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Modification of the Self-Sufficiency Ratio and Use in Welfare Assessment

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Abstract: The self-sufficiency ratio was modified through replacement of its denominator, i.e. actual total consumption, by a suitable level of consumption free from suppression as maintained by strata of consumers (producers) advantaging sufficient incomes (production budgets) and governed by consumption habits (technical recommended applications). Modified ratios avoid problems of false production adequacy, overestimation of surpluses or underestimation of deficits. Animal origin foods and phosphate fertilizers in Egypt are examples of commodities for which modified ratios are substantially lower than those traditionally estimated. In such cases, policies of domestic production and foreign trade require revision such as to cope with suitable levels of consumption. On the other hand, the estimated "fair" levels of consumption can be used to assess the welfare standard of the community.

Key words: Per capita consumption · Self-sufficiency terminology · Welfare assessment

INTRODUCTION

The self-sufficiency ratio is a common world wide terminology used to assess the extent of domestic production effectiveness in satisfaction of the community's consumption needs of any commodity. It is adopted to estimate surpluses or deficits requiring international trade to restore balance. It is simply calculated as the volume of domestic production of the commodity divided by the volume of its total consumption, as adopted by the international organizations such as FAO and WTO and accordingly relevant research articles [1, 2] (Anderson & Tyers,1992) [1] (Lim, 2005) [2]. Despite of its usefulness in such matter certain problems emerge through empirical application. The main source of such problems is of a linguistic nature since the concept of "sufficiency" actually applies only in cases where the levels of both income and prices allow properly sufficient consumption prevailing standards. On the other hand, many countries suffer suppressed levels of consumption far from being sufficient due to either low level of income, high prices or both. It is true that the actual consumption levels coincide with economic effective demand, however they still remain insufficient, whether humanly for consumption goods, or technically for production goods. Accordingly, the commonly used self-sufficiency ratio may be considered biased to high income countries. In short, the traditional ratio is strictly economic while the suggested ratio is more concerned with ethics of humanity.

In view of these respects, the study tends to suggest a modified self-sufficiency ratio which may avoid the problems emerging with adoption of the common traditional term.

MATERIALS AND METHODS

The suggested method for modification is base on replacement of the actual consumption term representing the ratio's denominator by the "proper" level of consumption whether humanly or technical, accordingly to the nature of the commodity. Modification details are presented after discussion of the problems accompanying adoption of the traditional term.

Problems of Use for the Traditional Self-sufficiency Ratio: As the common ratio may be proper for countries advantaging general high income levels, certain problems are associated with its use otherwise:

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Erroneous Classification According to Self-sufficiency Levels: Countries grouping according to the level of self-sufficiency ratio permits combining countries of different conditions with respect to effective contribution of domestic production. For example, the self-sufficiency ratios for red meat for Egypt and USA are almost equal while the corresponding figure for poultry is less for USA [3, 4]. This may lead to false conclusions with respect to effectiveness of production in meeting to the consumption needs compared between both countries. Such conclusions stem are due to disregarding the fact that the consumption level in USA is satisfactory while suppressed far below satisfaction in Egypt.

False Indications for Production Development Priorities: High self-sufficiency ratios may infer satisfactory production standards, a view that may indicate low priority for further promotion when comparison takes place among competitive products.

Underestimation of Importation Needs: A specific level of total consumption for a given commodity is the major indicator for market capacity. However, unrecognized suppressed consumption requires more imports than explicitly accounted for.

Overestimation of Exportable Surpluses: Domestic actual needs are underestimated whenever suppressed consumption exists. Accordingly surpluses to be exported are overestimated. This case may apply to phosphate fertilizers in Egypt for which high domestic prices disabled technically sufficient applications in Egyptian farms.

Modification of the Traditional Self-Sufficiency Ratio: To confront the stated above problems the traditional self-sufficiency ratio requires certain adjustments. It is suggested to replace the term's denominator, i.e. the actual total consumption, by an estimated volume of consumption of a "proper" or "suitable" size. This proper size alleviates suppression caused by budgets limitation, whether for consumption of consumable goods or application of production inputs.

