COMMENT ON Y. KURABAYASHI: THE IMPACT OF CHANGES IN TERMS OF TRADE ON A SYSTEM OF NATIONAL ACCOUNTS

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In an article [1] published in a recent issue of this review, Mr. Kurabayashi has intended to reformulate the terms of trade effect within a framework of national accounts at constant prices and to give a new formula for deflating the external transactions balance and net factor income from abroad. In 1964 [2] and 1967 [3], I have treated the same problem. The purpose of this note is to show that Mr. Kurabayashi's solution and mine are in fact identical.

Let us examine Mr. Kurabayashi's solution and mine, but before let us rapidly summarize the terms of trade effect problem in national accounts at constant prices. With Mr. Kurabayashi's notations, the external transactions account in its simplest form reads thus:

$$X = M + CS \tag{1}$$

where X and M respectively represent (at current prices) the exports and imports of goods and services and CS the nation's surplus (in current value) on external goods and services transactions.

If p_1 and p_2 are the price indices for exports and imports, the values of X and M at constant prices are:

$$\begin{cases} \tilde{X} = \dfrac{X}{p_1} \\ \tilde{M} = \dfrac{M}{p_2}. \end{cases} \tag{2}$$

The problem of the external balance in a framework of national accounts at constant prices is that it is meaningless to calculate the "deflated" value of CS as the difference between $\tilde{X}$ and $\tilde{M}$. As Geary ([4] to [6]) has pointed out, it is necessary to calculate the deflated value $\widetilde{CS}$ of CS by an appropriate price index. But then the external account is no longer balanced in constant prices. For restoring the accounts balance, it is necessary, as Geary has proposed, to introduce an adjustment variable $\tilde{T}$:

$$\tilde{X} + \tilde{T} = \tilde{M} + \widetilde{CS} \tag{3}$$

with

$$\widetilde{CS} = CS/p_N$$

where p_N is chosen *a priori* for economic reasons.

The problem of the external terms of trade variable $\tilde{T}$ is precisely to choose this price index p_N.[1]

For making this choice, Mr. Kurabayashi starts from two rules which are deduced from an analysis of the studies of Geary [6] and Stuvel [7].

The first rule is the following:

(Rule 1) (Geary's rule): The deflator of X is used for CS (and the income flows received from abroad) if $CS > 0$; on the other hand, the deflator of M is used if $CS < 0$.

If this rule is also used for the external balance of the rest of the world, there is a compensation between the (algebraic) gain of trade $\tilde{T}_1$ of the considered country with the rest of the world and the gain of trade $\tilde{T}_2$ of the rest of the world with this country:

$$\tilde{T}_1 + \tilde{T}_2 = 0, \tag{4}$$

because $X_1 = M_2$, $M_1 = X_2$ and $CS_1 = -CS_2$ and because the import and export price indices of the rest of the world are respectively the export and import price indices of the considered country.

[1]This deflator will be also used for net factor income from abroad. For simplifying, we shall not consider it here but this creates no problem and is generally admitted by all the authors.

The second rule—quoted rule 3—used by Mr. Kurabayashi is deduced by him from the critical analysis of Stuvel's rule (quoted rule 2)[2] and is the following:

(Rule 3) CS (and the income flows from abroad) is deflated by a deflator p_N which is constructed as the weighted harmonic mean of p_1 and p_2:

$$(4) \qquad p_N = \frac{1}{\alpha(1/p_1) + (1 - \alpha)(1/p_2)} \quad \text{with } 0 \leq \alpha \leq 1.$$

The terms of trade variable $\tilde{T}$ is under this condition:

$$(5) \qquad \tilde{T} = \tilde{X}(1 - \alpha)\left(\frac{p_1}{p_2} - 1\right) - \tilde{M}\alpha\left(\frac{p_2}{p_1} - 1\right).$$

The parameter α is specified by Mr. Kurabayashi:

$$(6) \qquad \alpha = \frac{X}{X + M}.$$

This choice preserves the "zero-sum condition" of the terms of trade variable, i.e. $\tilde{T}_1 + \tilde{T}_2 = 0$, where $\tilde{T}_1$ and $\tilde{T}_2$ are the values of the trade gain term calculated for this country on the one hand and for the rest of the world on the other hand.

Let us now analyse my own solution as presented in [2], pp. 11–21, and [3], pp. 39–47. Starting also from a critical analysis of Geary's and Stuvel's solutions, I proposed the four following rules for p_N and $\tilde{T}$:

(a) For p_N:

(Rule I). The deflator of CS (and of the income flows from abroad) shall be linked to the concept of the purchasing power of the national currency on the international market.

(Rule II). If one considers in terms of constant prices a country's external transactions account with the rest of the world and the rest of the world's account with that country, the surplus balance $\tilde{CS}$ of one shall be exactly offset by the deficit balance of the other.

