A RETURN TO THE ORIGINAL CONTROVERSIES IN THE HISTORY OF NATIONAL ACCOUNTING: A CONTRAST BETWEEN JOHN MAYNARD KEYNES AND JOHN RICHARD NICHOLAS STONE[1]

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Abstract:

The general idea in this article is to present a contrast between two well-known authors, John Maynard Keynes and John Richard Nicholas Stone (Richard Stone), for their contributions to the development of national income estimates and *National Accounting*. Before World War II, the estimates made by Colin Clark were the main reference for discussions on government budget at a time when economic statistics were in a very rudimentary stage. In 1939, Keynes made a very important critique of Clark's estimates, despite acknowledging its pioneering importance. Stone worked closely with Keynes during the war, and while agreeing with him on this particular issue over Clark, he distanced himself completely from him by proposing a distinct conceptual framework that came to influence modern *National Accounting*. What this contrast reveal is that the recent limitations attributed to GDP for dealing with current problems, in addition to the techniques employed, are conditioned to the purpose of measurement, which was redefined after Keynes's passed away.

Keywords: national income, national accounting, measurement, welfare

Resumo:

A ideia geral neste artigo é apresentar um contraste entre dois autores conhecidos, John Maynard Keynes e John Richard Nicholas Stone (Richard Stone) por suas contribuições para o desenvolvimento da *Contabilidade Nacional*. Antes da Segunda Guerra Mundial, as estimativas feitas por Colin Clark eram a principal referência numa época em que as estatísticas econômicas se encontravam em estágio muito rudimentar. Em 1939, Keynes fez uma crítica muito importante as estimativas de Clark, apesar de reconhecer seu pioneirismo. Stone trabalhou junto com Keynes durante a guerra, e apesar de concordar com ele nessa questão específica, afastou-se completamente dele ao propor uma estrutura conceitual distinta e que veio a influenciar a *Contabilidade Nacional* moderna. O que este contraste revela é que limitações atribuídas ao PIB para lidar com problemas atuais, além das técnicas empregadas, são condicionadas ao propósito de mensuração, o qual foi redefinido após o falecimento de Keynes.

Palavras-chave: renda nacional, contabilidade nacional, mensuração, bem-estar

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1.   INTRODUCTION

John Maynard Keynes and Richard Stone worked side-by-side during the war and contributed in creating the basic framework for developing the estimates of national income in Britain. But Keynes died right in the end of the conflict, in 1946. There is not an explicit debate between them, but only Stone's view on their relationship, which he mentions in some detail decades later in a lecture (in 1978) about the importance of Keynes contributions to *Political Arithmetick*[3] and Econometrics.

Stone became the main author in developing *National Accounting*, as his contributions, which rendered him the Nobel Prize in 1984, became known for having improved the construction of aggregate estimates and hence improved the basis for empirical economic analysis. Stone actually created a 'new' form of producing the estimates in the official revisions of the *System of National Accounts* (SNA), since 1947 to the 1968 revision.

In developing this 'new' form, Stone made some conceptual changes from what Keynes (together with Erwin Rothbarth, a German student who fled Nazi Germany and end up working with Keynes in Cambridge) did in *How to Pay for the War*. It is important to notice that Keynes and Rothbarth's estimates were still very rudimentary, as also were Stone and James Meade's 1941 estimates which were used in the 'revolutionary' *White Paper*, official report on British public budget which gave origin to Stone's 1945 report and then to the first 1953 SNA.

The general purpose of this research is to identify in the history of *National Accounting* a conceptual contrast between Keynes and Stone. It is important to contrast what Keynes (and Rothbarth) did in *How to Pay for the War* with the further developments in national income estimates that led to *National Accounting*, because it reveals how different was the purpose of the estimates and the framework for the concepts used in attending such purpose. In revealing this contrast we can (re)interpret some fundamental limitations in the more recent SNA revisions. The tension between considering the institutional differences between countries and, at the same time, measuring them under the overall purpose of *international comparability*, as the SNA does, will be briefly emphasized.

2.   THE DIFFERENT PURPOSES FOR MEASURING NATIONAL INCOME ESTIMATES BEFORE WORLD WAR II

The contrast that is being proposed in here, if we limit ourselves to a more technical view of the methods used in earlier national income estimates, is simply that John Maynard Keynes was against the use of *deflators*, while the use of *deflators* (the *implicit deflator* and the *double-deflation* method) has become the standardized practice in modern *National Accounting*. But underneath this technical change there is the overall conceptual framework adopted by each author, in which different purposes of measurement are contrasted for sustaining their respective conceptual choices.

While Keynes did make his conceptual choices for estimating national income concerned with real world circumstances at that time, and revealing through this a clear policy purpose for measurement, Stone, on the other hand, made his choices by pursuing a more consistent system as a purpose in itself (similar to Irving Fisher's justification for the isolation of circumstances on his approach to index number through his set of tests). Despite Stone was directly influenced by welfare based methods of valuation – i.e., seeking to improve measurement for making real income comparisons – he justified his choices under the general purpose of improving *international comparability* (also a goal for Arthur C. Pigou and Colin Clark's *national dividend* definition of income – the welfare approach to national income).

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[3] Term used following the 17th and 18th century authors who pioneered the work on trying to think national aggregates, as William Petty and Gregory King.

Praised by Keynes and Richard Khan in the 1930s, Colin Clark's 1929 estimates were the main source of economic statistics at that time, despite its limitations and rudimentary stage. Clark is considered to be the 'first' in the UK to produce a measure of economic activity from the level of spending, as in 1937 on his work *National Income and Outlays*[4]. Alec Cairncross's (1988) discussion on the lack of history of economic statistics, identifies Clark's seminal work as one of the most important changes in human affairs and economic policy. Cairncross emphasizes that the use of statistics for 1940's policy making was revolutionized and this is mainly because of Clark's influence and the encouragement to the estimation of economic aggregates. In Clark's (1965, p. 4) *National Income and Outlays* of 1937, he presented a definition for income as the *national dividend*[5] and emphasized its possibilities:

> The national dividend must always be conceived in real, but measured in money, terms. The measurement of differences through time or between different countries always involves therefore the difficult practical and theoretical problems concerned with index numbers […]. In any case, however, a dividend consisting of an infinite variety of goods and services can only be reduced to a common measure by means of a money unit. We may as a standard take the dividend of any place or time we wish, and by the use of price index numbers express other real dividends in terms of this standard. This process can never claim complete logical water tightness, but we can be satisfied that it works well enough in practice for comparisons over periods up to, say, twenty years, or for comparisons between communities whose ways of living are not too widely different. Comparisons over a wider range of time or space must become less reliable, while comparisons between the average real dividend per head in, say, Britain and India, or between the twentieth century and the Middle Ages, can only be accepted subject to very big qualifications. This does not imply, however, that they are not worth making.

As mentioned above, Clark's definition is the same as Pigou's 1920 book, *Economics of Welfare*. And in Chapter VI of Pigou's book – which was used as an Appendix in Clark's (1940) *Conditions for Economic Progress* – Irving Fisher's "ideal" index is praised as the most useful for Pigou's purpose of measuring the *national dividend*. Pigou's *national dividend* has made a great impact not only in Clark's initial attempts of estimating national income, but also in *National Accounting* in general. Clark's *Conditions for Economic Progress* also praises Fisher's "ideal" index. Since "there is no meaning in speaking of an increase or decrease in the national dividend in an absolute sense", in Clark's (1940, p. 486) words, Pigou's achievements were unquestionable.

Clearly, the introduction of the concept of welfare is the form Clark referred to the use of "real" figures, after deflating money values with a proper price index. In the mentioned appendix, Clark (*ibid*., p. 496) will reproduce the Fisher's *factor reversal test* as the measure of change most proper for their purposes, welfare comparisons. As noted in a 'special memorandum' (n. 43) named *The Economic Position of Great Britain* by Arthur C. Pigou and Colin Clark (1936, p. 18), but mostly written by Pigou[6], when prices of different periods have suffered large changes, "a mere comparison of money incomes does not tell us much." Since the "money façades" (expression by Pigou) doesn't reveal changes in the 'real' incomes, it is essential to make indirect measurements.

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[4] Clark's estimates were quarterly, rather than annual, and he would have pioneered macroeconomic analysis in his result. According to Arndt (1988), Clark was the first to employ the concept of *Gross National Product*, in place of traditional national income estimates. In this sense, Tily (2009: 232) attributes to Clark the title of 'first accountant' of national accounts.

[5] Alfred Marshall presented a definition of the *national dividend* in his *Principle of Economics*.

