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A survey on tax harmonisation theory

Abstract

The purpose of this paper is to show the advances of the tax harmonisation's literature. We show also that whether a tax harmonisation based on the origin principle can be actual Pareto-improving and potential one with public good provision. Provided this tax harmonisation follows a specific convergence rule towards to average tax of the two countries all possibilities lead to actual and potential Pareto-improvement. Furthermore, some topics to future research are presented.

1 - Introduction

Economic integration and free trade agreements have eliminated several border controls among countries. Given this environment, the only problem that still may hamper the trade flow is the tax system of each country and tax co-ordination has been regarded as the solution to the problems among border countries.

The indirect tax co-ordination's literature, viz., tax harmonisation has used in one approach the duality microeconomic theory¹ to examine the optimality of some tax convergence towards a common tax rate previously defined. Keen (1989) obtains the Pareto-improvement but the government needs to tax heavily imported goods (i.e., the protectionist device is necessary) but this behaviour violates international agreements (OECD, WTO, etc). He also considers that distorting taxes are returned to the consumer as a lump sum transfer. On the other hand, Delipalla (1997) considers this return to consumers as a public good provision. She uses the same structure of Keen (1987), but she arrives at some *potentially Pareto-improving* outcome, according to which we need to do transfers from the winner

country to the loser one to keep the consumer as well as before of a tax harmonisation. An *actual Pareto-improving*, i.e., two countries gain with harmonisation in the absence of such transfers, is obtained in Keen (1989) when moving from Nash equilibrium toward one similar tax structure. Using the origin principle, Lopez-Garcia (1996) obtains the same result but he needs of a further strong assumption that the local supply responses are identical in both countries at the initial position. This is similar to suppose that the consumers of the two countries have the same tastes. These papers, considering the world prices as given, do not analyse the impact of terms-of-trade on the welfare. In this case, the tax harmonisation must affect the demand of each country and therefore the level of tax revenue once the income effect is considered. Lockwood (1997) analysed this behaviour and showed the sensitivity of imported and exported goods with respect to change prices on the harmonising reform.

More recently, Lahiri and Raimondos (1998) use a structure similar to the one in the above papers, but they introduce the *restricted* revenue function and consider the provision of public good. Abstracting from all income effects and not considering concurrence between public and private goods, they consider the welfare of a country as given and analyse the impact of a tax harmonisation on the welfare of the other one. Hence, considering a weighted average of the tax rates in the two countries, as in Keen's approach, they show the possibility of welfare improving outcome by some tax reform. Whether the public good is over or under-supplied in both countries, a commodity tax harmonisation rule *is potentially Pareto improving*. Moreover, if the public good were under-supplied in the lower tax country and oversupplied in the higher tax country the tax reform would be *strictly Pareto-improving*.

The first purpose of this paper is to show the progress of the tax harmonisation's literature by linking the papers commented above.

The destination principle, that is the tax on the consumers, in the absence of any barriers and/or controls, guarantees a neutral effect of tax systems on competition. However, this tax base requires efficient monitoring in border controls because the possibility of tax frauds. Direct consumer purchases such that mail order firms, Internet, etc, have increased, augmenting so the inefficiency of the tax destination principle. In opposite, we have the origin, or source, principle under which commodities entering international trade are taxed at the rates prevailing in the country where they are produced. International trade agreements have been developed in order to eliminate border controls and making therefore the destination principle to converge towards the origin principle. The last but main purpose here is to discuss whether the actual and potential Pareto-improvement can be derived in the presence of local public goods provision on an origin principle. We show that there are situations under which some tax harmonisation leads to actual Pareto-improvement and potential Pareto-improvement. Some tax harmonisation converges towards the optimal tax lead to an actual Pareto-improvement. If the foreign country has higher (lower) level of distortion initially around of optimal tax, its initial tax rate must be lower (higher) than home one in order to obtain a potential Pareto-improvement.

We give now a description of the structure of the paper. Section 2 consists of a survey on tax coordination literature with possible extensions. Section 3 shows the possibility of future researches taking into account the tax harmonisation's literature and, finally, we conclude.