(b) For the trade gain $\tilde{T}$:

(Rule III). It should be possible to interpret the trade gain $\tilde{T}$ in a country's external transactions account as the gain resulting from the improvement of that country's position on the international market; it will appear as the difference between the gain realized on exports and the loss incurred on imports, both gain and loss being considered in terms of their algebraic value.

(Rule IV). The country's (algebraic) trade gain $\tilde{T}$ shall be exactly offset by the trade loss incurred by the rest of the world in its transactions with that country.

It is easy to see that (II) entails (IV) and reciprocally, so that (II) and (IV) cannot be fulfilled unless (I) is also.

This said, how is one to choose p_N in order to obey these four axioms? Following a Geary suggestion, I have proposed to take a linear combination of p_1 and p_2. This index verifies (I):

$$(7) \qquad p_N = \alpha' p_1 + (1 - \alpha')p_2 \text{ with } 0 \leq \alpha' \leq 1.$$

[2]This rule of Stuvel is the following:

(Rule 2) All entries of national accounts are deflated by a single deflator, say GDP deflator, which reflects the change in general prices. Thus, the GDP deflator shall be used for CS (and income flows from abroad).

But adopting this rule creates difficulties because it no longer ensures the "zero-sum condition" of trade gains. This is the reason why Mr. Kurabayashi proposes another rule. This is Mr. Kurabayashi's rule 3.

In [2] and [3], I have also shown such a consequence of Stuvel's method on the compensation of trade gains but, at the same time, I have pointed out another difficulty. With the Stuvel's deflator it is possible to have $\tilde{T} \neq 0$ even if the import and export prices remain unchanged: evidently we have $\tilde{T} \neq 0$ if there is only a variation of *internal* prices (and therefore of the GDP deflator) but it is no longer possible to interpret $\tilde{T}$ as an (algebraic) gain on the rest of the world.

This gives us:

$$\tilde{T} = \tilde{X}\left[\frac{1}{\alpha' + (1 - \alpha')(p_2/p_1)} - 1\right] - \tilde{M}\left[\frac{1}{(1 - \alpha') + \alpha'(p_1/p_2)} - 1\right]. \tag{8}$$

$\tilde{T}$ is positive if $p_1 > p_2$, that is if the country's position on the international market has improved. It is negative if $p_1 < p_2$, that is if the country's position has deteriorated. Lastly, it can be seen that $\tilde{T}$ is the difference (in algebraic terms) between a gain on exports and a loss on imports. $\tilde{T}$ therefore verifies (III).

For particularizing α', we started from the two following observations:

(1) If $M = 0$, that is to say $CS = X$, it can be said that CS is the result of X and one can take $p_N = p_1$, that is $\alpha' = 1$. Similarly if $X = 0$, it is natural to take $p_N = p_2$ and $\alpha' = 0$. This is like Geary's method, but only in the two limiting cases $M = 0$ or $X = 0$.

(2) Considering on the one hand the country in question, and on the other the rest of the world, the exports of one are the imports of the other and vice-versa. If it is intended to verify (II) and (IV), it is necessary to take for p_N a symmetrical expression in p_1, p_2 and X, M.

Taking these two observations into consideration, I have proposed in [2] and [3] to adopt for value of α':

$$\alpha' = \frac{\tilde{X}}{\tilde{X} + \tilde{M}}. \tag{9}$$

Apparently this solution is different from that of Mr. Kurabayashi as given by (4) and (6) but in fact it leads to the same value of p_N and therefore of $\tilde{T}$.

Let us indicate by the index (K) or (C) the value of p_N, CS and T for Mr. Kurabayashi and for me.

In Mr. Kurabayashi's solution, we have:

$$p_N^{(K)} = \frac{1}{\alpha/p_1 + (1 - \alpha)/p_2} \quad \text{with } \alpha = \frac{X}{X + M}$$

and therefore:

$$p_N^{(K)} = \frac{1}{[(X/p_1)/(X + M)] + [(M/p_2)/(X + M)]}$$

and consequently because $\tilde{X} = X/p_1$ and $\tilde{M} = M/p_2$:

$$p_N^{(K)} = \frac{X + M}{\tilde{X} + \tilde{M}}. \tag{10}$$

For my own solution, we have:

$$p_N^{(C)} = \alpha' p_1 + (1 - \alpha')p_2 \text{ with } \alpha' = \frac{\tilde{X}}{\tilde{X} + \tilde{M}}$$

and therefore:

$$p_N^{(C)} = \frac{\tilde{X}p_1}{\tilde{X} + \tilde{M}} + \frac{\tilde{M}p_2}{\tilde{X} + \tilde{M}} = \frac{X + M}{\tilde{X} + \tilde{M}}. \tag{11}$$

It is *the same value* as for $p_N^{(K)}$. In both approaches, we have:

$$\boxed{p_N = \frac{X + M}{\tilde{X} + \tilde{M}}} \tag{12}$$

It is in this form that I have finally given the p_N deflator in my study of 1964 (see [2], p. 18; see also [3], p. 47). As it appears in (12), so determined, the p_N deflator is symmetric in $(X, \tilde{X})$ and $(M, \tilde{M})$.