[6] As Pigou says in the introduction of the memorandum: "In 1927 I prepared a pamphlet for the London and Cambridge Economic Service entitled *The Economic Position of Great Britain*. In this an attempt was made to bring together in a collected account the dominant differences in the economic position of Great Britain in 1925-27, as compared with what it was immediately before the War. That pamphlet seems to have been found useful, but, since it was compiled, many important changes have occurred. The present time, the beginning of a new reign, when substantial progress towards recovery from the great depression has been made, is, perhaps, a suitable occasion for bringing it up-to-date and incorporating in it some new material. In this work I have had the advantage of collaboration with Mr. Colin Clark. He has prepared and is responsible for most of the tables; I have written the text and, the tables being taken as data, am responsible for that."

This is why Deaton (1981) will say that the construction of index numbers is an essential part of all *National Accounting*[7]. Deaton (*ibid.*, p. 130) sustains that:

> "[…] without compression and aggregation the mass of quantities and prices thrown up by the economic system would be incomprehensible. Yet from the outset such aggregation has been known to be meaningful only in the context of welfare measurement. But to what extent are welfare-based index numbers practical?"

This question was answered through Stone's 1956 booklet on index numbers, saying that the *welfare approach* avoids vagueness and obscurity in real concepts[8]. And so 'social accounting' could only develop in following this approach. But, if we look upon the history of *National Accounting*, and in the *Theory of Index Numbers*, the terms 'meaningful' and 'incomprehensible' used by Deaton are, in a certain way, confusing. Since we are emphasizing the importance of the different purposes of measurement, the meaningfulness and comprehensiveness of the aggregates were also a matter of conceptual disputes in developing the standard framework.

Among different approaches of *index numbers*, the question of *purpose*, and of *arbitrariness* in the selection of the 'best' properties (as geometric or arithmetic) and the 'best' index, reflects the importance of establishing general criteria for statistical and mathematical consistency in their construction. In general, the *index number problem*[9] is about the arbitrary 'choices' that are necessary in constructing any index. But another form of approaching the *index number problem* can be done by recognizing the matter of the purpose of measurement and how these inherent arbitrary 'choices' are justified.

As Wesley Mitchell (1938) shows, the problem of price fluctuations entered upon another phase when the world-wide rise of prices which began in 1896-97 had been under way for several years, and after 1900, more insistently after 1910, complaints about the rising cost of living became common in all civilized countries. In the historical movement between the different approaches of index numbers, the question of *purpose*, and of *arbitrariness* in the selection of its 'best' properties and 'best' indices, there is an increasing need for statistical and mathematical consistency.

In the most recent revisions of the SNA, 1993 and 2008, it became general recommendation for *National Accounting* to use index numbers to decompose changes in nominal expenditure into price and 'volume' effects. As Reinsdorf (2007) points out, this procedure was originated in Irving Fisher's (1920) *The Purchasing Power of Money*, published in 1911, in his discussion of the *product test* (or *weak factor reversal test*) although there are important differences in the modern version of it. In this book, Fisher (1920) proposes that the construction of a quantity index should be treated separately from a price index.

In the appendix to Chapter X of Fisher's book a comparison on the merits of the formulas of 44 price and quantity indices through a series of tests[10] is presented. As Boumans (2001, p. 323) interpreted, Fisher's original interest in index numbers arose from the problem of determining the 'purchasing power of money'. Inspired by the equation of exchange in the *Quantity Theory of Money*, *MV = PT*, Fisher approached the

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[7] Similarly, Carter, Reddaway and Stone (1948, p. 3) argues that "in the construction or appraisal of any index number, it is essential to be clear as to the objects it is intended to serve, i.e., what is it that you are trying to measure, and why?"

[8] "*First, they give content to such concepts as real consumption which might other- wise be vague and obscure; second, they bring out the fundamental difficulties in establishing empirical correlates to concepts such as real consumption and so help to show what can and what cannot usefully be attempted in the present state of knowledge; finally they show the circumstances in which particular empirical correlates , such as a measure of real consumption which can actually be constructed , are likely to provide a good or a bad approximation to the concepts of the theory.*" (Stone in Deaton, 1981, p. 130)

[9] The index number theory focuses on the *index number problem* as *the inherent ambiguity in one-dimensional measurements for multidimensional objects* (Warke, 2000). Or the problem of measuring heterogeneous entities as homogeneous, in the attempt of quantifying them though without having a physical dimension to do this. This allows us to identify how this problem was pervasive in different authors throughout history.

[10] In addition to the *circularity test* (also known as *the change of base test*) and the *dimensional invariance test*, Fisher proposed three other tests, that is, the *proportionality test*, the *determination test* and the *withdrawal or entry test*.

problem of determining the 'purchasing power of money' in his 1911 book, *The Purchasing Power of Money*, through the use of index numbers and their consistency through a set of tests. The main idea implicit in this relation is that with the speed of money constant, and given a certain amount of money, an inverse and proportional relationship between the variation of production and the *general price level* is established. In doing this, Fisher like earlier thinkers had to deal with the *index number problem*.

Saying otherwise, Fisher needed a *common unit* and he proposed to measure the quantity of a good from a unit estimated as '*dollar worth*' for the total volume of transactions T. This change in the unit of measurement used, have also changed the meaning of P in the exchange equation from being the average price *level* to become the average price *relationship*, that is, the price index. But this will be developed only in *The Making of Index Numbers* of 1922, where he formalized his famous reversal tests, whose aim was to resolve inconsistencies in the tests proposed in 1911, mainly when we are considering different spaces (countries) and different time periods (historical contexts).

The *factor reversal test*, which says that the multiplication between prices and quantities must always produce the same nominal value. But the satisfaction of the *factor reversal test* requires that the implicit quantity index have the same functional form as the price index. Though this test is a convenient way to insure that the implicit quantity index has axiomatic properties that are as good as those of the price index, this test is intrinsically important only if an identical approach to price and quantity indexes is desired. This test was then redefined by Ragnar Frisch (1930) in what he called the *product test*, or the *weak factor reversal test* as named by Samuelson and Swamy (1974). If the index is to be used for deflation of nominal expenditures, the *product test* is more operational, since it does not depend on the identical approach to both price and quantity indexes, i.e., they don't need to have the same function.

The Fisher index was developed for clearing his set of tests which actually tested mathematical properties of index numbers. Pigou and Clark will praise this index because it is the most suitable for attending their "national dividend" definition, and then comparisons of "real" income. Both authors emphasize the *factor reversal test* for its capacity of 'solving' the *index number problem*, though through a technically arbitrary justified choice, *an index number that is itself a purpose* (as Fisher responded Mitchell's critique).

Fisher's test approach to index numbers is very relevant in its applicability, since it created conditions for index number to be operational, at the same time that it avoids theoretical underpinnings and discussion on the purpose of the index number. So, Deaton initial statement is confusing, in the sense that *National Accounting* appears to be, somehow, a welfare indicator or a form of measuring welfare. If welfare-based index numbers are essential to *National Accounting*, but are only meaningful in the context of welfare measurement, then in what sense the index numbers constructed for *National Accounting* are meaningful concepts?

This question can be answered in the common purpose that will be reproduced in all the *United Nations's* (UN) *System of National Accounts* (SNA) since the 1947 initial report based on Stone's 1945 memorandum, and in the versions of 1953, 1968, 1993, and 2008, as also in the *European System of Accounts* (ESA) reports, is the overall goal to improve, more and more, the *international comparability* of the system. The SNA, as in the latter revision of 2008 (para 1.33), is to be used for international reporting of national accounts that conform to standard, internationally accepted concepts, definitions and classifications[11]. As the SNA 2008 goes:

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[11] Actually, the international comparisons goals from the 2008 SNA were prepared under the auspices of the *Inter-Secretariat Working Group on National Accounts* (ISWGNA) project, which is constituted by members from five organizations: the *Statistical Office of the European Communities* (Eurostat), the *International Monetary Fund* (IMF), the *Organisation for Economic Cooperation and Development* (OECD), the *United Nations Statistics Division* and regional commissions of the *United Nations*, Secretariat and the *World Bank*. But since our focus is the conceptual framework of the system, we shall leave the important discussion on institutional influences and meetings for a future study.

> The resulting data are widely used for international comparisons of the volumes of major aggregates, such as GDP or GDP per head, and also for comparisons of structural statistics, such as ratios of investment, taxes or government expenditures to GDP.

Further in the SNA 2008 (para 1.75), it is clearly stated that:

> GDP is often taken as a measure of welfare, but the SNA makes no claim that this is so and indeed there are several conventions in the SNA that argue against the welfare interpretation of the accounts.

