DOI: https://doi.org/10.37075/EA.2026.2.13 Economic Alternatives, 2026, Issue 2, pp. 647-673

Microeconomic and Macroeconomic Consideration of General Equilibrium Models, as Tools for the Socio-Economic Policy and Progress

Received: 10.06.2025
Available online: 30.06.2026

Argyrios D. Kolokontes*

Abstract

The social accounting matrices and the general equilibrium models integrate the microeconomic function of markets, composing macroeconomic outcomes. The level of state intervention does not impede the formation of macroeconomic balances. Sometimes, the scientific literature restricts the real capabilities of these models as planning tools by various commitments. Notwithstanding, in action, these tools have gained widespread acceptance, since all the socio-economic systems have used them for planning. This paper advocates that the general equilibrium models are not tools for the profits' maximization, but primarily they are tools for a gradual and perpetual holistic restructuring of productive networks, aiming the social felicity and happiness. A more meticulous glance in the thought of W. Leontief reveals and highlights the role of input-output analysis as a tool of social political economy and progress.

Keywords: Social accounting matrices, general equilibrium models, input-output analysis, social political economy, progress, happiness.

JEL: D57, D58, D60, E16, E27, E61, I31, O11, O12, O21, P11, P21

1. Introduction

The roots of '*models of interdependence and general equilibrium'* are found among the fundamental ideas of *'Tebleau Economique'* (1758) of François Quesnay (1694-1774), its theoretical expansion from Leon Walras (1834-1910) by the *'Elements d' Economie Politique Pure'* (1874), and their practical-quantitative dimension that was introduced by Wassily Leontief (1905-1999) (Leontief, [1928]1991, 1936a, 1937; Phillips, 1955; Sraffa, [1960]1963; Smith & Morrison, 1974; Mansur & Whalley, 1981; Baumol, 2000; Kurz & Lager, 2000; Kurz & Salvadori, 2000a, 2000b; Miller & Blair, 2009; Lopes & Neder, 2017; Thomassin, 2018). Both Jevons ([1871]1888) and Walras (1874) contributed the mathematical notation for the progress of general equilibrium theory (Robinson, 2006; André et al., 2010). The first model of Walras

* Department of Agriculture, University of Western Macedonia, Greece, Corresponding Author

was stochastic, using exclusively symbols for the variables of input-output sectoral correlations to describe the static potential equilibrium via the productive processes (Von Neumann, 1945; Robinson, 2006; Miller & Blair, 2009; André et al., 2010). Many others contributions, especially during the period 1930-1940, have been mediated in the evolution of *'applied or computable general equilibrium models (AGE or CGE models)'*, connecting the mathematical and statistical analysis with the econometrics, and with the microeconomic and macroeconomic theories as well, indenting a reliable description and measurement of cross-sectoral transactions to be accomplished (Leontief, [1928]1991, 1936a, 1936b, 1941; Von Neumann, 1945; Leontief, 1947; Smith & Morrison, 1974; Dervis, et al., 1982; Kurz & Lager, 2000; Kurz & Salvadori, 2000a, 2000b; Kidgell, 2003; Cardenete et al., 2012; Soklis, 2013; Haslop et al., 2017; Lopes & Neder 2017).

In the markets' economies (more or less mixed economies), the empirical general equilibrium models include production and allocation functions reflecting the strengths of sectoral demand and supply in the productive nexuses. Through the rational reactions of economic agents (consumers, enterprises and state) and the relevant provoking consequences of endogenous interconnectedness, these models are considered capable to foresee potential impacts on the whole economy, owing to exogenous stimuli (Dervis et al., 1982; Kidgell, 2003; Cardenete et al., 2012; Haslop et al., 2017; Mainar-Causapé et al., 2018; Chisari et al., 2019). On the microeconomic side, the combination of demand and supply in the AGE/CGE models yields the sectoral balances. On the macroeconomic side, the sectoral balances shape the general equilibrium of economy, depicting the produced value added and gross output.

A common illusion in the literature considers the general equilibrium models as maximization models as regards the profits of firms. As a matter of fact, the AGE/CGE models are concentrated on the policy for the socio-economic progress via a continual structural readjustment of productive networks. The socio-economic development is the dispersion of state-social merits that increase the social well-being and felicity. The social prosperity and the amelioration of average happiness are connected with the conditions of daily life and the ability of citizens to cover personal biological and psychological needs. Consequently, even though the progress of average per capita income is not the only factor, however it is a main part of socio-economic development process, when the increase of per capita income is stemmed from the reduction of unemployment, the fighting against poverty, the public investment on the useful infrastructures for the economy and the citizens. Another, equally, significant part of social prosperity and personal happiness is straightforward connected with the produced benefits of state infrastructures. Thoughts like these explicate the reasons why the empirical general equilibrium models have been utilized from conflicting streams of socio-economic political thought. An interesting example includes the scientific studies of Kantorovich ([1939] 1960) and Koopmans (1949α, 1949β) that were emerged through different economic and sociopolitical considerations (Lopes & Neder, 2017).

This paper advocates that the general equilibrium models are crucial tools in order the socio-economic policy to be exerted. By default, the scope of input-output analysis was not the maximization of firms' profits,

at least according to Leontief's philosophy. The paper pays attention to two points. The first deals with the designation of usability of models as suitable tools for the melioration of social prosperity, through the planning and the implementation of appropriate developmental socio-economic policies, both in the pure/mixed market economies and in those societies in which the state keeps an enhanced role as for the administration of productive resources. The other one point concerns the illustration of microeconomic and macroeconomic conjunction with the general equilibrium models and via them. The paper starts stressing the coupling between the macroeconomic and the general equilibrium models. The explication of incorporation of microeconomics in the models, follows. The penultimate section is concentrated on the input-output (I-O) analysis as a tool for the developmental socio-economic policy; and the manuscript ends up with a recapitulation of inferences.

2. Macroeconomic and general equilibrium models

The general equilibrium models delineate the relations among the various sectors in an hypernational, national, regional or local economy. The sectoral interdependence is a given situation irrespective of the socio-economic political consideration and the organization of state. Consequently, the productive interaction can be outlined both in the market economies (more or less mixed economies) and in the centrally directed economies. This is the key-point in Leontief's contrivance and his attempt to yield empirically the structure of productive networks.

Leontief himself had referred to the contribution of Marxian thought in the evolution of economic science (Leontief, 1938; Clark, 1984). Leontief's scientific work and his interests do not demonstrate an attempt to create a model able to maximize the profits of productive units. Instead of this, the philosophy of intelligent Leontief's thought seems to be oriented to the construction of an empirical mathematical framework capable of improving the social welfare (Lahiri, 2000; Lopes & Neder, 2017). Under this vein, before Leontief handed in the *'input-output analysis'* to the scientific world, by the study *"The Structure of American Economy: 1919-1929: An Empirical Application of Equilibrium Analysis"*, in 1936; Leontief's thought had been already composed by stimuli derived from various socio-economic considerations and hues. The publication of 1936 was the capstone of Leontief's research that had begun earlier, as his first sound declaration on the scientific affairs was recorded in 1928 by the *"Die Wirtschaftals Kreislauf"* (that was republished in English, in 1991, as *"The Economy as a Circular Flow"*). Leontief utilized the scientific, theoretical and empirical, researching knowledge, he had got from his studies, on philosophy and sociology in St. Peterburg (Leningrad) University and studying economics in Berlin, aiming to describe the peculiarities of U.S.A. market economy via a calibrated empirical transactional model, during a period in which the collection of necessary statistical information was a feat. The I-O models became attractive for all schools of economic thought (Lahiri, 2000). The conjunction of I-O analysis with the Marxian syllogism, as for the value of employment, was displayed by Morishima (1973) and Roemer (1981) (Lahiri, 2000). The main contribution of Leontief's economic thought does not concern only the empirical computable dimension of I-O analysis, but also the fit of various socio-economic approaches,

configurating a tool capable of gradual and continual improvement of social felicity in any socio-economic administrative system; and this is the reference point of this paper.