2 - The Tax Harmonisation's Literature

The elimination of all tariff barriers, physical border controls, and protective devices between two countries may reduce distortion in the tax system, but it does not suffice to fulfil fair trade. This point of view is backed by Keen (1987) who suggests some harmonisation in

the indirect tax system by using a standard model of international trade. We will describe many details of this model because it will be used as benchmark to the following expositions. We have each country with N commodities and a single consumer. The consumer of the home country is characterised by an expenditure function $e(q,u)$ where q is the consumer price vector and u is the consumer's utility. Similarly we have $E(Q,U)$ characterising the foreign consumer (henceforth home country with lower case letters and abroad country with upper case letters). He considers a competitive production sector in each country with revenue functions $r(P)$ and $R(P)$. Initially he also characterises some transfer of the first commodity (z) from the foreign country to the home one to keep the foreign consumer at some constant utility level (U). In equilibrium, the net demand for each commodity is

$$e_q(q,u) + E_Q(Q,U) - r_p(P) - R_p(P) = 0 \quad (1)$$

where a subscript indicates differentiation. In each country, consumer equals its expenditure with the national income of each country plus the revenue due to the distorting tax on the demand, i.e.,

$$e(q,u) - r(P) - t'e_q(q,u) - P_1z = 0 \quad (2)$$

and

$$E(Q,U) - R(P) - T'E_Q(Q,U) + P_1z = 0 \quad (3)$$

where P_1z is the transfers value in terms of the commodity 1 from the foreign to the home country to keep the foreign country at a given utility level (U).

A harmonisation in the tax system between two countries is performed assuming that $t \neq T$ and also that this tax harmonisation converges towards some common structure $N-1$ vector H . The harmonising reform $[dt, dT]$ is

$$\begin{bmatrix} dt \\ dT \end{bmatrix} = \beta \begin{bmatrix} H - t \\ H - T \end{bmatrix} \quad (4)$$

where $H = [e_{qq} + E_{QQ}]^{-1}(e_{qq}t + E_{QQ}T)$ and β is a small positive scalar. Moreover, it can be seen that $H = \Sigma t + (I_{N-1} - \Sigma)T$, where $\Sigma = [e_{qq} + E_{QQ}]^{-1}e_{qq}$ and I_{N-1} is the identity matrix. We call H a weighted average of the domestic taxes of the two countries. Keen concludes that the proposed reform is potential Pareto-improvement when we account for the transfer of the first commodity from foreign country to home country.

Observe above the kind of reform may be Pareto-improving, if we compensate through transfers the country which lost with this harmonisation. However, it is not an easy task since some inter-country coordination is required to accomplish those transfers. Keen (1989) addresses the possibility of actual Pareto-improvement by a tax harmonisation. A reform $\{dt, dT\}$ is strictly welfare increasing in the home country ($du > 0$) considering here the existence of protectionist impulses in the world markets, i.e., higher revenue tax on the imported commodities.

In fact, Keen (1987, 1989) ignore the budgetary implications of such reforms. We can observe this since that they just propose that tax revenue is returned to consumer in the form of a lump-sum transfer. Delipalla (1997) extends this model by considering the possibility the use of countries' tax revenue to finance the provision of a local public good. Using the same structure as Keen (1987, 1989), she also considers two countries with $N+1$ commodities, N private goods and one local public good privately produced. A single consumer is represented by an expenditure function. These functions are $e(q, g, u)$ and $E(Q, G, U)$ to the home country and the foreign country where the scalar g and G are the levels of public good provision of home and foreign countries, respectively. The production sector is assumed perfectly competitive with decreasing returns to scale and therefore profit functions $\pi(P)$ and $\Pi(P)$ are taxed fully. The government levies commodity and income taxes and gets lump

sum transfer to finance the public good provision. Considering the possibility of a tax reform $\{dt, dT\}$, transfers between governments and between consumers, assuming no income effects, separability between private and public good and constant world prices a commodity tax harmonisation is potentially Pareto-improving ($du > 0$, given U). The first transfer guarantee the gain from reduced consumption inefficiency goes to both countries; and the second one, between governments, ensures that the tax revenue is constant in both countries. A tax harmonisation actually Pareto-improving happens if the revenue increases in the country of the individual with the higher marginal valuation of the public good and the transfer between consumers ensures that individuals from both countries gain. If only a government transfer takes place, while keeping the utility of the foreign country constant ($dU = 0$), an increase on home welfare (potential Pareto improving) is obtained by an increase in the revenue (received from the foreign government) in the home country.