As the index numbers constructed for *National Accounting* could only be developed as being 'meaningful' concepts, it is the purpose of *international comparability* that will sustain the use of welfare based methods for valuation, though the purpose of the system is not to measure welfare. This is interesting when we can find in Keynes's (2013, p. 51) definition of an index number, in his awarded 1909 essay on index numbers, *The Method of Index Numbers with Special Reference to the Measurement of General Exchange Value*:

> An index number is in itself no more than the measure of the magnitude of an object at one time or in one place in terms of the magnitude of the same or a similar object at another time or in another place.

If we compare this definition with Utz-Peter Reich's (2001, p. 67) definition for the purpose of *National Accounting*, though he has written it commenting on *index numbers*, there is an interesting similarity in considering that the "purpose of national accounts is to compare economic parameters in time and space". In an earlier work about the changes on the conceptual framework of *National Accounting*, Reich (1986) made an important observation that, in such systems, *structure dominates the method*. Although he was discussing terminology issues on the SNA debates pre-1993 revision, such statement also serves to comprehend how in the post-war history of *National Accounting*, the overall purpose of *international comparability* allowed for the idea of *consistency* of the accounts to serve as a form of neutralizing divergences and controversies on its conceptual framework. As the structure of the system was intended to allow for direct comparisons, the fact that the value of transactions between institutions are nominal values is a limitation. This is why *deflation* will be an important issue, though it was not ultimately adopted among different authors in their contributions for the estimating economic aggregates, Keynes being one of them.

Keynes and Stone were important authors that made crucial contributions to the development of *National Accounting*. But the trend of an *accounting structure domination* places them in different conceptual frameworks. This 'domination' is contrasting in these frameworks because of their divergent measurement purposes, which consequentially lead to the need of strong assumptions over our economic reality in pursuing the objective of measuring it. This shall be our main point to be raised in this section. In the history of *National Accounting*, to the more recent version of the standard system adopted by many countries through the UN's SNA, and the ESA, different aspects of reality were suppressed in attending to the *consistency* and the international unification of the system. But under extreme circumstances, as due to severe economic crisis, war, or a pandemic, these differences are highlighted altogether with the limitations of the system. In this sense, *institutional differences* between countries, as to their taxation structure and government role, become contrasting with the purpose of *international comparability*, as adopted since the end of the WWII. This is one crucial point to be stressed in Keynes's *How to Pay for the War*, as it will be discussed in the next section.

In the same year when Keynes published his estimates with Rothbarth, John Hicks started an important debate after the publication of *Value and Capital* (1939), which will endure throughout the 1940s in *The Valuation of Social Income* (1940) in the famous *Economica* journal. In this paper, Hicks presented two senses of Income that were coming up in the 1940s, and that were not identical. This contrast established a 'watershed' on the relevance of the different forms of valuation used on national income estimates. For Hicks (1940, p. 106-107), Pigou was the main representative of that time of a long line of economists who

sought in social income an index of economic welfare, of the wealth of nations, so that we would have 'little choice except to follow that tradition'.

The interpretation of social income (or product) as an indicator (or an index) of welfare was based on the theory of consumer choice. As Chiodi and Ditta (1999, p. 265) interpreted, in the core of Hicks's research on the valuation of social income through the course of four decades he ultimately came to the conclusion that we cannot possibly have the measure of a 'change' in social income, but at most a measure of it, according to the alternative goals we envisage as being achieved in the measuring of social income. Hicks identified the consequences of his own taking into account alternative income distributions when discussing on different measures of real income. Because Hicks identified this goal, he could comprehend the inherent limitations in measuring social income for that purpose. In this sense, the only measure which might be relied upon as coherent is that based in the least realistic of the assumptions – namely, when the social product is equally divided among identical consumers (the representative consumer hypothesis).

As Chiodi and Ditta (*ibid.*, p. 266) concludes, in the continuity of the work of Hicks on national income valuation, the measurement of an aggregate of a heterogeneous collection of commodities means to evaluate those commodities. But valuation is applied in the SNA as a 'multi-purpose' or 'flexible' process in which the user plays an important role. Still, the history of the SNA shows an inclination of methods of valuation towards a more consistent integration of input-output matrix in which homogeneity plays an essential and necessary role.

Although the SNA is considering the problem of aggregating heterogeneous commodities through a more flexible manner, in the history of the SNA there was a very strong focus on consolidating the use of index numbers for homogeneous commodities in allowing more consistent methods of valuation. Though many authors are discussing on the recent limitations of GDP, it is still hard to comprehend its consequences due to its generalized common use in modern society. The contrast proposed in this paper tries to interpret this limitation from another perspective and in a more conceptual view. The *standardization* of measurement procedures that consolidated *National Accounting* can be related with the *standardization* of the practices this form of measurement allows.

Diane Coyle (2017) has emphasized that for macroeconomic policy-making and for many forms of economic analysis in modern times, it is hard not to think of GDP. But when we think about GDP, and its growth as it is most common, is it *real* GDP growth that is taken as shorthand for progress or improvement in discussing social welfare and the overall nation's economic and political performance (Coyle, 2017). If we compare the initial efforts on the development of economic statistics in the late 1930s and early 1940s, with the WWII, and then the post-war era, we can identify a significant change in emphasis as to whether national income estimates, and later *National Accounting*, should account for aspects of welfare or not. In the next sections, we shall interpret this change through Keynes and Stone contributions.

3. KEYNES'S HOW TO PAY FOR THE WAR CONCEPTUAL BREAKTHROUGH: THE POLICY PURPOSE

In the history of *National Accounting*, Hicks (1990) and den Butter (2007) identifies a 'shift' on the development of the estimates. In his last paper written in 1989, '*The Unification of Macro-Economics*', Hicks (1990, p. 536-537) emphasizes in the final section of his paper, some of these problems were explored by many neoclassical authors, and after arguing on the 'explosion' of the 'price-mechanism' approach – made purely theoretical in Gerrard Debreu's works – as limited for 'macro' problems, he also shows that:

> Another quite different direction in which neoclassical economists went 'macro' in an interesting manner was in its concept of the Utility Optimum, with the valuation of the social product at *market price*, rather than *cost*, which goes along with it. This received its most important expression in the *Economics of Welfare* of Pigou. The estimates of National Income which were made by Colin Clark were income in the sense of Pigou and thus carried on from it.

So we have to give a proper attention for interpreting this shift in the valuation of the social product, which was initially made at 'costs', but then, in following the neoclassical concept of aggregated 'Utility Optimum', shifted to valuation at *market prices*. But actually this is not so defined in concerning how *National Accounting* came to adopt *market prices* valuation, mainly in relation to valuation at *factor costs* which remained in effect for more than 50 years, as Tily (2009) argued. Through the interpretation of Keynes perspective on national income estimates, and how the estimates came to be made after the WWII, we will show that this 'shift' cannot be dissociated from the changing emphasis on economic policy, though against Keynes's view.

Bateman (2006) attributed as one of the most significant changes in the economic and political life of the twentieth century the introduction of demand management in the industrialized democracies. Governments from different countries took on responsibility for using fiscal and monetary policy to stabilize the total demand for goods and services. On the other hand, as Musgrave (1987) has interpreted, in the advances (and retreats) of Keynes's ideas after his death in 1946, the advent of inflation in the late 1960s and during the 1970s has changed the dimensions of macroeconomic policy. While full employment policies had a specific connotation in terms of measurement of national income and the use of fiscal policy, the concern towards the wide notion of growth has changed such specificity, creating more loose measurement purpose and economic policy mixture.

Keynes's initial approach to estimating national income was not concerned with growth, but with raising the level of activity, as Tily (2015) argued on reviewing Coyle's book. But on the ground of practical application, Keynes's approach was rejected. Though, conceptually, Keynes's ideas were ground-breaking for the development of *National Accounting*. For Tily (*ibid.*, p. 4), *National Accounting* was first concerned with the level of economic activity; growth came somewhat later. *National Accounting* has developed under the movement of policy toward setting a trajectory for demand growth against a trajectory for supply growth, an approach which, for Tily, has underpinned policymaking ever since.