In order for the emerging potentialities of general equilibrium models to be understandable as for the utilization of productive resources of economies, the debate has to begin from the macro-level of *'Social Accounting Matrices (SAM)'*. The social accounting matrices systematized the data collection. The sectoral transactions are part of SAMs. The SAMs were the outcome of Richard Stone's (1913-1991) pioneering study. Stone and his collaborators in University of Cambridge deployed the *'Rectangular System of Accounts'* using the *'make and use matrices'*; revising the *'International System of National Accounts'* (de Melo, 1988; Soklis, 2013). The role of Erik Thorbecke and Graham Pyatt for the evolution of SAMs is noteworthy, as well (Pyatt & Thorbecke, 1976; Pyatt & Round, 1979; Defourny & Thorbecke, 1984; Pyatt & Round, 1985; Pyatt, 1988; Kahn & Thorbecke, 1989).

The database of SAM reflects the structure of national accounts, adopting a more meticulous manner for the depiction of balance between the income and the expenditure of economic agents. The I-O transactional matrices are parts of SAMs (the grey squares in table 1) either as *'sector-by-sector'* or as *'product-by-product'* I-O models (Tesfatsion, 2006; Haslop et al., 2017). Table 1 displays a general form of SAM in order the information about the macroeconomic relations to be revealed providing a synthetic presentation of national accounts.

The generalized shape of SAM (table 1) can be enhanced at the desirable per case degree of analysis, decomposing the data for the productive factors, the sectors of production, the products or/ and the consumers, adding new rows and columns (Frisch, 1936; Leontief, 1936b, 1947, [1966]1986; Kymn & Norsworthy, 1976; Dervis et al., 1982; Defourny & Thorbecke, 1984; Drud et al., 1986; Robinson & Roland-Holst, 1988; Crown, 1990; Jackson & Comer, 1993; Comer & Jackson, 1997; Robinson et al., 2001; Lahr & Stevens 2002; Lofgren et al., 2002; Kidgell, 2003; Round, 2003; Wing, 2004; Madsen & Jensen-Butler, 2005; Robinson, 2006; André et al., 2010; Breisinger et al., 2010; Taylor, 2010; Cardenete et al., 2012; Mastronardi et al., 2012; Alikaj & Alexopoulos, 2014; Cardenete et al., 2015; Dwyer, 2015; Haslop et al., 2017; Mainar-Causapé et al., 2018; United Nations, 2018; Chisari et al., 2019). Of course, this decomposition does not affect the total measurements. The rows and the columns of SAM expound the general equilibrium and the balance of income and expenditure of participants in economy (*'government-budget balance'*, *'trade balance'* and *'savings-investments balance'*).

Especially the savings-investments balance (S=I) reflects the balance of interests in the loanable funds market (Darvis et al., 1982; Robinson. 2006). The configuration of interests influences the level of consumption and investment at present, and hence the interchange between the present and the future welfare in terms of available productive resources. For this scope, trials have been done for the construction of '*Inter-temporal optimization models'*, capable of giving emphasis on the sacrifice of potential optimum of present for the amelioration of future situation (Müller-Hansen et al., 2017). The intertemporal optimization models are exactly focused on the diachronic evolution of social well-being balance, without exaggerations for

Table 1. A representative form of SAM.

	Productive Sectors	Products	Productive Factors	Households	Government	Savings and Investments	External Trade	Synthesis of Income
Productive Sectors		D					Ex	**Production Value**
Products	(Int)			C	G	I		**Demand Value**
Productive Factors	W			(*)	$(P_H)^*$			**Income from the Productive Factors**
Households			Y					**Households Income**
Government	T_w	T_P		T_H				**Governmental Revenue**
Savings and Investments				S_H	S_G		S_F	**Total Saving**
External Trade		Im						**Imports Value**
Synthesis of Expenditure	**Production Cost**	**Supply Value**	**Payments of Productive Factors**	**Households Expenditure and Saving**	**Governmental Expenditure and Saving**	**Investing Expenditure**	**Exports Value and Saving from Abroad**	**Total Income = Total Expenditure**

Source: Empirical personal process based on references and applications (Dervis, et al., 1982; Defourny & Thorbecke, 1984; Drud et al., 1986; Robinson & Roland-Holst 1988; Robinson et al., 2001; Lofgren et al., 2002; Kidgell, 2003; Round, 2003; Wing, 2004; Madsen & Jensen-Butler, 2005; Robinson, 2006; André et al., 2010; Breisinger et al., 2010; Taylor, 2010; Cardenete et al. 2012; Mastronardi et al., 2012; Alikaj & Alexopoulos, 2014; Cardenete et al., 2015; Dwyer, 2015; Haslop et al., 2017; Mainar-Causapé et al., 2018; United Nations, 2018; Chisari et al., 2019).

profits' maximization success, just following the vein of sustainable development.

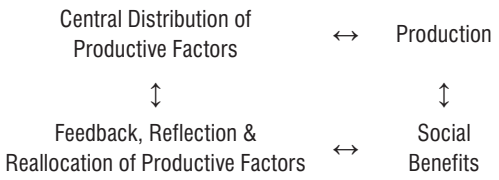
Table 2 gathers the relations of the SAM matrix. The governmental revenues depend on the direct and indirect taxes, while the governmental consuming and investing outlays are a proportion of governmental revenues (Robinson, 2006; André et al., 2010). In essence, these magnitudes are estimated depending on the level of economic activity. The rising of economic activity increases the state tax revenues and as a consequence magnifies the governmental consuming and investing expenditures. The sector of public administration cannot be considered as a sector that aims to maximize its profits, in contradiction to the private sector. The consumption and investment of public sector

should be focused on the social utility and the corresponding produced benefit. Characteristic examples are the benefits for the citizens via the state constructions and infrastructures, as the road networks, bridges, ports, airports, railway networks, leisure parks for children and adults, and so forth, as well as the provided services of public administration, schools, hospitals, nursing homes, e.t.c., using the tax system for the redistribution of income among the citizens through the provided (many times free of charges) public services. Contemporaneously, sometimes in our days, the private sector interchanges a part of present with a future prosperity spending income for investments (Robinson, 2006; Müller-Hansen et al., 2017; Lopes & Neder, 2017), videlicet chooses to restrict its profits maximization, the consumption and the savings, at the present time, investing to a future sustainability.

At the end of the day, the SAM as a database for the derivation of I-O models illustrates the interconnection of sectoral productive outputs with their allocation (sectoral supply), describing the intermediate and the final consumption (sectoral demand for inputs and households' demand for consumption) and the investment (private and public), taking into consideration the payments of productive factors, as well as the external trade of an open economy; and all these in a framework of a continual cyclical restarting (Leontief, [1928]1991; Pyatt & Thorbecke 1976; Darvis et al., 1982; Defourny & Thorbecke, 1984; Pyatt & Round, 1985; Drud et al., 1986; de Melo, 1988; Robinson & Roland-Holst, 1988; Pereira & Shoven, 1988; Pyatt, 1988; Kahn & Thorbecke 1989; Robinson et al., 2001; Kidgell, 2003; Round, 2003; Wing, 2004; Madsen & Jensen-Butler, 2005; Robinson, 2006; André et al., 2010; Breisinger et al., 2010; Taylor, 2010; Dwyer, 2015; Haslop et al., 2017; Mainar-Causapé et al., 2018; United Nations, 2018; Chisari et al., 2019).