As we have seen above, in models of tax harmonisation between two countries, a Pareto-improvement outcome is only achieved through a very strong and less realistic assumption of no tax revenue requirements. Lockwood (1997) considers a two-country model with N goods and a single factor of production supplied elastically in each country that is internationally immobile. He also supposes full specialisation in each country, i.e., the home country produces only goods $j = 1, \dots, m$ and the foreign country produces goods $j = m+1, \dots, n$. The firms are price-takers and therefore the producer prices are $P_j = w$ to $j = 1, \dots, m$ and $P_j = W$ to $j = m+1, \dots, n$.

The consumer is represented by preferences by traded goods, a public good and leisure. The wage rate in home country and foreign country are w and W with immobility of labour between two countries. His behaviour can be showed by one expenditure function and, the consumption equilibrium will be $e(q, w, u, g) = wl$ and $E(Q, W, U, G) = WL$ that is, the

expenditure on goods and leisure equals income since no pure profit exists. The government levies the tax and spends it in providing a non-tradeable public good in each country. Additionally, in both countries, the production of one unit of public good requires one unit of labour. Considering now a tax reform around the initial Nash taxes he analyses an actually Pareto-improving reform, $du > 0$ and $dU > 0$, initially for the home country and concludes that any reform can only affect positively the home country's welfare through changes in foreign country's taxes. If one country already maximises its welfare by one tax reform, given the tax system of other country, the home country's welfare only changes if the foreign country's tax changes. Introducing the tax harmonisation (4) in the case of a two goods model he shows that an improvement in the terms of trade, in both countries, increases their welfare. He shows also that (proposition 2 in the Lockwood's paper):

i) If the exporter good is more heavily taxed than the importer good, then $du < 0$ and $dU < 0$. The *harmonising tax reform* must increase the tax on the imported good and decrease the tax on the exported good in both countries;

ii) If the imported good is more heavily taxed than the exported one, so any harmonising reform which decreases the importing taxes in both countries is Pareto-improving, i.e., we obtain simultaneously, $du > 0$ and $dU > 0$;

iii) If the two traded goods are substitutes, then at least one Pareto-improving harmonising tax reform can be found; and

iv) If the two traded goods are independent, then no harmonising Pareto-improving reform exists.

To generalise these results he considers that all traded goods are *independent* and concludes that if there exists some good exported by each country that is taxed more highly

by the importing country than the exporting country, then a Pareto-improving harmonising reform exists.

The definition of the weight H is fundamental in the determination of impact of a tax reform on the welfare. The Keen's papers as the Delipalla's, define the matrix-weighted average of the domestic tax structures of the two countries depending on local demand sensibility. Lopez-Garcia did the same thing, however there; instead the weight depends on local supply sensibility because he uses the origin principle. In Lockwood's, the weight are as Keen's and it does not require producer prices to be left unchanged but he alerts that if a simple average of the taxes harmonisation is considered this harmonising tax reform may not lead to a Pareto-improvement.

Lahiri and Raimondos (1998) take into account the demand responses of the tax change but instead they use non-uniform taxes. This framework considers $N + 1$ tradeable private goods and one public good produced in each one of the two countries with the use of m factors of production that are assumed internationally immobile and fixed supply. The preference of consumers are represented like before and the private sector generates a revenue represented by a *restricted* revenue function, given the producer prices and the level of public provisions goods (g, G). Abstracting of all income effects ($e_{pu} = E_{pU} = 0$) and assuming separability in consumption between private and public goods ($e_{pg} = E_{pG} = 0$) they alert that, in a harmonising tax reform, the weight Σ has to be chosen carefully in order to get the reform potentially Pareto-improving. Analysing the situation where public goods are over-supplied in both countries, they select a matrix weighted average as $H = \Sigma t + (1 - \Sigma)T$ where Σ captures both the demand responses of the tax change and the extent of over-supplies of the public goods and show us that this commodity tax harmonisation rule is potentially Pareto-improving. Otherwise, if the public good is under-supplied in both countries the commodity

tax harmonisation rule is also potentially Pareto-improving. When the public good is under-supplied in the foreign country and oversupplied in the home country this harmonisation rule is actually Pareto-improving. What is important to emphasise here is that Lahiri and Raimondos get harmonising tax reform potential and actual Pareto-improving by considering different types of weights in order to obtain one harmonisation rule.