As a consequence of the equality of $p_N^{(K)}$ and $p_N^{(C)}$, the value of the trade gain variable $\tilde{T}$ in my system is also the same as in Mr. Kurabayashi's solution. Evidently, we have in both methods:

$$\tilde{X} - \tilde{M} = \widetilde{CS} - \tilde{T}$$

and therefore:

$$\tilde{CS}^{(K)} - \tilde{T}^{(K)} \equiv \tilde{CS}^{(C)} - \tilde{T}^{(C)}$$

and consequently because $p_N^{(K)} = p_N^{(C)}$ and then $\tilde{CS}^{(K)} = \tilde{CS}^{(C)}$:

$$\tilde{T}^{(K)} = \tilde{T}^{(C)}$$

It results from this equality that the trade gain term $\tilde{T}$ in my system verifies also the rules of Mr. Kurabayashi's solution (although Mr. Kurabayashi writes the contrary in [1], p. 290, footnote 3); particularly, the trade gain term in my system verifies the zero-sum condition and is such that $\tilde{T}_1 + \tilde{T}_2 = 0$ (and that by construction, following my rule IV). This is evident because the external balance deflator p_N given by (7) and (9) or by (12) is the same for the studied country and for the rest of the world (the definition of p_N is symmetric for the country and for the rest of the world).

In other words, Mr. Kurabayashi's analysis leads exactly—but partly by another way—to the same choices for p_N and $\tilde{T}$ as those which, in 1964, I have proposed[3] in [2]. The form of the trade gain term $\tilde{T}$ given in (5) by Mr. Kurabayashi however appears perhaps better than the one given by the relation (8). But the difference is only formal as the two relations (5) and (8) give the *same* numerical results.

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References

[1] Y. Kurabayashi, "The Impact of Changes in Terms of Trade on a System of National Accounts: An Attempted Synthesis", *The Review of Income and Wealth*, series 17, no. 3, Sept. 1971, pp. 285–297.

[2] R. Courbis, "Comptes économiques nationaux à prix constants". *Etudes et Conjoncture*, July 1964 (or *Etudes de Comptabilité Nationale* no. 6, 1964), pp. 5–76.

[3] R. Courbis, "Comptabilité nationale à prix constants et à productivité constante", Report presented to the Xth IARIW Conference, Maynooth (Ireland), August 1967, *The Review of Income and Wealth*, series 15, no. 1, March 1969, pp. 33–76.

[4] R. W. Burge and R. C. Geary, "Balancing of a System of National Accounts in Real Terms". 1957 IARIW Conference, De Pietersberg, August 1957.

[5] United Nations Statistical Commission. "Systèmes d'indices de prix et de quantités pour la comptabilité nationale". 27th Dec., 1957. Report no. E/CN. 3/L46.

[6] R. C. Geary, "Problems in the Deflation of National Accounts: Introduction", *Income and Wealth*, series 9, 1961.

[7] G. Stuvel, "Asset Revaluation and Terms of Trade Effects in the Framework of the National Accounts". *Economic Journal*, Vol. LXIX, no. 274, June 1959, pp. 275–292.

[3] In section 3 of his article, Mr. Kurabayashi generalizes for the complete system of national accounts the solution he adopted for the external balance. He proposes for the expenditure account $C + S = P$ (where C, S and P respectively represent national consumption, national saving and net domestic product in current value) to deflate the saving S by:

$$p_s = \frac{1}{\beta(1/p_p) + (1 - \beta)(1/p_c)} \quad \text{with } \beta = \frac{P}{P + C}$$

where p_p and p_c are respectively the implicit NDP deflator and the consumer's expenditure price index.

It is in a particular case the solution which more generally I have proposed in 1964 [2] (see also [3], p. 47). In this system, the deflator which must be used for the balance Σ of an account $R = D + \Sigma$ (where R and D respectively represent the resources and uses) is—as proposed for the external balance in (11)—the general price index which is relative to all the operations of this account, that is:

$$p_\Sigma = \frac{D + R}{\tilde{D} + \tilde{R}}.$$

where $\tilde{D}$ and $\tilde{R}$ are the values at constant prices of D and R.

It is easy to show that using such a deflator for the expenditure account gives for p_s the same value as that adopted by Mr. Kurabayashi.