The aforementioned follows the basic principles of economic theory, according to which the market economies are based on the logic:

Correspondingly, in the centrally directed economies the syllogism is:



In the centrally directed economies, the administration of production does not belong to firms, but it is controlled by the government. The SAM presents the distribution of productive factors from the central authority, the sectoral outcomes via the centrally controlled transactional flows, the level of coverage of social needs (including household and individuals' needs), and the reallocation of productive factors for the amelioration of social utility and benefit. The noticeable difference is found on the point that the efficiency and the effectiveness are not targets of productive units themselves, but a recognized and acceptable social obligation of employees' productive units.

Table 2. The balances of SAM.

W:	Productive Factors Cost	$W + T_W + Int = GDP_1$	$W + T_W + Int = D + Ex = GDP_1$
T_W:	Direct taxes of productive process		
Int:	Intermediate Demand		
D:	The value of domestic products (with the intermediate demand [Int] to participate in the domestic demand [D])	$D+Ex=GDP_1$, (in which: $Int \subset D$)	
Ex:	Exports		
GDP_1:	Gross Domestic Product at cost prices		
T_P:	Indirect taxes on the products prices		$GDP_2 = GDP_1 + T_P$ (1st approach)
GDP_2:	Gross Domestic Product at market prices (1st approach).		
Im:	Imports	$D+Im+T_P=Int+C+G+I$, (in which: $Int \subset D$)	$D + Im + T_P = Int + C + G + I$ $\rightarrow$ $D + Im + T_P + Ex - Ex = Int + C + G + I$ $\rightarrow$ $(D + Ex + T_P) + Im - Ex = Int + C + G + I$ $\rightarrow$ $GDP_2 + (Im-Ex) = Int + C + G + I$ $\rightarrow$ $GDP_2 = Int + C + G + I + (Ex-Im)$ (2nd approach)
C:	Households' consumption (or outlay)		
G:	Governmental outlay for consumption and investment		
I:	Private investment outlay		
GDP_2:	Gross Domestic Product at market prices (2nd approach).		
Y:	Productive factors' payments (or households' income)	$Y=W$	
P_H:	Allowances to households	$Y + (P_H) = C + T_H + S_H$	
T_H:	Direct taxes of households		
S_H:	Savings of households		
S_G:	Governmental savings; and governmental revenue – expenditure balance	$G + S_G - P_H = T_X + T_P + T_H$ $\rightarrow$ $S_G = T_X + T_P + T_H - (G + P_H)$	
S_F:	Savings of abroad	$S_F + Ex = Im$ $\rightarrow S_F = Ex - Im$	
I_T:	Total investment outlay (private and governmental); and savings-investments balance		$I_T = S_H + S_G + S_F$

Source: Empirical personal process based on references and applications (Dervis et al., 1982; Defourny & Thorbecke, 1984; Drud et al., 1986; Robinson & Roland-Holst,1988; Robinson et al., 2001; Lofgren et al., 2002; Kidgell, 2003; Round, 2003; Wing, 2004; Madsen & Jensen-Butler, 2005; Robinson, 2006; André et al., 2010; Breisinger et al., 2010; Taylor, 2010; Cardenete et al., 2012; Mastronardi et al., 2012; Alikaj & Alexopoulos 2014; Cardenete et al., 2015; Dwyer, 2015; Haslop et al., 2017; Mainar-Causapé et al., 2018; United Nations, 2018; Chisari et al., 2019).

The relations of table 1 and 2 may generate more complicated thoughts and variants. For instance, someone may wonder what could have happened if the government had kept a number of productive factors as public regarding their exploitation. In such a case, some productive factors may create income for the households, while others may do the same for the state: $Y=Y_H+Y_G$. This implies a state saving equal to: $Y_G+G+S_G-P_H=Y_G+T_W+T_P+T_H-P_H$. This may be translated as an increased governmental consuming and investing spending $G^{(+)}$, or/and as more governmental savings $S_G^{(+)}$ according to Y_G, which ostensibly increases the accumulative investing expenditure: $I_T^{(+)}=S_H+S_G^{(+)}+S_F$ and the gross domestic output at market prices: $GDP_2^{(+)}=Int^{(+)}+C+G^{(+)}+I_T^{(+)}+(Ex-Im)$, but these syllogisms are just fictitious, since moreover the households end up having less income owing to less productive factors on their own, and this prospect reduces the households consumption $C^{(-)}$. As a matter of fact, the reduction of households' consumption is expected to be greater than the increase of governmental consumption: $C^{(-)}\geq G^{(+)}$ leading to a shrinkage of gross domestic output ($GDP_2^{(-)}$). Ultimately, the households lose a part of their prosperity, generating a greater addiction from the state for economic help in order the goods that cannot be bought by them to be acquired, a situation owing to the fact that the state has kept productive factors on its ownership. This explains the reason why the redistribution of income and wealth is preferrable to become through a fair tax system, in comparison with the possession of productive factors by the state itself. Nonetheless, the state control on the productive activities is necessary indenting the social behoof to be ensured. As it is obvious, the entrepreneurial profit is absent from the sectoral interconnectedness in a pure centrally directed economy.

It's no coincidence that the first empirical I-O Leontief's model was completely closed, since the first step was not to be concentrated on the exogenous stimuli but just on the observation and the elucidation of transactional flows (Leontief, 1936a, 1936b, 1941). A closed model is a homogenous system with 'n+k' equations and 'n+k' variables ('n' are the sectors as sellers and purchasers into the 1st quadrant of transactional table, while 'k' are the components of 2nd and 3rd quartile; scilicet the elements of final demand and value added correspondingly). The role of an absolutely closed model is only descriptive. The model can provide a unique mathematical solution, supposing a scheme with 'n+k' equations and 'n+k-1' unknown variables. This is either an open model (nxn, with k exogenous variables) or an augmented model (n+k-1, but not totally closed n+k, videlicet with at least one exogenous variable) and serves the scopes of policy-makers. The open form of I-O models was revealed from the requirement for predictions. Leontief essentially opened his model to policy-planners in 1951. Hence, the elements of vector of final demand (2nd quadrant) can be either endogenous or exogenous to the system (but not all, until n-1 of them), permitting its implementation for forecasts. The same is in force for the components of vector of value added (3rd quadrant). The choice of suitable model depends on the targeting questions and the availability of data, especially from the data of the 4th quadrant of Leontief's transactions matrix, since this quarter reflects the cross among the elements of final demand and value added (2nd and 3rd quartiles), constituting part of the shadow economy.

In order the consequences of state-supported and individual decisions to be studied, the I-O models connect the exogenous stimuli with the repercussions of the sectoral interdependencies that can be generated from them, checking the multiplying impacts on the whole of the economy. In the market economies, the state intervenes only indirectly in the operation of productive network. The role of state is the redistribution of income, meliorating the average social welfare. The taxation of private profit is a nodal process for this scope. This process falls partially down when the state is not able to defuse the tax evasion. Simultaneously, the state applies incentives and disincentives (usually via the tax system; or/and allowances of private investment) to boost the enlargement of targeting sectors. These are the sectors that are capable of multiplying the gross output, the income or/and the employment, on account of their interdependencies with the rest of the economy. Hence, in a long-run prospect, the governmental plan owes to be the strengthening of sectors that reveal the most important potential multiplicative effects in terms of output, income or/and employment, using the suitable motivations, even if the rest sectors of the economy end up to be shrunk or stagnated, because of the influences of providing incentives and disincentives by the state. A reallocation of productive factors among the productive activities takes place during this procedure. As the state control is increased, the state authority determines the structure of productive network more and more. In the centrally directed economies, the planning for the reallocation of productive factors is a completely state-supported decision. In these economies, the market's strengths are not operated. The state authority is not concentrated on the motivation and decides by its own for the distribution of productive factors among the productive activities aiming the improvement of average social prosperity. This means that in the centrally directed economies, the exogenous stimuli remain inactive. The state decides for the social development and security, weighing the prestige of national force on the one hand, and on the other the social choices for well-being.