In the tax harmonisation's literature Keen (1987, 1989) and Lopez-Garcia (1998) use the destination principle and allow for the possibility of transfers between countries. Also using destination tax base, Delipalla (1997), Lockwood (1997), Lahiri and Raimondos (1998) assume that governments levy this kind of tax to finance the public good provision. Otherwise, Lopez-Garcia (1996) considers the origin principle, but only analysing the existence of transfers. The equivalence between these two principles is shown in Lockwood, de Meza and Myles (1994). They show that this equivalence holds in a competitive economy with n goods and factors of production, arbitrary factor taxes, and general transport cost structures for both consumers and producers. It holds also in an imperfectly economy and in monetary economies with nominal wage rigidity and the flexible exchange rate. But they have to assume uniformity of taxes within each country.

Now we analyse the possibility of a harmonising tax reform, based on the origin principle. Lopez-Garcia (1996) proposes a tax reform with commodity taxes based on the origin principle, i.e., the tax levied on the produced sector, and in this case there is the possibility of “exporting tax”, which is in opposition to international agreements of OECD and WTO. Furthermore, in the absence of any border control, the destination principle converges towards origin principle. Lopez-Garcia considers the same structure as in Keen (1987, 1989) but now $\Sigma = r_{pp} [r_{pp} + R_{pp}]^{-1}$ and therefore $H = [r_{pp} + R_{pp}]^{-1} (r_{pp}t + R_{pp}T)$ in (4). He shows that, despite considering the origin principle, a potential Pareto-improvement is

obtained, i.e., given the utility level of the foreign country, the policy leads to an increase in home country's welfare when an appropriate international transfer accompanies it. Analysing now whether this reform can be achieved without an international compensation, he shows also that starting from Nash equilibrium to the actual Pareto improving is achieved the supply needs have the same sensitivity in both countries in relation to prices.

Lucas (2001), following strictly Lahiri and Raimondos (1995, 1998), generalises Lopez-Garcia by considering a model with the possibility of the public good provision. We consider a model with two countries², which each one has one representative consumer, tradeable private goods, one non-tradeable public good and factors of production internationally immobile and exogenously supplied. These commodities and factor markets are perfectly competitive. We suppose the absence of transport cost such that the only distortions in trade are due to consumption taxes levied on the origin principle. Hence, the consumer price is the same in both countries ($q = Q$) and the producer price is $p = q - t$ and $P = q - T$, where p and P are the producer prices in each country. The representative consumer in each country is represented by expenditure functions $e(q, g, u)$ and $E(q, G, U)$ respectively. Considering just the home country the total differential is $e_q dq + e_g dg + e_u du$ where $e_g < 0$ is the marginal rate of substitution (*MRS*) between the public good and lump sum income and it is known as, in absolute value, the 'marginal willingness to pay for the public good'. The term e_u is the inverse of marginal utility of income and e_q is the demand function³. The production sector behaves competitively with *restricted* revenue $r(p, g)$ and $R(P, G)$ of home and foreign country, respectively. These revenue functions are *restricted* because the public good is non-tradeable, but competes with the private sector for the use of the factors of production. This function $[r, R]$ is convex in $[p, P]$.

Considering $e(q, g, u)$ and $E(q, G, U)$ in (1) and that the governments levy tax on the supply to finance their public good provision we obtain the budget constraints of private sector and the public sector budget constraint in each country. Transfer of the first commodity from the home country to the foreign one is allowed keeping the consumers at some utility level also. Assuming the commodity 1 (labour, for example) as the numeraire (so $q_1 = 1$), which is untaxed in both countries we will have $N+5$ endogenous variables (q, u, U, g, G, z) . In search for an Actual Pareto-improvement, we should define the transfer $z = 0$ and analyse the (q, u, U, g, G) given the tax parameters t and T . On the other hand, a potential Pareto-improvement should be verified by analysing (q, u, g, G, z) given the tax parameters and holding U constant. As it is usually done in the literature of tax harmonisation, we abstract from all income effects and assume that the supply of private goods is not affected by public good provision.