Roy Harrod (1974) acknowledged that Keynes could not have been expected to have a systematic idea on growth. Keynes's ideas were related to the political possibilities for full employment. Then how this affected the construction of his estimates in *How to Pay for the War* and how this can be contrasted with *National Accounting* developed fundamentally on Stone's contributions? As we saw in the previous section, the matter of aggregation and the construction of the first national income estimates has changed the scope of the *index number problem*, i.e., how to choose the proper weights and a common unit for measurement. The ancient problem of measuring utility was not enough of a problem to impede its use and application in modern economic measurement, including *National Accounting*, as in many passages of the SNA revisions and its welfare based valuation method. It seems that the problem with the utility concept, although lacking a common unit for measurement, could be circumvented in the process of aggregation, a point made by Bergson (1938).

For Keynes (2013, p. 51), an index number is in itself no more than the measure of the magnitude of an object at one time or in one place in terms of the magnitude of the same or a similar object at another time or in another place. When Keynes is dealing with the nature of the quantities under investigation is not so hard to think about the *index number problem*. As Bradford and Harcourt (1997, p. 109) will say, all the problems associated with measurement of aggregate economic quantities revolve around the question of determining a common unit. And, for Keynes, this was also a justification for avoiding the idea of *general price level*, since he considered that the quantity theory failed to account for the relative price changes.

In chapter 4 of the *General Theory*, Keynes (2013b, p. 39) will emphasize the "known but inevitable element of imprecision that, as we know, accompanies the concept of the general price level". When dealing with the difficulties caused by this problem, which is the *index number problem*, Keynes (*ibid.*) classifies them as "purely theoretical" difficulties which, despite the "quantitative indeterminacy", "are unnecessary".

This is evident in a passage, in which Keynes defends the importance of 'best' grounding instead of using *vague* concepts about problems that he himself points out as 'inevitable':

> To say that net output to-day is greater, but the price-level lower, than ten years ago or one year ago, is a proposition of a similar character to the statement that Queen Victoria was a better queen but not a happier woman than Queen Elizabeth – a proposition not without meaning and not without interest, but unsuitable as material for the differential calculus. Our precision will be a mock precision if we try to use such partly vague and non-quantitative concepts as the basis of a quantitative analysis.

Then, immediately after this comprehensive rejection of the *general price level*, Keynes defends his own fixed wage-weighted employment index, starting from the *wage-unit*, with the proposition that wage skill differentials change only slowly. Although Keynes had his own *arbitrary* index number (Persky, 1998, p. 202), whose use is marked by the same difficulties, his justification is precisely directed to the problem at hand: avoiding the *vagueness* of using a *general price level* concept.

As Hoover (2012, p. 31) has interpreted, Keynes's measure of value of the *wage-unit* used in the *General Theory* is not far from Adam Smith's or Thomas Malthus's "labor-commanded" standard of value. The measurement of economic aggregates through monetary terms gave Keynes the possibility of adding up incomes, expenditures, and product of disparate workers, consumers, and firms, without having to deal with the problem of defining a common unit. As Hoover (*ibid*.) will say:

> Naturally, behavioral relationships must in some sense be formulated in "real," rather than monetary, terms. Despite – or, perhaps, because of – a deep knowledge of index numbers, Keynes does not appeal to a price index as a deflator, but re-expresses monetary quantities in wage units (the ratio of the monetary quantity to the typical wage rate for manual workers), in effect adopting a relative social standard for real value rather than deflating by the price of a basket of disparate goods with somewhat arbitrary weights.

In Chick (1983, p. 58) it is argued that Keynes might have rejected the recovery of 'real' values by deflation on the grounds that the use of a *general price level* diminishes the importance of the consumption-investment distinction. The two components of aggregate demand essentially operate in different time frames as consumption expenditure is geared toward the satisfaction of wants in the present, while investment is the provision of future productive capacity. As such, the role of expectations (and the rate of interest) is important in determining the demand, and thus price, of investment goods, but not for single-use consumption goods. The real income of households is dependent on the price of consumption goods but not at all (effectively) on that of investment goods. Hence the use of a general price index to recover real values is not appropriate, obscuring, as it does, these important differences.

As Harcourt and Riach (2005, p. xix) discussed, as far as the *general price level* was concerned, Keynes argued that shocks to the system must of necessity have different effects on the prices of different commodities and this occurrence vitiates any attempt to give precision to the notion of the general price level and of changes in it. Moreover, he found it impossible to conceive of weights which were independent of the prices to which they were attached in the construction of index numbers. In this sense, to not be *vague* is to have a circumstantial *practical purpose* to real world problems, and justify what is being measured, instead of pursuing concepts which denies such aspects of economic reality.

How to Pay for the War is notorious for the accounting construct that was applied Keynes, which used the conceptual background of the *General Theory*[12]. Cuyvers (1983) have argued in his investigation about the

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[12] Keynes wrote the *General Theory* just in the 1930s, when the effects of the 1929 crisis were most evident. The Keynesian revolution has an essential importance in the way in which Keynes uses accounting conventions in *General Theory* to give greater practical utility to policymakers. And within his principle of effective demand, two approaches are separated that must give the same total value: the cost of factors (cost factor), which he delimits for payment of wages practically, and the cost of use (*user cost*), such as operating costs with depreciation and consumption of products from other companies in the production process, as an intermediate consumption (Keynes, 2013, p. 23).

elaboration of *How to Pay for the War*, although it is well known that Keynes showed great reluctance to use the concept of gross income, and although Keynes explain this in the *General Theory*, wartime was decisive in Keynes's conceptual 'choices'. In a supplementary note for discussing the concepts used in *How to Pay for the War* published also in 1940, Keynes (1940) will show the importance of the definition of income he adopted in constructing the estimates, and also why he opted for a net system and why he diverged in all these points from Colin Clark's 1937 estimates.

In Keynes's 1940 supplementary note, he identifies two problems: War potential and maximum national output. When Keynes argued that there were a relative number of estimates circulating with the same title of *How to Pay for the War*, he emphasized how different meanings of national income could lead to different problems and not only in the difference of estimated amounts. This is similar to what Mitchell (1938) identified, as showed in the previous section, in the construction of price indexes throughout history. But the matter of aggregation clearly presents more challenges, since it incorporates the use of index numbers in the valuation of the aggregated estimates. Keynes was well aware of the limitations that the use of index numbers could bring in their application. As Tily (2009, p. 350) noticed, Keynes's preoccupation with 'War Potential' has determined his critical approach to Clark's estimates in dealing with depreciation.

For Keynes (1940, p. 61-62), *Taxable Income* concerns individual incomes, and it is different from Clark's *Gross National Income*. Two definitions are required on Keynes's national income aggregates: the meaning of individual output and the meaning of individual income. Keynes's idea of *Gross Income* is based on the definition used in the *General Theory*, with the help of the concept of *user cost*, upon which the amount of *Effective Demand* depends. Because Clark didn't consider individual incomes, as Keynes did with his *Taxable Income* definition, *transfer incomes* do not appear in Clark's estimates. For Keynes (*ibid.*), prices as ordinarily understood, which enter into the usual index numbers, are not equal to *cost*. Prices used in the index numbers are *market prices*, which are greater than current *cost* by: (1) taxes charged in intermediate consumption to producers and retailers and (2) *user cost*, a concept used by Keynes in *General Theory* that is the cost of resources effectively used in production.

Keynes criticism over Clark's differentiation between *market prices* and current *cost* is that Clark adds *indirect taxes* and current *depreciation* to current *costs* before applying the index numbers. In other words, Clark duplicates these taxes and depreciations that already appear on *market prices*. For Keynes, *indirect taxes* should not be part of the figures of national physical resources because of the risk of deflating output in terms of money by an inappropriate price index. As Keynes (*ibid.*) says:

> Experience shows, I think, that this is at least as serious a trap as the risk of deflating output in terms of money by an inappropriate index number of price. Moreover, Mr. Clark's procedures not even successful in giving us the market price of output. His addition of an amount, somewhat arbitrarily determined, to cover current depreciation is not capable of precise theoretical determination and is certainly not, in practice, the correct amount required to convert factor-cost to market price.

The conversion of *factor-cost* to *market price* is a main concern that will be recurrent in national income discussions after the IIWW, as we already saw in Hicks's 1940 *Economica* paper. Though, in a more practical view of this issue, what is revealing in Keynes estimates is how he constructed and to what purpose. As Kurabayashi (1994, p. 97) summarized, the breakdown of sectors for the income and outlay account is essential for the accounting structure of *How to Pay for the War* so that Keynes could delve into the distribution and redistribution of incomes between the sectors for *the management of war economy*, through decisions on the public budget.