Both in the mixed/pure market economies and the centrally planned economies, the crucial point remains the selection of targeting productive activities for their reinforcement. As mentioned above, this choice depends on the multiplicative diffusions on the rest of the economy, in terms of output, income and employment. When the economies are open to the international trade then the multiplying sectoral dynamic can be affected by the corresponding sectoral exports and imports, scilicet from the sectoral external trade, the comparative advantages into the contemporary international fragmentation of production, the vertical specialization and the international outsourcings, the ability of domestic production to substitute the sectoral imports (Lau et al., 2006; Meng & Qu 2008; Romero et al., 2009; Lau et al. 2010; Yang et al., 2015; Puttanapong, 2016; Meng et al., 2017). However, this is only the one side of the coin, since if the models of general equilibrium were mechanisms for the profits' maximization, then a decision for an exclusive production (e.g. weapons) would be possible. Of course, a decision like this cannot be rational at the social sphere, due to the fact that nothing offers to the daily life of society. Thus, the state must take the opportunity cost of sectoral reallocation of productive factors, on account of its planning incentives/disincentives, into consideration.

This opportunity cost is a cost on the social felicity owing to the state-supported propulsive policy-decisions as concern the (re)structure of economy's productive network.

In any case, the route of I-O analysis has passed from various hues of socio-economic thought. Kurz and Salvadori (2000a) highlighted the close relationship of I-O analysis with the classic approach of the production, the distribution and the relevant prices. An interesting fact is that Adam Smith seems to have published his economic theory in 1776, ten years after the *"Premier problème économique"* of physiocrat François Quesnay ([1766]1958) and two years after his death. The classic approach is focused on the potential long-run impacts on the structure of productive nexus. These impacts follow the changes on the sectoral production functions, due to the evolution of technology and technical productive factors (Leontief, 1947, 1961, [1966]1986; Almon, 1963, 1966; Rogerson & Plane, 1984; Plane & Rogerson, 1986; Jackson et al., 1990; Lopes & Neder, 2017; Thomassin, 2018). The neoclassical approach, giving emphasis to the evolution of consumers' preferences, seems to be more focused both on the effects in the productive network in the short-to-medium period and the long-run framework too. The consumers' preferences stipulate the households' demand as a component of final demand. Therefore, the onset point for the neoclassical approach is the exogenous stimuli that affect the final demand, while the crucial point in the case of classical approach is the technical capabilities of supply (Almon, 1963, 1966; Smith & Morrison, 1974; Lopes & Neder, 2017). As a matter of fact, one of them brings about the other. For instance, an adjustment's attempt of supply to demand provokes the necessity for technological inventions and improvement of organizational methods. Of course, this does not mean that in the economies with a high state intervention, the necessity of technological progress does not exist, but it just only means that the technological achievements in the centrally planned economies are not the result of sectoral markets' function. Under such circumstances the technological progress is not the consequence of demand and supply mechanism, but the capstone of endeavors for the covering of real social needs, such as the magnifying needs of population's increase.

According to the aforementioned, the point of interest for the centrally directed economies is the allocation of productive factors among the various productive options in such a way that the efficacy of social employment may be ameliorated, improving the social welfare as well (Leontief, 1938; Kantorovich, [1939]1960; Lange, 1949, 1957, [1961]1978; Lopes & Neder, 2017). For these economies, the general equilibrium models do not constitute a planning tool for the expansion of production following the microeconomic purposeful forces of entrepreneurial profit, but are a tool for a macroeconomic arrangement that protects the state-supported planning and control of production and economy from the extremes of pure capitalism (Kantorovich, [1939]1960; Lange, 1949, 1957, [1961]1978; Lopes & Neder, 2017). However, the absence of entrepreneurial profit as a propulsive factor of economic activity is considered the basic reason of reduced efficacy.

It is obvious that in the macroeconomic level, the general equilibrium models operate as models for the gradual and perpetual melioration; and not as optimization models; adopting the Keynes principles for the role of state for an upper social felicity. The optimum in this evolution process is a utopian

continuously evolving goal. Whereas, the gradual amelioration is the unique plausible approach. This articulates the reason why the general equilibrium models are not tools for the structural planning of productive networks exclusively in the pure/mixed market economies; but these models both have been used for similar purposes by the centrally planned economies (Serck-Hanssen, 1962; Staller, 1965; Long, 1970; Tretyakova and Birman, 1976; Shapiro, 1977; Chen, 1990; Cohen, 2002; Andreosso-O'Callaghan and Yue, 2004; Chen et al., 2004; Lau et al., 2006; Kuboniwa, 2008; Lau et al., 2010; Sonis & Hewings, 2007; Jiang, 2011; Yang et al., 2015; Baranov et al., 2018).

3. Microeconomic and general equilibrium models

The I-O models are behavioral models based on the decisions of economic agents (state, firms, consumers, according to the scheme of the socio-economic approach). The macroeconomic equilibrium of economy is the result of the microeconomic balances in the individual sectoral markets. The equipoise of sectoral markets is not necessary happened under full employment conditions. Instead of it, the full employment should be considered as a sectoral exception, maybe in a sector by few only high specialized employees. Such sectors usually remain under the straightforward full state control, as for instance is the nuclear energy.

The growing planning under partial employment conditions is easier than this in full employment conditions. The planners keep the capability of boosting a sectoral activity relied on unexploitable productive factors. On the contrary, under full employment conditions, the increase of a sector's output presuppose the conveyance of productive factors from other sectors, in which the outputs will be reduced, and this is the alternative opportunity cost for the economy and the welfare of society, owing to the restricted productive capabilities of limited productive factors (Kolokontes et al., 2019). Beyond the alternative opportunity cost, the society is also burdened an inflationary cost from the rise of outputs prices, on account of the increased payments of productive factors as a consequence of their competitive alternative uses. It is easy for someone to understand that taking the dimension of place and the non-balanced spatial development, the employment mobility and the capital one, into consideration, the described situation becomes more complicated. When the productive outputs depend on the limited inputs, then the unique capability of a simultaneous proliferation of sectoral outputs is founded on the improvement of literacy level. Learning, knowledge, the communicative and collaborative skills, the perceptual ability, the empathy, the foresightedness, the flexibility, the adjustability and the ingenuity are the quality components of human efficiency and effectiveness, determining the innovation of organizations and the technological inventions, given that the quality of human capital is a key-factor for progress, social felicity and happiness.

In the pure/mixed market economies, the markets constitute the framework for the action of enterprises and households. The markets may have one (*mono-*), few (*oligo-*) or many (*poli-*) sellers (*-poly*) and purchasers (*-psony*), shaping various schemes: *'monopoly-monopsony', 'monopoly-oligopsony', 'monopoly-polipsony'* or *'pure monopoly'*, *'oligopoly-monopsony'*, *'oligopoly-oligopsony'*, *'oligopoly-polipsony'* or *'pure oligopoly'*, *'polipoly-monopsony'*, *'polipoly-*

oligopsony', *'polipoly-polipsony'* or *'perfect/ full competition'*. Furthermore, the products can be absolutely homogenous (*'monopoly-'* and *'polipoly-'*), or less or more differentiated (*'oligopoly-'* and *'monopolistic competition'*). Among the various markets' forms, the degree of free action, volition and choice for the firms and the consumers vary as well, defining the bargaining power of each group (Dervis et al., 1982; Mastronardi et al., 2012; Cavaliere & Lombardi, 2015; Haslop et al., 2017; Müller-Hansen et al., 2017). The formation of AGE/ CGE models relied on the acceptance that the individual agents, firms and households, behave rationally, aiming maximum revenues, minimum cost, maximum profit and maximum utility (Almon, 1963; Dervis et al., 1982; Kurz & Lager, 2000; Kurz & Salvadori, 2000a, 2000b; Mastronardi et al., 2012; Haslop et al., 2017; Lopes & Neder, 2017; Müller-Hansen et al., 2017; Thomassin. 2018). The firms are characterized by conscious decisions, while the households present conscious and subliminal impulsive actions and reactions owing to their habits and living experience. Besides, this explains the consumption of unhealthy products such as the tobacco products and the intoxicants (Cavaliere & Lombardi, 2015). In addition, the decisions of production and consumption are influenced by factors such as the tradition, the customs, the social norms and culture (Weber, 1978; Cavaliere & Lombardi, 2015; Lopes & Neder, 2017). The differentiations on the decisions about the consumption and the production in the various societies affect their structures and the produced transactional flows forming different productive networks at the local, regional, national and hypernational level.