We can analyse the possibility of an actual Pareto improvement by abstracting from intergovernmental transfers ($dz = 0$) and considering one tax reform of the form $dt = -\beta(t - t^*)$. We can show that this reform is actual Pareto-improving because $du > 0$ and $dU > 0$ to similar manipulations. Considering now the possibility of transfers we intend to obtain a potential Pareto-improvement by analysing the welfare effects from a tax reform (dt, dT) and from a transfer (dz), required to hold U unchanged ($dU=0$). Consider also a harmonising tax reform towards a common H , as in (4) but now $\Sigma = r_{pp} (r_{pp} + R_{pp})^{-1}$ is a positive definite matrix because its components are positive definite. Besides considering the local supply responses this harmonising tax reform leads to an average of pre-existing tax structure. We can show that this new tax harmonisation rule is potential Pareto-improving ($du > 0$, given U) with the following intuition: If the foreign country has an initial level of distortion around of its optimal tax higher than the home country one, an origin based tax

harmonisation requires its initial tax rate of all commodities to be lower than the home country one in order to yield a potential Pareto-improvement. Otherwise, if the home country has a higher initial level of distortion, its initial tax rate of all goods should be lower than that of the foreign country in order to yield a potential Pareto-improvement.

3 Topics for future researches

As saw before all models in the tax harmonisation theory assume some assumptions to obtain actual and/or potential Pareto improvement. Further in these models we do not have considered some characteristics of the economy that can change the results.

Factor supply changes

We can analyse the possibility of exogenous change of the factor supply in the home country. This new behaviour must affect the prices and utilities levels. Thereby, this behaviour can leave the home country worse off. Using the same model's framework the equilibrium condition can be rewrite as

$$\begin{aligned} e(q,u) &= r(p,v) \\ E(Q,U) &= R(P) \\ e_q(q,u) + E_Q(Q,U) - r_p(p,v) - R_P(P) &= 0 \end{aligned}$$

where v is the factor endowments in the home country and all others variables as defined before. With this new behaviour we can analyse the effects of the home country and the foreign country and analyse also the possibility of a tax harmonisation.

Changes in Technology

The technological shifts can be considered in our basic model just by introducing a shift parameter in the revenue function. Considering only one technological shift κ in the home country the general equilibrium conditions become

$$\begin{aligned}
e(q,u) &= r(p,v,\kappa) \\
E(Q,U) &= R(P,V) \\
e_q(q,u) + E_Q(Q,U) &= r_p(p,v,\kappa) + R_p(P,V).
\end{aligned}$$

But we need know the precise nature of the change in technology. If the technical change is *product augmenting* we can therefore write the revenue function as $r(\kappa p, v)$. On the other hand, if the technical progress simply increases factor endowments, the revenue function becomes $r(p, \kappa v)$.

Factor Movements

All tax harmonisation models consider the immobility of the factors of production between the countries. We can show the movement of factors from one country to another just, for example, by supposing that the income stays in the country to which it has moved i.e. the investor contribute to the welfare of this country. Initially, we can suppose that the home country invests directly ξ in the foreign country. Then, the home country's income is $e(q,u) = r(p,v) + W\xi$ where the right side is the value of its own output plus the income earned by its direct investment in the foreign country. The income of the foreign country is reduced by the amount paid for the services of factors. This behaviour yields the following equilibrium conditions:

$$\begin{aligned}
e(q,u) &= r(p,v) + W\xi \\
E(Q,U) &= R(P,V) - W\xi \\
e_q(q,u) + E_Q(Q,U) &= r_p(p,v) + R_p(P,V).
\end{aligned}$$

On the other hand, we can keep all other factors and consider a migration of labour. Considering that migrants do not repatriate any income to their country of origin the new equilibrium condition becomes

$$\begin{aligned}
ve(q,u) &= r(p,v) \\
VE(Q,U) &= R(P,V) \\
ve_q(q,u) + VE_Q(Q,U) &= r_p(p,v) + R_P(P,V).
\end{aligned}$$

Observe that if one marginal shift of $d\xi$ occurs so that $dV = d\xi = -dv$, then we can analyse the possibility of indirect tax harmonisation considering this approach.