Such purpose is explicit in the distinct definitions of national income presented by Clark and Keynes. The distinguishing of the measurement of *ex-ante* (potential) and *ex-post* (actual) figures is not only based on *double-counting*, but on the circumstances for making these figures more useful. Instead of a criterion for avoiding *double-counting*, the main criteria, in the case of Keynes approach, is based on the concept of *user cost* presented in the *General Theory*. What changed is the purpose of measurement under different

circumstances for using these estimates, despite Kurabayashi's (*ibid.*, p. 98) view that Keynes's argument is liable to be out of place regarding the distinguishing of the measurement of *ex-ante* and *ex-post* figures.

Therefore, the question that Keynes asked in *How to Pay for the War* was *How much government could afford to spend*. And his estimates developed for dealing with this question is not only relevant to the war situation, but also for moments of profound crisis when government has no other choice than to intervene. More than arguing on the importance of government, Keynes also defended his perception on how government should be treated in the estimates, through the use of the idea of *loan expenditures*[13] in sustaining the possibility of deficit financing, though not encouraging it. In the Appendix of *How to Pay…*, Keynes (2013d, p. 430) states that the figure of "*loans from the public*" is correspondingly reduced below the actual amount borrowed by the government and represents only that part required to cover the net current deficit exclusive of the investment expenditure.

In overall, the purpose of growth in *National Accounting* has produced conceptual changes that also influenced on how the public budget is to be perceived in the treatment of government in measurement. While Keynes had a particular view on loan expenditures that implied in a separate budget for government dealing with deficit financing, as he introduced together with other concepts from the *General Theory* in *How to Pay…*, further developments in *National Accounting* let the treatment of government, and the public budget in the accounts, with concern to keep a balanced budget.

And since Keynes had a specific goal to be attended through fiscal policy, i.e., full employment, when making his estimates for *How to Pay…*, the goal of growth has allowed for flexibilization of this policy recommendation. It is important to emphasize is how Keynes (*ibid.*) contrasted his approach from Clark's, in the sense that both made their estimates for different purposes, that is:

> In certain contexts, particularly in temporal comparisons of real output and income, this may be convenient. But in most contexts I believe that the other course is better and (provided that one is careful about the appropriate index number of price) less misleading.

And later, Keynes (ibid., p. 63) will say it again, though noting the limitation for fiscal policy purposes:

> Indeed, I see no practical purpose for which Mr. Clark's concept can be useful, except for comparisons of real output by means of the usual index numbers over periods between which the fiscal system and the character of consumption are unchanged.

This, we believe, was Keynes's main concern in the matter of national income estimates, not only in strengthening its conceptual core, but also looking at how the estimates would help in real problems to be solved – a clear policy purpose –, and to what is being measured and why. As Hall (1989) emphasizes, Keynes's ideas helped loosen a fiscal constraint that stood in the way of expanding needed social programs:

> Although Keynes was by no means responsible for the expansion of the welfare state that is sometimes linked to his name, his theories placed increasing responsibility for economic performance on the government's shoulders, and his attacks on the priority which classical

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[13] In Chapter 10 of the *General Theory*, in the discussion on burying and digging up banknotes as means against unemployment, Keynes will use the term 'loan expenditure' in a footnote, stating that: "It is often convenient to use the term 'loan expenditure' to include the public investment financed by borrowing from individuals and also any other current public expenditure which is so financed. Strictly speaking, the latter should be reckoned as negative saving, but official action of this kind is not influenced by the same sort of psychological motives as those which govern private saving. Thus 'loan expenditure' is a convenient expression for the net borrowings of public authorities on all accounts, whether on capital account or to meet a budgetary deficit. The one form of loan expenditure operates by increasing investment and the other by increasing the propensity to consume." (Keynes, 2013a, p. 128-129). Although Keynes recognises that public loan expenditure "operates by increasing investment ... and the propensity to consume", analysis of its operation will be given in further discussions on the budget.

economics attached to a balanced budget helped to loosen a fiscal constraint that stood in the way of more generous social programs.

But at the same time that Keynes's ideas served as a basis for justifying government expenditure in the economy, though not its uncontrolled expansion, the aversion to Keynes was fundamental for criticizing and opposing state intervention. The distaste to Keynesianism in the 1960s and 1970s was so strong that it is very difficult to distinguish if authors against Keynes were opposing his thoughts or opposing the post-war enlargement of government's role in the economies. Under this cloak of anti-Keynesianism, national income measurement was not only being stablished and practiced throughout nations in post-war era, but also changing drastically from its original uses.

4. STONE'S CONSISTENCY IN NATIONAL ACCOUNTING: THE PURPOSE OF INTERNATIONAL COMPARABILITY

As Stone (1980, p. 68) reminds us in his lecture given in 1978 on Keynes's contributions, 'the initial motivation for publishing official estimates of national income and expenditure arose out of a misunderstanding about these very concepts.' Different procedures were being contrasted in the 1930s, when the use of estimates of national income were becoming more attractive for governments in the aftermath of the Great Depression, and in the upcoming IIWW.

In this same lecture, as Stone (*ibid.*) recalls his relationship with Keynes, which will shall comment further, he also emphasizes Keynes' exaggerated tone in his criticism. For Stone, Keynes's posture has brought upon his own work ambiguity and superficiality. We would like to emphasize in this paper a point which is, in our view, the main concern. When Stone (*ibid.*) is commenting on Keynes works on index numbers, he makes the following assertion:

> In constructing index-numbers Keynes lays great stress on the importance of weighting, on the grounds that in some of their writings both Edgeworth and Bowley had suggested that it was not of great importance. While excessive attention to weighting is unlikely to lead to much improvement, approximately correct weighting is essential. In most of the index-numbers of the time, weighting, if present at all, was extremely perfunctory; on the other hand, even assuming the data to be available, it would not always have been easy to see what weights were appropriate before the national accounts made possible a systematic approach to the relationships among index-numbers.

In Stone's opinion, national accounts made possible a "systematic approach to the relationship among index numbers". But the relationships among index-numbers, and how the perception of these relationships changed, made possible *National Accounting*. The problem is that such relationships are part of the problem of weighting and arbitrariness, that is, the *index number problem*. And as we saw, these relationships are conditioned to the 'choices' in the construction of any index number, as to their purpose in what is being measured and why. As we will argue, the beginning of the era in which national accounting was conducted on the basis of international guidelines in order to promote *international comparability*, begins to be standardized after Keynes' passed away in 1946. The beginning of the 1950s marks Stone's diversion from Keynes's approach to national income estimates and its transformation in *National Accounting* in further Stone's contributions. And in the center of this transformation, Stone's *systematic approach to index numbers*, based on ideas and concepts we saw on the previous sections.

The high cost of attending the purpose of *international comparability* in economic statistics is the suppression of the differences in the definitions of income used that might not mean the same on different countries. It is in the suppression of these definitional differences that we find severe conceptual controversies in measuring economic activities. But, at the same time, the adoption of the general purpose of measurement for *international comparability* also allows for the insertion of theoretical assumptions which uses utility concept with the premise for obtaining real estimates. Saying otherwise, it allows to avoid the well-known limitations of utility measurement. It was Stone who made possible the systematic approach to the relationships among index numbers in the national accounts.

On April 7, 1941, the first *White Paper* in England was published, which included the first the first official estimate of national accounts, and which placed Stone (who was a student of Clark and admirer of Pigou) and James Meade in the conceptual path towards the 'new' *National Accounting*. The presentation of the 1941 *White Paper on National Income and Expenditure* (*An Analysis of the Sources of War Finance and an Estimate of the National Income and Expenditure* – Cmd. 6261) was succeeded by the publication in *The Economic Journal* on the same year by Meade and Stone under the title *The Construction of Table of National Income, Expenditure, Saving and Investment*. Keynes actually supervised the publication of this work that would set the benchmark for the further development of *National Accounting*, though in a different way. The accounting structure of the article by Meade and Stone (1941) presents a set of five tables, in which the aggregates are distributed according to their purpose in the economy. In Meade and Stone's 1941 paper, the construction of the accounting identity between product, income and expenditure, was to register in the government income and expenditure table the counterpart on the government side of each operation associated with the passage of the concept of *factor cost* to *market price*[14].

In one of the first official documents that tried to present a unified form of producing 'social accounts' was the 1947 report by the *League of Nations*, which integrated in its appendix a methodological note made by Stone in 1945. The procedure of *correcting the money values appearing in the accounts for changes in the value of money* was a problem discussed in Stone's appendix and it remained a fundamental one in the further decades in the emergence of *National Accounting*. And in the 'heart' of this problem, we find the *index number problem*, i.e., "the problem of defining quantities" (Stone, 1947).