The households' desires and the governmental consumption are components of final demand activating the enterprises. Such as the cogwheels, the sectors interact each other leading the intermediate and final demand in the productive networks (Lopes & Neder, 2017; Müller-Hansen et al., 2017). In the markets without state interventions and restrictions as for the number of sellers, sooner or later, the entrance's difficulties in these markets are bowed down from the investors who 'smell' the prospect for profits and undertake competitive initiatives. In case of imperfect markets (e.g in an oligopolistic sectoral market) a microeconomic *'quasi-balance'* is in force. The shape of market alters, either when the number of sellers and producers are changed or when the products acquire differentiations. For instance, more sellers with a diversity of differentiated products create a *'monopolistic competition'*. The plethora of competitive firms and the diversity of products that can satisfy the same needs provide to consumers alternative options and price-quality combinations, making the monopolistic competition a desirable kind-market from the developmental patterns. Regardless of the market form, in any occasion, the enterprises choose their production level taking as a main criterion the equation of marginal cost with the marginal revenue. Hence, the empirical general equilibrium models are not connected to specific markets forms and this illusion must stop existing. The calibrated transactions in an empirical general equilibrium model permit the coexistence of various sectoral markets schemes, as each one sectoral output is grouped and homogenized with the others as monetary value (Kolokontes et al., 2019). As a consequence, the empirical application itself shoots down and solves the theoretical restrictions in the construction of Leontief's functions and I-O analysis. The application of general equilibrium models by the centrally

directed economies is the strongest proof of this illusion.

In other words, when a statistical authority collects data about the sectoral transactions in terms of values, each one sector keeps its particular market scheme. The sectoral market scheme is an internal sectoral matter, as it is described above. The sectoral transactions are influenced by the schemes of sectoral markets, for instance as for the definition of products prices, but using value's terms this obstacle is resolved. Leontief's I-O model unifies all the sectors and the whole of microeconomic sectoral transactions under a macroeconomic consideration. Besides, the stable prices is a short-run acceptable condition that permits the study of total sectoral outputs focusing exclusively on their quantities (Kolokontes et al., 2019,2020; Kolokontes, 2021). In the era when Leontief constructed his model, he expressed the sectoral transactions using linear equations. The pre-existing scheme of sectoral markets is not restricted by these linear equations. The linear equations just describe theoretically the connections among the sectors, when the computable exploitation of model begins as a macroeconomic planning tool. In our days, the technology progress permits the configuration of general empirical/computable equilibrium models with non-linear equations. However, there are scientists that continue to be confused among these connections and expressions and moreover they characterize negatively the quality of loud macroeconomic tools, like as the general empirical/computable equilibrium models. But a tool is a tool. People make the tools and people handle the tools. A tool's handling necessitates a profound knowledge about it, either to meliorate it or just to applicate it correctly.

In the centrally directed economies, in the cases that the models were expressed in monetary terms (Lange, [1961]1978), the sectoral productive cost for Lange (1904-1965) was the value of using services of technical factors. When the marginal cost per unit of output does not include the marginal profit (scilicet the marginal payment of entrepreneurship) and furthermore it does not include direct and indirect taxes (magnitudes that do not appear in the models of centrally directed economies) (Sraffa, [1960]1963; Lange, [1961]1978), then the value of using services of technical factors configures the production cost, both at the cases of marginal and total level. In contradiction, the general equilibrium models in the pure/mixed market economies take account of the marginal payment of entrepreneurship and the direct and indirect taxes for the configuration of market prices of outputs (Leontief, 1938; Lange, [1961]1978; Lopes & Neder, 2017).

Eventually, the more noteworthy difference among the markets' approaches is the fact that the centrally planned economies are not interested in producing a range of products for each specific need of customers, scilicet the consumers have not got alternative choices due to the absence of private competition and marketing. On the contrary, in the pure/mixed market economies, the competitive outputs offer options to consumers, since the production of quality-price differentiated outputs constitute a basic target of private firms, via the market schemes of monopolistic competition and pure oligopoly.

4. I-O models and developmental socio-economic policy

Progress is a common target for all the socio-economic political systems. The differences among them define the level and

the modus of state intervention. The ownership, the allocation and the usage of productive factors, the sectoral tax incentives and disincentives, the allowances of initiatives for private investments, the subsidies of interests, the policies for the impetus of sectoral final demand, the public investments and the state infrastructures (roads and railways, ports and airports, decentralized public organizations, the structure of health system, the structure of education system, and so forth), the enactment of industrialized areas, technological parks, technological-scientific-innovative poles and networks are all parameters of developmental policies affecting in practice the structure of local, regional and national productive nexus, as well as the economic surplus and deficit of state. The calibration of I-O models provides the policy-makers the chance to simulate empirically the impacts of potential developmental decisions, *'ex post'* and *'ex ante'* (Mansur & Whalley, 1981; Darvis et al., 1982; Baumol & Wolff, 1994; Alikaj & Alexopoulos, 2014; Cardenete et al., 2015; Dwyer, 2015; Kolokontes et al., 2018; United Nations, 2018; Kolokontes et al., 2019, 2020; Kolokontes, 2021, 2025).

The significance of SAMs as databases is emanated from their utility for the construction of '*direct and total requirements matrices'*. These matrices constitute the base for the measurements of sectoral output multipliers. Furthermore, the direct and total requirements matrices of outputs are the basis for the derivation of direct and total requirements matrices of employment, income and whatever else factor of analysis, which are used in order the sectoral employment, income and so forth multipliers to be measured (Smith & Morrison, 1974; Breisinger et al., 2010; Haslop et al., 2017; Kolokontes et al., 2018, 2019, 2020; Kolokontes, 2021). An abundance of multipliers is mentioned in the bibliography and the scientific literature. All the indices do not answer the same questions and must be chosen and used carefully (Kolokontes et al., 2018, 2019, 2020; Kolokontes, 2021, 2025). The direct and total requirements matrices are the peak of Leontief's contribution for ex ante consequences' analysis of decisions that are made in the framework of growing planning; and ex post evaluation of outcomes.

