policies in the labour market; and, (ii) they should vigorously implement trade reforms and lower their tariff rates on importables.

Our analysis also presents an important statistically testable hypothesis. One can examine by using cross-country data to verify whether countries with relatively unregulated labour market characterized by less trade unionism that are reflected in lesser intersectoral wage differential have been less affected during the last worldwide economic recession compared to countries with higher wage dispersion and more trade union activities. If this hypothesis is found to be statistically significant the purpose of the present analysis will be served.

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