As Comim (2001, p. 224) recalls, the development of national accounts was characterized after the 1947 report (and Stone memorandum of 1945) in two broad tendencies: to *standardization* and to *extension* of the accounts. Stone had a major concern with classifications, on how to classify transactions, groups, sectors, industries, and so on, in redesigning the accounting framework. In the 1953, 1966 versions of the SNA, *standardization* was at the center of the developments. The debate whether the estimates of national income should be made at *factor costs* or at *market prices*, mostly in the 1940s and 1950s, did not cause too much impact in the further developments that would led to the 1953 (and the 'first' official) SNA. As Nicholson (1955, p. 216) generalized the issue:

> The difference between these two estimates [national income at *factor cost* or at *market prices*] of any component of the national income is equal to the total net indirect taxes on the items in question (*i.e.*, total indirect taxes *less* total subsidies).

Consistency, in the hands of Stone, will revolutionize these conceptual problems, and eventually avoid dealing with inherently arbitrary constructions, i.e., not having to concern or justify the usage of arbitrary assumptions. Still, even though the consistency approach did allow a tremendous growth in national income estimates towards a common objective – real output and income comparisons –, and led to *National Accounting*, it also denied the question of how national income is defined and consequently the question of determining a common unit in dealing with economic quantities.

But only in the 1968 SNA that, as Comim (*ibid.*) identified, the tendency towards the *extension*, and the structure for consistency, was manifested for the development of regional accounts and sociodemographic statistics. Some advances can be identified in previous papers, before the 1968 SNA. In the first (annually) edition of *The Review of Income and Wealth* of 1951, based on a set of papers presented in the first general conference (set up in Cambridge) of the *International Association of Research in Income and Wealth*

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[14] In the 1941 *White Paper*, we can see that the economic aggregates they sought to estimate were *Net National Income* and *Net National Product*, both at *factor costs*. Even though the applicability of the pioneer method is limited in practical terms and merely expository as in Kurabayashi (1994, p. 101), the methodological contribution to national accounts was notorious. But, in the matter of differences with *How to Pay for the War*, as Cuyvers (1983, p. 632) observed, there were many similarities, mainly in the national output in Keynes and Rothbarth, was the same as net national income in Meade and Stone, and the valuation at *factor costs*.

(IARIW), Stone (1951) will present a paper entitled *Functions and Criteria of a System of Social Accounting*, in which Stone's concern is with a consistent system of classification.

Stone's system is presented in the principles for defining transactions. For Stone (*ibid*., p. 3), in a more practical point of view it is necessary to translate this system into terms which permit of measurement in the actual world, and this has, in his words, "a more and a less theoretical aspect." In order to proceed empirically, Stone (ibid.) will argue that we cannot do it in a purely theoretical as we cannot do it in a purely empirical way. In general, we cannot make absolute classifications because we lack absolute theoretical definitions to the "empirical correlates" used. Equally, Stone (*ibid*., p. 4) continues, we cannot proceed in a purely empirical way, since we do not have a "natural and inevitable basis of classification." In Stone's approach in his paper, an accounting structure provides the definitions needed for the empirical correlates of the theoretical concepts used for recording a transaction. As Stone (ibid.) will say:

> To proceed empirically, even if we recognize the need to record a transaction, would simply mean that we should accept the empirical correlate of someone else's theoretical definition which might be quite unsuited to our purposes and in any case would not avoid the inevitable element of theory.

In our interpretation, it seems that Stone justify his use of theoretical concepts with the purpose of building a consistent system of classification through an accounting structure, but at the same time Stone can avoid theoretical controversies in assuming this specific purpose through a consistent accounting structure. The main concern was to the relationships between transactions rather than transactions themselves (*ibid*., p. 6). The form which Stone (*ibid*.) comment on the policy purposes of the estimates is restricted to determining which specific categories were to be important for policy makers:

> For example, the central feature of an anti-inflation policy can be put in the form of the best means to obtain sufficient saving to finance investment without a serious rise in prices. The method of relating government budgetary policy to other factors in the national economic system presupposes that the magnitude of the problem can be gauged by relating items in the government's budget to those in the accounts of the nation as a whole.

This is very contrasting with Keynes arguments in *How to Pay for the War*, and which sustained his approach to the estimates, even if in very rudimentary form. What we are trying to make clear is that Stone's approach is very contrasting to Keynes's in the matter of letting the 'correct levels' define policy action, in close resemblance with Abba Lerner's (1943) *functional finance* which gives a loose treatment to deficit financing and to government budget balances[15]. We shall return to this matter in the end of this section.

Later, in the very beginning of Stone and Prais's (1952) paper, *Systems of Aggregative Index Numbers and Their Compatibility*, we find how Stone develops the systematic approach to index numbers and implement his system of classifications. The authors argue on the consequences of the development of national accounting system integrated with Wassily Leontief's input-output framework. As the information generated in this system is presented for a number of years, it is inevitable for the authors that attempts will be made to adjust the series expressed in current money terms for changes in prices. The need for constructing index numbers of quantities and prices are a consequence of this inevitable development in interpreting the information of national accounting. But under the restriction that "quantity index numbers constructed on different bases of valuation, such as market prices and factor costs, are in general not compatible and cannot be transformed into one another", Stone (*ibid*., p. 565) will propose a compatibility between price and quantity index numbers, through the product of a Laspeyres (Paasche) quantity index

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[15] "In brief, Functional Finance rejects completely the traditional doctrines of "sound finance" and the principle of trying to balance the budget over a solar year or any other arbitrary period. In their place it prescribes: first, the adjustment of total spending (by everybody in the economy, including the government) in order to eliminate both unemployment and inflation, using government spending when total spending is too low and taxation when total spending is too high; second, the adjustment of public holdings of money and of government bonds, by government borrowing or debt re payment, in order to achieve the rate of interest which results in the most desirable level of investment; and, third, the printing, hoarding or destruction of money as needed for carrying out the first two parts of the program." (Lerner, 1943, p. 41).

and a Paasche (Laspeyres) price index will yield identically the change in value of the group of transactions concerned, what is well-known as the *product test*, as we saw earlier. But since Stone is approaching index numbers through matrices for constructing these relationships, we will focus on the general relations this compatibility implies. Stone often organized national accounts on the basis of an extensive "transaction matrix"[16] which is then used to construct different types of models by imposing various kinds of restrictions on it and combining it with a "response matrix." This associates the structure of *National Accounting* to model building[17], as Johansen (1985, p. 12-13) observes:

> When this kind of national accounts system is used, e.g. in constructing models which include production, consumption and investment structures, conversions have to be carried out among the different classifications. Stone solved this problem by means of so called classification converters, i.e., matrices with different types of proportional constants. By multiplying by these classification converters, the figures in one block of a national accounts matrix are transferred to another classification.
>
> […]
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> In the context of national accounts, Stone also did considerable work on the construction of indexes. The main emphasis of these studies has not been on the economic theory where by indexes are constructed on the basis of utility theory or welfare theory, but rather on the compatibility of complete systems of price indexes, volume indexes and estimates in a national accounts system where many definitional constraints have to be satisfied.

As Atlerman and Marimont (1970, p.150) paper on the 1968 revision of the SNA shows, until the advent of the 1968 SNA the two major valuation bases for measuring output were *market price* and *factor costs*. While the *market price* was equivalent to the price the purchaser paid for the commodity, the *factor costs* were *market prices* less the excess of indirect business taxes over subsidies. But in the 1968 SNA the choice among valuation bases has been increased by adding graduations in value between the market prices and factor costs valuation methods. In the 1968 revision, there are six forms of valuation though keeping the same extremes of *market prices* and *factor costs*[18]. A distinguishing feature of the 1968 SNA, for the authors (*ibid*.), was "the inclusion, for the first time, of a system of quantity measures and their associated implicit price deflators." With its major emphasis on commodity flows and input-output accounts, the 'new' system expand the possibilities of quantity and price measures. Since the earlier SNA was based on the use and supply tables, which were rectangular matrices. In not being symmetrical matrices, several analytical properties were not applied.

In this sense, Stone's most important contribution to *National Accounting* is identified in the 1968 SNA, in the statistical and conceptual integration of the income and production accounts with the input-output accounts. By disaggregating the production accounts to show both the output (or supply) and the consumption of commodities, the value of commodities produced in each industry and the value of commodities consumed by each producing industries and by final consumers, the commodity x commodity

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[16] The transactions matrices with N sectors transacting on n accounts, $\mathbf{W}$ and $\mathbf{w}$, are respectively valued at *market prices* and at *factor costs* with Nn x Nn dimensions, and are decomposed in price ($\mathbf{P}$) or and quantity ($\mathbf{Q}$) matrices, as, for example, $\mathbf{W = PQ}$.