The higher the decomposition sectoral analysis in a model is, the more meticulous control of various alternative scenarios for the developmental pattern will be (Kolokontes et al., 2019, 2020; Kolokontes, 2025). However, a high decomposition entails difficulty in collecting of necessary statistical data (Smith & Morrison, 1974; Kymn & Norsworthy, 1976; Crown, 1990; Jackson & Comer, 1993; Comer & Jackson, 1997; Lahr & Stevens, 2002; André et al., 2010; Cardenete et al., 2012; Alikaj & Alexopoulos, 2014; Dwyer, 2015; Haslop et al., 2017; United Nations, 2018; Kolokontes et al., 2019). The available time for the data collection, the spatial dimension of study, the static or dynamic representation; are all factors that affect the models schemes (Leontief, 1941, 1947, 1951, 1961; Lange, 1957, [1961]1978; Leontief, [1966]1986; Rogerson & Plane, 1984; Plane & Rogerson, 1986; Robinson & Roland-Holst, 1988; de Melo, 1988; Pereira & Shoven, 1988; Pyatt 1988; Jackson et al., 1990; Kirman, 1992; Rizvi, 1994; Robinson, 2006; Tesfatsion, 2006; André et al., 2010; Cardenete et al., 2012; Alikaj & Alexopoulos, 2014; Dwyer, 2015; Lopes & Neder, 2017; Müller-Hansen et al., 2017; Thomassin, 2018; Kolokontes et al., 2019; Kolokontes, 2021, 2025). The researching scopes specify the appropriate formation of general equilibrium models as concerns the sectoral decomposition, the

variables and their sizes, the elements of final demand and the components of value added, the adoptive restrictions, etc. (Almon, 1963, 1966; Smith & Morrison, 1974; Kymn & Norsworthy, 1976; Mansur & Whalley, 1981; de Melo, 1988; Pereira & Shoven, 1988; Robinson & Roland-Holst, 1988; Crown, 1990; Jackson & Comer, 1993; Comer & Jackson, 1997; Shishido, et al., 2000; Lahr & Stevens, 2002, Kidgell, 2003; Wing, 2004; André et al., 2010; Breisinger et al., 2010; Cardenete et al., 2012; Mastronardi et al., 2012; Soklis, 2013; Dwyer, 2015; Haslop et al., 2017; United Nations, 2018; Chisari et al., 2019; Kolokontes et al., 2019). Consequently, the difficulty in gathering necessary statistical information affects: the options for the scale and the questions of scientific research; the manner of mechanical non-survey simulations for the secondary derivation of regional and local models when the corresponding data are in scarce; and the limitations of models in connection with the economic theory and empirical action (Frisch, 1936; Leontief, 1936a, 1936b, 1937, 1941, 1947, 1951, [1966]1986; Mansur & Whalley, 1981; Baumol, 2000; Shishido et al., 2000; Kurz & Lager, 2000; Kurz & Salvadori, 2000a, 2000b; Kidgell, 2003; Miller & Blair, 2009; Cardenete et al., 2012; Mastronardi et al., 2012; Soklis, 2013; Dwyer, 2015; Haslop et al., 2017; Chisari et al., 2019; Kolokontes et al., 2019; Kolokontes, 2025).

If the models of general equilibrium were mechanisms for the profits' maximization, then a decision for only one specific production (e.g. weapons) may be possible, but as it is pointed out in the aforementioned a decision like this cannot be rational at the social sphere, due to the fact that nothing offers to the daily life of society as concerns the satisfaction of biological of psychological needs. The manner of decisions in the microeconomic level must not be confused with the modus and the results of macroeconomic decisions. On the microeconomic level, the maximum revenues, the minimum cost, the maximum profit and the maximum utility are logical behavioral parts of market economies. The enterprises follow the equation between the marginal cost and the marginal revenue to decide the scale of production. On the macroeconomic side, the state alters the game. The state influences and guides the productive activities affecting the sectoral markets. In the market economies, the state itself is directly a consumer and an investor; while indirectly distributes the productive factors through developmental laws, directives, incentives and disincentives. Whereas, in the centrally planned economies, the state is interesting in controlling the productive activities, sharing directly the productive factors. The difference in the centrally directed general equilibrium models is the absence of microeconomic sectoral markets mechanisms. The state, the public sector, is the unique producer and distributor. Or else, macroeconomically, the productive interconnectedness operates without exogenous stimuli, since the targets of state authority are the unique exogenous factor of centrally directed general equilibrium models. Thus, either in the pure/mixed market economies or in the centrally planned economies, the macroeconomic scope of empirical general equilibrium analysis is not to succeed in profits maximization but to meliorate the *'average social benefit'* gradually and perpetually. Besides, in cases of pure/mixed markets the profits maximization process is fulfilled by the pre-existing internal function of sectoral markets and their connectedness. The enacted, by the state, sectoral incentives and disincentives in the pure/mixed markets serve almost the same scope with the direct

allocation of productive factors in the centrally planned economies.

To this attempt, usual goals of growing patterns are the best use of land, the rational exploitation of water, the minimization of used energy, the minimization of environmental degradation and this of social pathogenesis too; and the literacy (Lenzen, 2003; Kelly et al., 2015; Belegri-Roboli et al., 2016; Kelly, 2016; Kakderi & Tasopoulou, 2017; Müller-Hansen et al., 2017). Thereby, the macroeconomic aims of planners for the progress of society and economy are not exclusively economic, but they must be social and humanistic as well, giving emphasis on the felicity and happiness of societies via the public provisions or social redistributions. The economic enlargement owes to serve the felicity and the happiness of societies. This is the real progress of humanity.

In human societies, the total and the individual average utility from the consuming products and services, the living environment and the conditions of daily life, depend on two parameters: the first is the state decisions and the other one is the individual subjectiveness of happiness via the personal feelings and beliefs. The scope of progress owes to be exactly the collateralization of such living conditions capable of improving the average living utility and happiness of individuals (Müller-Hansen et al., 2017). The *'progress'* is not only the economic enlargement, but a wider target enclosing the amelioration of daily living conditions generally; or more correctly progress must embrace social happiness.

The measurement and the improvement of happiness in a society is an extremely interesting challenge, but it constitutes a very complicated aim. The estimation of happiness requires a parametrization by many quality variables. The emotions can be described using ordering numerical variables, which however cannot be considered as precise measurements. The behavioral-emotional heterogeneity among the people makes the estimation and the administration of happiness more difficult, due to its subjectiveness, given that personal happiness stems from various and different situations for every one of us. Notwithstanding, some points are common almost for all.

The progress can create choices and potentialities for all the individuals. The development has to utilize everyone productively, according to their skills, traits, beliefs, experiences and knowledge. This must be happened on the whole of the territory, continually over the time and in all the sectoral activities. The progress of any socio-economic organizational scheme is the outcome of productive contribution of all the heterogenous personalities of society, contemporaneously. The choices of growing planners for the restructuring of productive activities should target positive effects on the average per capita happiness, regardless from the subjectiveness of its measurement and the behavioral-emotional heterogeneity among the people. The conscious targeting for the melioration of average social happiness owes to be the epicenter of socio-economic policy. Regardless of the level of state intervention in an economy, a common acceptance must be that the macroeconomic tool of general equilibrium models is not a maximization methodology on the macroeconomic level, despite the fact that the sectoral economic activities in the microeconomic background follow the economic optimization. As a matter of fact, the general equilibrium models are a methodological framework for a gradual and perpetual improvement of productive networks, constituting *ex officio 'the Leontief's*

gift' for the socio-economic policies in favor of all the local, regional, national and hypernational societies.

5. Synopsis and inferences

In the bibliography and the scientific literature there is often the illusion that the general equilibrium models are pent in a severe connection with a specific type of market, describing exclusively perfect competition markets. The calibration of transactions in the empirical general equilibrium models permits the coexistence of various sectoral markets' schemes, as each one sectoral output is grouped and homogenized with the others as monetary value. The adoption and the application of general equilibrium models from the centrally directed economies constitutes the strongest proof regarding the above illusions. The AGE/CGE models are appeared as macroeconomic tools capable of describing the macroeconomic balance of economy. However, behind this visible picture, the architectural background of AGE/CGE models is composed by microeconomic sectoral productive functions and connections.