Methods of Proper Consumption Estimation: Three alternative methods are suggested to estimate the proper or suitable size of total consumption for consumers' goods.

Experts View: the proper level may be determined by a group of experts in fields of sociology, psychology, health and economics. Such method may be subject to contradictive views concerning the weight of factors governing taste, especially as being mostly non-quantitative.

Consumption Levels of Culturally Similar Countries: level of consumption for other countries may be adopted, provided the similarity in consumption influential factors other than budget limitations governed by income (capital) and prices. It would be suitable to adopt the per capita level of consumption for a country where habits and tastes are almost the same as the original country, but advantage easy access to the commodity permitted by sufficient income and/or low prices. Suitability of such method depends upon the extent of similarity in consumption habits and tastes among both countries.

Consumption Levels of High Income Classes of the Same Country: use of the average per capita consumption of the highest income brackets is most appropriate, provided the availability of national budget surveys rendering the required data. This relies on the assumption that any differences in tastes between the income brackets of a particular country are only due to income variations for which neutralization is assumed by this study.

Modified Self-Sufficiency Ratios: The modified self-sufficiency ratios are modified according to the following equations:

MSSR = TProd / PTC x 100 (for consumption goods or inputs)

or

= TSSR x PPC / APC for consumption goods

= TSSR x ATC / PTC for inputs

Where:

MSSR = Modified self-sufficiency ratio
Tprod = Total domestic production
TSSR = Traditional self-sufficiency ratio
PTC = Proper (or recommended) total consumption
PPC = Proper per capita consumption
APC = Actual per capita consumption
ATC = Actual total consumption (for inputs)

Use of the "Proper Consumption" Term as a Criterion for Social Welfare Standard: In addition to estimation of a proper self-sufficiency ratio, the estimated proper consumption level can serve as a criterion for estimating the general standard of social welfare for the community,

which is usually estimated by the sum of consumers' and producers' surpluses [5]. This is applied by estimation of the geometric weighted mean of the ratios of total actual to total proper consumption for principal selected commodities

$$WS = \sqrt[n\sum wl]{(w_1)\, cr_1 \times (w_2)\, cr_2 \times \ldots \times (w_n)\, cr_n}$$

Where:

WS = welfare standard cri = aci /pci
aci = actual total consumption of commodity i
pci = proper total consumption of commodity i
wi = weight of commodity i
I = 1, 2, ….., n

Empirical Examples for Modification of the Self-Sufficiency Ratio for Selected Commodities: The general low consumption of animal origin foods in Egypt justifies their selection as examples for the self-sufficiency ratio modification. Likewise, phosphate fertilizers are selected as an example for inputs for which use is below recommended allowances.

Level of Consumption for Animal Origin Foods: As shown in Table 1, average per capita consumption of animal origin foods have increased between periods (1994-97) [6] and (2000-06) [7, 8] by rates ranging between 7% for red meats to nearly 46% for poultry ad eggs. Such increases are mostly due substantial production increases by percentages ranging between 40% for red meats to almost 182% for chicken. As the percentage of production for dairy products has exceeded that of consumption during the compared periods this group has advantaged an increase of the self-sufficiency ratio by almost 17%, while the corresponding estimates for other items hardly changed. It is worth mentioned that under the policy of encouraging promotion of the domestic production of poultry the state withheld importation of poultry products within the studied periods, establishing as such full self-sufficiency for such products.

Table 2 shows comparison between estimated actual per capita shares to the proper levels for the selected food items. The suggested proper shares were derived from the estimated averages for the highest total expenditure brackets according to the latest national family budget survey [9] adjusted by views of dieticians with respect to the proper meal serving of each item. As revealed, the estimated per capita actual shares were dramatically lower than the proposed proper levels falling to nearly 32.5% for eggs and up to almost 57% for dairy products. If compared with average corresponding standards for developed countries the differences would be severer since even the suggested proper levels were almost half the levels realized in most of the developed countries for almost all the referred to items.

Table 1: Annual averages of total production, total consumption (1000 m.t.) and per capita shares of animal origin foods in Egypt (kg) (1994-97), (2000-06).