[17] As in both papers, Stone (1951) (1952) presented an analogy in which the accounts, as he suggests, may be regarded as the nodes of a network and the transactions may be regarded as directed flows between pairs of nodes. In describing a simple transaction model he made this analogy for understanding the identical balance of the accounts by referring to Gustav Kirchhoff's first law for electrical circuits in which for any node (junction) in a circuit, the sum of currents flowing into that node is equal to the sum of currents flowing out of that node; or equivalently: the sum of the currents in a network of conductors meeting at a point is zero.

[18] "The choice now includes: purchasers'; producers'; approximate basic; true basic; approximate factor; and true factor. The purchasers' values are identical to market values, that is, they both represent the delivered cost to the purchaser. Producers' values are the value at the boundary of the producing establishment, and therefore are less than purchasers' values by the cost to the buyer, of the trade and transportation margins. The approximate basic value of a commodity is the producers' value less the tax on that commodity. True basic values are producers' values which exclude both the commodity tax on the given commodity and such taxes on the goods consumed directly and indirectly in the production of the commodity. The approximate factor values are producers' values excluding the commodity tax and all other indirect taxes on the commodity. The true factor value is the approximate factor value excluding indirect taxes on the direct and indirect inputs to the commodity."

and the industry x industry matrices, was constructed. But within each matrix, as Alterman and Marimont (*ibid*., p. 145) shows, the sum of the row generally is not equal to the sum of the corresponding column.

The fundamental change that will mark the 1968 SNA and Stone's contributions, and his pursue for the integration with Leontief's input-output structure, is the use of implicit price deflators to derive constant-price value of production, expenditures, and gross capital formation. As according to Alterman and Marimont (*ibid*., p. 156):

> It is generally agreed that, in concept, price indexes which are to be used as price indicators should exclude the effect of changes in product mix and reflect only the effect of changes in price. From this viewpoint, the price deflators in the national accounts are not suitable as price indicators precisely because they reflect the change in product mix from one period to the next in addition to the change in prices. Strictly speaking, the implicit deflators can only be used to measure the change in price between the base period and a given period, and not between given periods. For this reason, the SNA recommends the development of Laspeyres price indexes in addition to the Paasche implicit deflators, as part of a system of price and quantity indexes.

Stone had outgrown Keynes's approach by shifting its limitation to measure the economy in the restricted concern to measure the war effort (or War potential), to another perception of the economy, in a world out of war. A major breakthrough in the 1968 SNA was 'the inclusion, for the first time, of a system of quantity measures and their associated implicit price deflators.' With its major emphasis on commodity flows and input-output accounts, the 'new' system expanded the possibilities of quantity and price measures, and advance towards constant-price measures.

In the construction of a system of national accounts in constant prices is where Stone set the development of national accounts apart from Keynes approach in *How to pay…*. Despite Keynes had used constant-price estimates, the main difference with Stone further contributions is on how to justify reference period. For Keynes, it was pre-war prices, i.e., due to the present circumstances at his time. For Stone, and as the war ended, there was not a precise overall circumstance for making such reference, but the analysis of growth. Vanoli (2005, p. 409) observed that national accountants and statisticians substitute the term "volume" for that of "quantity", which exclusively applies to the elementary level. *Volume combines heterogeneous quantities*. Volume measurement will become a critical component of *National Accounting*, in determining how many more (or fewer) goods and services can be purchased with a given increase in value, price and volume must be measured separately. In this sense, GDP at constant-prices is a volume measure, and also referred to as real GDP, or value added in volume terms. A volume estimate of GDP becomes essential because it removes the effects of price changes. This is why the SNA 2008 recommends a technique called *double-deflation*.

While Keynes was estimating the national income concerned with the production mobilization caused by the war, Clark's estimates were concerned with the comparison of real levels of income for evaluating changes in welfare, that is the level of production of the previous period without disturbing causes on relative prices – government and taxation. This is a very important change in the history of *National Accounting*, because in the hands of Stone, and how the SNA came to be consolidated, we find an inclination of the whole system to embrace more and more Clark's, and Pigou's, approach, i.e., in avoiding disturbances on relative prices. To reach *international comparability*, the SNA recommended a unified system that favored real figures for consistency in comparison.

Still, despite the great achievement Stone, there are important limitations when we contrast it with Keynes earlier approach. The contrast between Keynes and Stone in the history of *National Accounting* shows how the debate on the treatment of intermediate services provided free of charge by government to market producers, i.e., how to set up the proper valuation method for constructing the aggregates. The SNA was based on welfare valuation methods, if we follow Stone's contributions, in order to avoid disturbance on relative prices. Consequently, the SNA was inclined to measure the economies under a very narrow view on its policy purposes what is very different from its original attempts of estimating national income and

using it for dealing with issues at hand. In overall, the goal was to systematically oppose to any action that would imply in 'less liberty' of economic relations. The choices made in the construction of National Accounting reflects the desire of what to do with such estimates.

5. *CONCLUDING REMARKS:*

The contrast that has been proposed, in a very technical view of the earlier national income estimates, is simply that Keynes was against the use of deflators, while the use of deflators (the implicit deflator and the double-deflation method) has become a standardized practice in modern *National Accounting*, initially under the influence of Stone and his persistence with Leontief's framework. But in a conceptual view, this contrast is very interesting in revealing the different purposes of measurement that sustained their conceptual choices in estimating economic aggregates. In overall, the purpose of growth in *National Accounting* has produced conceptual changes that also influenced on how the public budget is to be perceived in the treatment of government in measurement. While Keynes had a particular view on loan expenditures that implied in a separate budget for government dealing with deficit financing, as he introduced together with other concepts from the *General Theory* in *How to Pay for the War*, further developments in *National Accounting* let lose the treatment of public budget by adopting different separation. And since Keynes had a specific goal to be attended through fiscal policy, i.e., full employment, when making his estimates for *How to Pay…*, the goal of growth has allowed for flexibilization of policy, implemented under the overall concern to growth. This is why Tily (2015) and Schmelzer (2016) will emphasize in the idea of growth as a purpose in itself. It doesn't matter if GDP is not intended for welfare measurement, since it was formulated for international comparability, i.e., countries as 'better' than other, independent of the significance of this homogeneous international output.

REFERENCES:

ALTERMAN, J.; MARIMONT, M. L. *Prices and Price Analysis in the Framework of the. National Accounts*, **The Review of Income and Wealth,** ser. 16, No. 2, pp. 145-146, June, 1970.

ARNDT, H. W. *Colin Clark. In*: IRONMONGER, D.; PERKINS, J. O. N.; VAN HOA, T. (eds.), ***National Income and Economic Progress: Essays in Honour of Colin Clark***, pp. 1–7. Londres: Macmillan, 1988.

BERGSON, A. *A Reformulation of Certain Aspects of Welfare Economics*. **Quarterly Journal of Economics**, 52(2), 310-34, February, 1938.

BOUMANS, M. "*Fisher's Instrumental Approach to Index Numbers*", *In*: MORGAN, M.; KLEIN, J. L. (eds.), ***Age of Economic Measurement***, Durham: Duke University Press, pp. 313-344, 2001.

BRADFORD, W.; HARCOURT, G. C. Units and definitions. In: HARCOURT, G. C.; RIACH, P. A. ***A second edition of the general theory***. London: Routledge, v. 1, 1997.

BUTTER, F. A. G. den. National Accounts and Indicators, In: BOUMANS, M. (ed.) ***Measurement in Economics: A Handbook***, Amsterdam: Elsevier/Academic Press, 2007.

CAIRNCROSS, A. *The development of economic statistics as an influence on theory and policy*. In: IRONMONGER, D.; PERKINS, J.; VAN HOA, T. (eds.) ***National Income and Economic Progress Essays in Honour of Colin Clark***, 11-20. Basingstoke: Macmillan, 1988.

CARTER, C. F.; REDDAWAY, W. B.; STONE, R. ***The Measurement of Production Movements***. Cambridge University Press, 1948.

CHICK, V. *Time and the Wage-unit in the Method of The General Theory: history and equilibrium*. In:

LAWSON, T; PENSARAN, H. Keynes Economics Methodological Issues, 150-160, 1985.

CLARK , C. *The Conditions o f Economic Progress*. Londres: Macmillan, 1965.

CLARK, C.; PIGOU, A. C. *The Economic Position of Great Britain*, Macmillan, London, 1936.