In this framework, the wider the state intervention in an economy is, the more state-supported the sectoral monopolies are. On the contrary, when the state control is reduced, the sectoral markets become monopolistic competition and oligopolies. Eventually, the more noteworthy difference among the markets' approaches is the fact that the centrally planned economies are not interested in producing a range of products for each specific need of customers, scilicet the consumers have not got alternative choices due to the absence of private competition and marketing. On the contrary, in the pure/mixed market economies, the competitive outputs offer options to consumers, since the production of quality-price differentiated outputs constitute a basic target of private firms, via the market schemes of monopolistic competition and pure oligopoly.

In any case the behavioral functions of consumers and producers in the various sectoral markets reflect the side of microeconomic analysis, while the macroeconomic consideration is represented by the general equilibrium for the whole of sectoral markets. In the pure/mixed market economies, the firms decide following the equation of marginal cost with the marginal revenue, and the state intervenes in the operation of sectoral markets adopting incentives and disincentives, enacting relevant developmental laws and directions. A reallocation of productive factors among the productive activities takes place during these procedures. As the state-control is increased, the state authority specifies the structure of productive network more and more. In the centrally directed economies, the planning for the reallocation of productive factors is a completely state-supported decision. In these economies neither the strengths of markets operate, nor the purposeful impulses. The state authority is not concerned about motivation. The exogenous stimuli are inactive; and the state decides for the social development and security, weighing the prestige of national force on the one hand, while on the other the coverage of needs of population, but without any options offer.

In order the policy-makers to make decisions and create medium-to-long run patterns for a gradual holistic restructuring of economy, they are informed details for the existing already situation of productive nexus via the general equilibrium models (constructing for the output, the employment, the income or whatever else factor). As it

must be clear from the aforementioned, the microeconomic targets of firms in the markets' economies cannot obviously be considered the same with those of state-supported general equilibrium analysis. The role of AGE/CGE models is foretelling, aiming a continual-perpetual structural melioration of economy again and again, considering that the macroeconomic optimum is a utopia. The scope of these models is to provide estimations for the medium-to-long run potential sectoral multiplying diffusions in terms of output, employment, income and so forth, under a fluctuating range of magnitudes, between an open until to a completely closed scheme of models (Kolokontes et al., 2019, 2020; Kolokontes 2021, 2025). As a matter of fact, the crucial usability of general equilibrium models must be the evolution and the perpetual improvement of average social felicity and happiness.

Despite the fact that there are quality factors, such as the educational policy (and as a consequence its relation with the innovation, the social-emotional and moral maturation and the socio-economic achievements) that cannot exclusively be assessed by monetary values, however the databases of SAMs and the calibration of I-O models provides to the growing planners a suitable tool for empirical ex ante and ex post simulations of present and future perspectives of economy checking various possible developmental scenarios, and controlling the national accounts contemporaneously. The development has to utilize everyone productively, according to their skills, traits, beliefs, experiences and knowledge. This must be happened on the whole of the territory, continually over the time and in all the sectoral activities. The progress of any socio-economic organizational scheme is the outcome of productive contribution of all the heterogenous personalities of society, contemporaneously.

Since the control of the economy by the state authority is increased, the only exogenous factor of general equilibrium models ends up being the state targets. Thus, when a state intervenes, either indirectly (by incentive and disincentives) in case of pure/mixed markets' economies or directly in case of centrally planned economies, the scope of empirical general equilibrium analysis should not consider the achievement of profits' maximization, but instead of it is the gradual and perpetual improvement of *'average social benefit'*, taking the opinion and the decisions of state authority into consideration; and regardless the fact that the sectoral economic activities in the microeconomic background of pure/mixed markets' economies follow the economic optimization. Progress for a society denotes its ability to resolve problems. This is something wider than the rational administration of productive factors for the magnification of productive outputs. Progress must be considered as something more substantial, as it is making *'from the people'* and *'for the people'*, taking the human feelings and the heterogeneity among them into account.

The people are the driving forces for the whole of productive activities in whatever socio-economic organizational scheme. The choices of growing planners for the restructuring of productive activities should target positive effects on the average per capita happiness, regardless from the subjectiveness of its measurement and the behavioral-emotional heterogeneity among the people. The conscious targeting for the melioration of average social happiness owes to be the epicenter of socio-economic policy. Thereby, the macroeconomic aims of planners

for the progress of society and economy are not exclusively economic, but they must be social and humanistic as well, giving emphasis on the felicity and happiness of societies via the public provisions or social redistributions. The economic enlargement owes to serve the felicity and the happiness of societies. This is the real progress of humanity.

Hence, independently from the level of state intervention in the economy, the common context is that the general equilibrium analysis is not a maximization methodology, but a methodology for gradual and perpetual improvement; constituting *ex officio 'the Leontief's gift'* for the socio-economic policies in favor of all the local, regional, national and hypernational societies. Leontief passed in the pantheon of economic science providing to the general equilibrium models of Jevons and Walras their applied dimension, by his empirical I-O tables. However, Leontief's stochastic contribution seems to be deeper. When Leontief represented the I-O analysis as an immigrant in the U.S. contemporary core of market economy, handed in the economic science a tool for the rectification of unrestrained capitalism and the improvement of social justice in terms of average well-being. The social political dimension of Leontief's I-O analysis must be concerned his crucial contribution.

The AGE/CGE models are tools that even have noteworthy unused capabilities. There are a lot of misrepresentations and fallacious implementations of these models and the corresponding derived multipliers, especially in the frontloading impact analysis (Kolokontes, 2021). Despite the fact that the matter of real felicity and happiness remains the more interesting challenge for the aims of socio-economic policy, there are not yet suitable general equilibrium models capable of taking both the behavioral quality parameters of happiness and the calibrated quantity measures of sectoral interacted spillovers into a unified consideration.

References

Andreosso-O'Callaghan, B. and Yue, G. 2004. Intersectoral Linkages and Key-Sectors in China, (1987-1997). *Asian Economic Journal*, 18(2), pp. 165-183. DOI: https://doi.org/10.1111/j.1467-8381.2004.00188.x

Alikaj, M. and Alexopoulos, Y., (2014). Analysis of the Economy of Region of Western Greece. An Application of Social Accounting Matrix (SAM). *Procedia Economics and Finance*, 14, pp.3-12. DOI: https://doi.org/10.1016/S2212-5671(14)00679-0

Almon, C.Jr., (1963). Consistent Forecasting in a Dynamic Multi-sectoral model. *The Review of Economics and Statistics*, 45(2), pp. 148-162. DOI: https://doi.org/10.2307/1924652

Almon C.Jr., 1966. The American Economy to 1975: An Interindustry Forecast. New York: Harper and Row.

André, F.J., Cardenete, A.M. and Romero, C., (2010). Designing Public Policies: An Approach Based on Multi-criteria Analysis and Computable General Equilibrium Modeling. Srpinger with Fundación BBVA. DOI: https://doi.org/10.1007/978-3-642-12183-8

Baranov, O.A., Pavlov, N.V, Slepenkova, M.Iu. and Tagaeva, O.T. (2018). Dynamic Input-Output Model with a Juman Capital Block Applied to Forecasting of the Russian Economy. Studies on Russian Economic Development, 29, pp.654-664. DOI: https://doi.org/10.1134/S1075700718060023

Baumol, W.J. and Wolff, E.N., (1994). A Key-Role of Input-Output Analysis in Policy Design. Regional Science and Urban Economics, 24(1), pp. 93-113. DOI: https://doi.org/10.1016/0166-0462(94)90021-3

Baumol, W.J., (2000). Leontief's Great Leap Forward: Beyond Quesnay, Marx and Von Bortkiewicz. *Economic Systems Research*, 12(2), pp. 141-152. DOI: https://doi.org/10.1080/09535310050005662