Tariffs and Tax Harmonisation

We can consider also that an open economy imposes tax on its commodities well as the imported goods. Now, we must consider tariffs and their revenue to analyse the equilibrium condition in each country⁴. Analysing just the trade taxes in the home country the equilibrium is

$$\begin{aligned}
e(q,u) &= r(p,v) + \pi m \\
E(Q,U) &= R(P,V) \\
e_q(q,u) + E(Q,U) &= r(p,v) + R(P,V)
\end{aligned}$$

where $\pi = q - Q$ is the tariff vector and $m = e_q - r_p$ is the import vector. We can consider that this tariff vector affects prices at home and abroad as also the terms of trade. Thereby new results on indirect tax harmonisation can be achieved.

Considering the possibility of indirect tax harmonisation in the context of distribution of income by tariff instruments, we can divide the consumers of one country in two groups and analyse the distribution aspects. Let one country with just two consumers and two factors. Then e^1 and e^2 are the expenditure functions and u^1 and u^2 the utility levels at home for the respective owners of factors 1 and 2. Similarly, upper case letters for the foreign country. The equilibrium conditions are

$$\begin{aligned}
e^1(q_1, q_2, u_1) &= w_1 v_1 \\
e^2(q_1, q_2, u_2) &= w_2 v_2 + \pi_1 m_1 \\
E^1(Q_1, Q_2, U_1) &= W_1 V_1 \\
E^2(Q_1, Q_2, U_2) &= W_2 V_2 \\
e_1^1 + e_1^2 + E_1^1 + E_1^2 &= r_1 + R_1.
\end{aligned}$$

We can analyse an indirect tax harmonisation between two countries considering this new approach.

Effective Protection

To analyse this we need consider the intermediate goods in a productive process. Let $x = (I - A)\Phi$ where x is the vector of net outputs, Φ that of gross outputs, A the matrix with elements a_{ij} . Solving Φ in terms of x we have $\Phi = (I - A)^{-1}x$. Maximising the value of net output $p'x = p'(I - A)\Phi = \pi'\Phi$ where $\pi = (I - A)'p$ as the value added per unit on the activity level in the economy. Let us define a function $\rho(\pi, v)$ being the maximum of this maximisation's problem. Then, the optimum choices of Φ will be given by $\Phi = \rho_\pi(\pi, v)$ and the competitive factor prices w by $w = \rho_v(\pi, v)$. Thus, $r(p, v) = \rho[(I - A)'p, v]$, i.e., $r_p = (I - A)\rho_\pi$. Now we are in conditions to introduce the concept of effective protection in this analyse. If we increase the unit value added generated (π) by an activity we are therefore increasing the protection. With this we can analyse the possibility of Pareto improvement considering an effective protection.

4 Conclusion

The theoretical approach in tax harmonisation has meaningfully advanced. Indeed, as important factor contributing to the progress of such literature is that many models share key characteristics. For instance, most models consider that markets are perfectly competitive and that the government expends its indirectly levied tax in transfers or public good provision. In

addition these models usually use two-country framework and take (non-cooperative) Nash tax rates as initial condition. In other words, these assume that, given one country's utility level, the other country maximises its own utility level. Furthermore, most of these models allow for the possibility of potential Pareto-improvement, once that some assumptions are satisfied.

Although most papers assume the destination principle approach to tax harmonisation - Lopes-Garcia (1996) is an exception - one should expect that this principle converge towards the origin tax base because the increasing world-wide economic integration eliminates border controls. In this paper we show that a tax harmonisation based on the origin principle can also generate both actual and potential Pareto-improvement. Whereas the former is an intuitive result, the last requires a specific assumption to be reached. If the foreign country initially has a higher (lower) level of distortion around the optimal tax, its initial tax rate must be set at a lower (higher) level than that of the home one in order to obtain a potential Pareto-improvement. To get this harmonising tax reform we consider the traditional assumptions except that we do not need a uniform tax rate. Therefore the tax rates levied on all of the goods of a country need to be higher (lower) than the rates levied on the goods of the other country. Observe also that we have not considered some characteristics of the economy that could change the results. The factor supply changes as in technologies, the factor movements, the tariff revenue and the effective protection could be analysed but we leave them for future researches.

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Notes:

¹ In these models, we use the expenditure function, which need to obtain one expenditure level of private goods that the consumer keeps on the same utility level.

² Much more details of this model can be saw in Lucas (2000).

³ We abstract from all income effects.

⁴ Keen (1999) analyses this behaviour but considering another approach.

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