COMIM, F. *Richard Stone and measurement criteria for national accounts*, **History of Political Economy**, Annual Supplement, Vol. 33, pp. 213-234, 2001.

CUYVERS, L. *Keynes' Collaboration with Erwin Rothbarth*, **The Economic Journal**, Vol.XCIII, 1983.

DEATON, A. *Essays in the Theory and Measurement of Consumer Behaviour in Honour of Sir Richard Stone*. Cambridge: Cambridge University Press, 1981.

DIEWERT, E. W. *Index number theory: past progress and future challenges*, artigo apresentado na SSHRC Conference on Price Index Concepts and Measurement, Vancouver, junho 30-July 3, disponível em < http://www.econ.ubc.ca/diewert/concepts.pdf>, 2004.

_____. "*The early history of price index research*". *In*: DIEWERT, W. E.; NAKAMURA, A. O. (eds.), *Essays in Index Number Theory*, vol. 1, Amsterdam: Elsevier Science Publishers, pp. 33– 66, 1993.

_____. "*Index numbers*", pp. 6.212-6.243. *In* EATWELL, J.; M. MILGATE, M.; NEWMAN, P. (eds.), *The New Palgrave: A Dictionary of Economics*. 3rd ed., Londres: Palgrave Macmillan, 2018.

EDGEWORTH, F.Y. *Papers Relating to Political Economy*, Volume 1, New York: Burt Franklin, 1925.

FISHER, I. *The Purchasing Power of Money. Its Determination and Relation to Credit, Interest and Crisis*. Nova Iorque: Macmillan, 1920.

_____. "*The Best Form of Index Number (with Discussion)*," **Quarterly Publication of the American Statistical Association**, New Series 17, pp. 533–551, 1921.

_____. *The Making of Index Numbers*. A Study of Their Varieties, Tests, and Reliability. Boston e Nova Iorque: Houghton Mifflin Company, 1922.

_____. *Money Illusion.* Nova Iorque: Adelphi Company ,1928.

FRISCH, R. "*Annual Survey of General Economic Theory: The Problem of Index Numbers*," **Econometrica**, n. 4, pp. 1–38, 1936.

HABERLER, G.; HAGEN, E. E. "*Taxes, Government Expenditures and National Income.*" **Studies in Income and Wealth**, National Bureau of Economic Research, n. 8, pp. 1–31, 1946.

HARCOURT, G. C.; RIACH, P. A. A 'Second Edition' of the General Theory. Vol 1, New York: Routledge, 1997.

HICKS, J. R. *The Valuation of Social Income*, **Economica**, n. 7, pp. 105–24, 1940.

_____. *The unification of macroeconomics*, **Economic Journal**, v. 100, pp. 528-538, 1990.

HOOVER, K. "*Does Macroeconomics Need Microfoundations?*", *In*: HAUSSMA, D. M. (ed.), **Philosophy of Economics: An Anthology**, Nova Iorque: Cambridge University Press, 2008.

JEVONS, W. S. *The Theory of Political Economy*. 3rd ed., Londres: Macmillan, 1888.

JOHANSEN, L. Richard Stone's Contributions to Economics. *Scandinavian Journal of Economics*. 87, 1, pp. 4–32, 1985.

KENDRICK, J. W. *The New System of National Accounts*, Massachusetts: Kluwer Academic Publishers, 1996.

KEYNES, J. M. "*The Concept of National Income: A Supplementary Note.*" *The Economic Journal*, V. 50, n. 197, march, pp. 60-65, 1940.

_____. *The general theory and after: a supplement. The Collected Writings of John Maynard Keynes – CWJMK, XXIX*, London: Royal Economic Society, 2013a.

_____. *Essays in Persuasion*. London: Macmillan, 2013b.

_____. *A Treatise on Money. Collected Writings of John Maynard Keynes, Volume 5*, Nova Iorque: Cambridge University Press, 2013c.

_____. *The General Theory of Money, Interest and Employment. The Collected Writings of John Maynard Keynes*, Volume VII. Nova Iorque: Cambridge University Press, 2013d.

KURABAYASHI, Y. *Keynesʹ How to Pay for the War and its influence on Post War National Accounting*, in Z. Kenessey (editor), The Accounts of Nations, IOS Press.

MEADE, J.; STONE, R. The Construction of Tables of National Income, Expenditure, Savings, and Investment, *Economic Journal*, n. 51, jun-set., pp. 216–233, 1941.

MITCHELL, W. C. *The Making and Using of Index Numbers*. Washington, D.C.: Bureau of Labor Statistics, Bulletin 284, 1921, reprinted 1938.

NICHOLSON, J. *National Income at Factor Cost or Market Prices?*, *The Economic Journal*, v. 65, n. 258, june, pp. 216–224, 1955.

PERLMAN, M. *Political purpose and the national accounts*. In ALONSO, W.; STARR, P. (Eds.). *The politics of numbers*. New Iorque: Russell Sage Foundation, 1987.

PERSKY, J. *Price Indexes and General Exchange Values*, *Journal of Economic Perspectives*, v. 12, n. 1, Winter, pp. 197–205, 1998.

PIGOU, A. C. *Economics of Welfare*, 4th edition. London: Macmillan Publishing, 1932.

PRASCH, R.E. *The Probability Approach to Index Number Theory Prelude to Macroeconomics*. In: RIMA, I. H. (ed.) *Measurement, Quantification and Economic Analysis*, 176-187. London: Routledge, 1995.

REICH, U. P-. *National Accounts and Economic Value*. New Iorque: Palgrave, 2001.

REINSDORF, M. B. "*Axiomatic Price Index Theory*," *In*: BOUMANS, M. (ed.) *Measurement in Economics: A Handbook*, Amsterdam: Elsevier/Academic Press, 2007.

RONCAGLIA, A. The Wealth of Ideas. New York: Cambridge University Press, 2005.

SCHMITT, B. (1986) The process of formation of economics in relation to other sciences. *In*: BARANZINI, M.; SCAZZIERI, R. *Foundations of Economics*. Oxford: Basil Blackwell.

STIGLITZ, J. E; SEN, A; FITOUSSI, J.P. *Report by the Commission on the Measurement of Economic Performance and Social Progress*, available from http://www.stiglitz-sen-fitoussi.fr, 2009.

STONE, R. Definition and measurement of the national income and related. In: ONU. *Measurement of National Income and the Construction of Social Accounts*. *Studies and Reports on Statistical Methods*, n. 7, Genebra, 1945.

_____. Functions and Criteria of a System of Social Accounting. *The Review of Income and Wealth*, series I, Cambridge, England: Bowes and Bowes, 1951.

_____. "*The use of social accounting matrices in building planning models*." *In*: STONE, R. *Mathematical Models of the Economy and other Essays*, Londres: Chapman and Hall LTD, pp. 224-248, 1970.

_____. *Keynes, political arithmetic and econometrics*. Keynes Lecture in Economics, Proceedings of the British Academy, 1988.

STONE, R.; PRAIS, S. J. Systems of Aggregative Index Numbers and Their Compatibility. The Economic Journal, Vol. 62, No. 247, pp. 565-583, Sep, 1952.

TILY, G. *John Maynard Keynes and the Development of National Accounts in Britain, 1895–1941*. *Review of Income and Wealth*, s. 55, n. 2, jun., 2009.

_____. *The National Accounts, GDP and the "Growthmen"*. January 2015. http://static1.squarespace.com/static/541ff5f5e4b02b7c37f31ed6/t/54b3afeae4b0d2480d43d760/1421062122575/CoyleReview_Tily.pdf (accessed April, 2019).

UN. *Measurement of National Income and the Construction of Social Accounts*. *Studies and Reports on Statistical Methods*, n. 7, Genebra, 1947.

_____. *A System of National Accounts and Supporting Tables*. *Studies in Methods*, n. 2, Nova Iorque, 1953.

_____. *A System of National Accounts*. Série F, n. 2. *Revision* 3, Nova Iorque, 1968.

_____. *A System of National Accounts*. Nova Iorque, 1993.

_____. *A System of National Accounts*. Nova Iorque, 2008.

VANOLI, A. *A history of national accounting*. Amsterdam: IOS, 2005.

_____. *National accounting at the beginning of the 21st century: Wherefrom? Whereto?*, *EURONA - Eurostat Review of National Accounts and Macroeconomic Indicators*, Luxembourg, 2014.

WARKE, T. *Multi-Dimensional Utility and the Index Number Problem: Jeremy Bentham, J. S. Mill, and Qualitative Hedonism*, *Utilitas: A Journal of Utilitarian Studies*, n. 12, pp. 176–203, 2000.