	1994-1997			2000-2006		
Item	Prod.	Con.	P. capita	Prod.	Con.	P. capita
Red meats	443	575	10.1	620	764	10.8
Poultry	290	291	5.1	819	819	7.8
Fish	349	470	8.3	824	1030	19.5
Eggs	148	149	2.6	273	273	3.9
Dairy products	2318	3429	60.1	4457	5605	78.9

Source: estimated from: MOA-"Agricultural Economics Bull".Ameria Press.vols. 1998, 2006.

Table 2: Actual and proper per capita consumption (kg/year), traditional and modified self-sufficiency ratios (%) for animal origin foods (1994-97), (2000-06).

	1994-1997				2000-2006			
	Per capita consumption		Self-sufficiency ratio		Per capita consumption		Self-sufficiency ratio	
Item	Actual	Proper	Actual	Mod.	Actual	Proper	Actual	Mod.
Red meats	10.1	26	77	29.9	10.8	26	79.1	32.9
Poultry	5.1	24	100	21.3	7.8	24	100	32.5
Fish	8.3	12	74.2	51.3	9.5	12	79.6	63.0
Eggs	2.6	18	100	14.4	3.9	18	100	21.7
Dairy products	60.1	140	67.6	29.0	78.9	140	79.5	44.8

Source: calculated from Table 1 and modified ratios equations.

Subsequently, as also shown in Table 2, the modified self-sufficiency ratios seem substantially lower than the traditionally estimated ratios as far as 22% for eggs and 33% for either poultry or red meats. On the other hand, due to the prevalent consumption habits establishing low propensity to consume fish the differences between traditional and modified ratios were at minimum, as the last was almost 79% of the first (2000-06). Likewise, since production of dairy products has substantially increased during the between the two studied periods the modified ratio rose from nearly 43% to almost 56% of the traditional estimated ratio.

Use of Phosphate Fertilizers Use: Phosphate fertilizers represent an example for production requisites for which the traditional self-sufficiency is misleading. Its estimated level reached 182.3% as average for (1994-97) mounting to almost 203% for (2002-06), permitting almost one-half the total bulk of production for exportation. Nevertheless, due to the ongoing high domestic prices farmers were obliged to apply almost 36.2% and 38.3% of the technical recommended applications based on the prevalent cropping structures for the two studied periods, respectively. Accordingly, the estimated modified ratios were estimated at about 65.8% and 77.8%, respectively. As such, the illusionary surpluses are converted to actual deficits demanding imports in stead of exports.

CONCLUSIONS

The study showed that assuming suitable, in stead of actual consumption levels for certain commodities would bring the self-sufficiency ratio far below the commonly used ratio. The difference would be much wider if the standards prevailing in developed countries were adopted in stead. As such, use of the traditional ratio appears to be misleading with respect to the level of sufficiency of domestic production in satisfaction of actual needs. Accordingly, priorities of production and exports promotion programs such as to alleviate suppression upon domestic consumption and permit sufficient supply allowing more suitable consumption levels. That is considering that fulfillment of the sufficient levels of consumption represents the ultimate goal for any state's economic policies in areas of production and foreign trade. The same argument extends to particular production requisites for which their high domestic prices vs. limited capital of producers obliged levels of application far below recommended allowances and hence surpluses were directed toward exportation, while if recommended allowances were actually applied the commodity would convert to importable in stead of exportable.

Summary: The study tended to suggest a specific modification of the traditional self-sufficiency ratio. Such modification aimed at confrontation of problems of illusionary production sufficiency, overestimation of exportable surpluses and underestimation of imports requirements. The modification focused on replacement of the ratio's denominator, i.e. actual total consumption, by a "proper" size of consumption based upon a humanly satisfactory level for consumable goods or technically recommended allowances for production inputs. The adopted level of consumption derived from levels common among strata of consumers enjoying required consumption standards enabled by their income levels and reflecting their consumption tastes. The modified ratios were substantially lower than the traditional ratios for commodities of relatively high domestic prices, such as animal origin foods and chemical phosphate fertilizers. Accordingly, such commodities may require higher priorities in production promotion programs, considering that some goods, such as phosphate fertilizers, falsely appearing as exportable, may be actually in need for imports to satisfy technically recommended application levels.

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