Belegri-Roboli, A., Demertzi, A., Markaki, M., and Michailides, P., (2016). The Macroeconomic Impacts of the Attiki Odos Motorway in the Greek Economy: An Input-Output Analysis. *Munich Personal RePEc Archive (MPRA)*, No.74429. https://mpra.ub.uni-muenchen.de/74429/

Breisinger, C., Thomas. M. and Thurlow, J., (2010). Social Accounting Matrices and Multiplier Analysis: An Introduction with Exercises. Washington, D.C.: International Food Policy Research Institute. DOI: http://dx.doi.org/10.2499/9780896297838fsp5

Cardenete, A.M., Guerra, A-I and Sancho, F., (2012). Applied General Equilibrium: An Introduction. Springer. DOI: 10.1007/978-3-642-24746-0

Cardenete, A.M., Delgado, C.M., Fuentes, P.D., Lima, C.M., Mainar, A.J., Rueda-Cantuche, J.M, Mary, S., Santini, F. and Gomez, P.S., (2015). Rural-Urban Social Accounting Matrixes for Modelling the Impact of Rural Development Policies in the EU. Luxenburg: Publications Office of the European Union. DOI: 10.2791/939085

Cavaliere, V. and Lombardi, S., (2015). Exploring Different Cultural Configurations: How Do They Affect Subsidiaries' Knowledge Sharing Behaviors? *Journal of Knowledge Management*, 19(2), pp. 141-163. DOI: https://doi.org/10.1108/JKM-04-2014-0167

Chen, X. (1990). Input-Occupancy-Output Analysis and its Application in China. In Chatterji, M. and Kuenne, R.E. (Eds), Dynamics and Conflict in Regional Structural Change. London: Palgrave Macmillan. DOI: https://doi.org/10.1007/978-1-349-10636-3_16

Chen, X., Guo, J. and Yang, C. (2004). Chinese Economy Development and Input-Output Extension. *International Journal of Applied Economica and Econometrics*, 12(1), 43-88.

Chisari, O.O., Mastronardi. L.J. and Romero, C.A., (2019). Commodities Prices and Critical Parameters for Macroeconomic Performance: A CGE Analysis for Argentina, Brazil and Chile. *Estudios Económicos*, 36(72), pp. 5-30. DOI: http://revistas.uns.edu.ar/ee/article/view/1658

Clark, L.D. (1984). Planning and the Real Origins of Input-Output Analysis. *Journal of Contemporary Asia*, 14(4), pp.408-429. DOI: https://doi.org/10.1080/00472338485390301

Cohen, I.S. (2002). Growth and Distribution in Russia and China: A Social Accounting Matrix Analysis. *International Advances in Economic Research*, 8(4), pp. 296-304. DOI: https://doi.org/10.1007/BF02295504

Comer, J.C. and Jackson, R.W., (1997). A Note on Adjusting National Input-Output Data for Regional Table Construction. *Journal of Regional Science*, 37(1), pp. 145-153. DOI: https://doi.org/10.1111/0022-4146.00047

Crown, W.H., (1990). An Interregional Perspective on Aggregation Bias and Information Loss in Input-Output Analysis.

Growth and Change, 21(1), pp. 11-29. DOI: https://doi.org/10.1111/j.1468-2257.1990.tb00507.x

Defourny, J. and Thorbecke, E. (1984). Structural Path Analysis and Multiplier Decomposition Within a Social Accounting Matrix Framework. *The Economic Journal*, 94(373), pp.111-136. DOI: https://doi.org/10.2307/2232220

Dervis, K., de Melo, J. and Robinson, S., (1982). General Equilibrium Models for Development Policy. Washington, D.C.: World Bank Research Publication. Retrieved from: https://www.un.org/en/development/desa/policy/mdg_workshops/eclac_training_mdgs/dervis_demelo_robinson_1982gemsfordevpolicy.pdf.

de Melo, J., (1988). SAM-based Models: An Introduction. *Journal of Policy Modeling*, 10(3), pp. 321-325. DOI: https://doi.org/10.1016/0161-8938(88)90025-7

Drud, A., Grais, W. and Pyatt. G. (1986). Macroeconomic Modeling Based on Social-Accounting Principles. *Journal of Policy Modeling*, 8(1), pp.111-145. DOI: https://doi.org/10.1016/0161-8938(86)90007-4

Dwyer, L., (2015). Computable General Equilibrium Modelling: An Important Tool for Tourism Policy Analysis. *Tourism and Hospitality Management*, 21(2), pp. 111-126.

Frisch, R., (1936) Annual Survey of General Economic Theory: The Problem of Index Numbers. *Econometrica*, 4(1), pp. 1-38. DOI: https://doi.org/10.2307/1907119

Haslop, F., Mastronardi, L.J., Romero, C.A. and Tarelli, J.P., (2017). Understanding Regional Tourism Impact When Data is Scarce: Dealing With the Absence of a Regional Input-Output Table. 25th international input-output conference of International Input-Output Association (IIOA), June 19-23, 2017, Atlantic City, New Jersey. Retrieved from: https://www.iioa.org/conferences/25th/papers/files/2946_20170515031_Mastronardi_romero_haslop_tarelli_IIOA.pdf.

Jackson, R.W. and Comer, J.C., (1993). An Alternative to Aggregated Base Tables in Input-Output Table Regionalization. *Growth and Change*, 24(2), pp. 191-205. DOI: https://doi.org/10.1111/j.1468-2257.1993.tb00960.x

Jevons, S.W., (1878). The Theory of Political Economy. 3rd ed.. McMillan and Co (1st ed.: 1871). Retrieved from: https://oll.libertyfund.org/titles/jevons-the-theory-of-political-economy.

Jiang, X. (2011). Statistical and economic applications of Chinese regional input-output tables. Groningen: University of Groningen. https://pure.rug.nl/ws/portalfiles/portal/2545344/08complete.pdf

Kahn, H.A. and Thorbecke, E., (1989). Macroeconomic Effects of Technology Choice: Multiplier and Structural Path Analysis Within a SAM Framework. *Journal of Policy Modeling*, 11(1), pp. 131-156. DOI: https://doi.org/10.1016/0161-8938(89)90028-8

Kakderi, C., and Tasapoulou, A., (2017). Regional Economic Resilience: The role of National and Regional Policies. *European Planning Studies*, 25(8), pp. 1435-1453. DOI: https://doi.org/10.1080/09654313.2017.1322041

Kantorovich, L.V., (1960). Mathematical Methods of Organization and Planning

Production. Management Science, 6(4), pp. 366-422. DOI: https://doi.org/10.1287/mnsc.6.4.366 [1st publication: Leningrad State University, 1939]

Kelly, S., (2015). Estimating Economic Loss from Cascading Infrastructure Failure: A Perspective on Modelling Interdependency. *Infrastructure Complexity,* 2(1). Article 7. DOI: https://doi.org/10.1186/s40551-015-0010-y

Kelly, S., Tyler, P., and Crawford-Brown, D., (2016). Exploring Vulnerability and Interdependency of UK Infrastructure Using Key-Linkages *Analysis. Networks and Spatial Economics*, 16(3), pp. 865-892. DOI: https://doi.org/10.1007/s11067-015-9302-x

Kirman, A.P., (1992). Whom and What Does the Representative Individual Represent? *The Journal of Economic Perspectives*, 6(2), pp. 117–136. DOI: https://www.jstor.org/stable/2138411

Kidgell, J., (Ed.) (2003). Handbook on Social Accounting Matrices and Labour Accounts. Luxemburg: European Commission, Leadership Group on Social Accounting Matrices.

Kolokontes. D.A., (2021). Reposition of Forward to Backward Input-Output Analysis. *Scientific Annals of Economics and Business*, 68(2), pp. 195-232. DOI: https://doi.org/10.47743/saeb-2021-0015

Kolokontes, D.A. (2025). Symmetrical Approaches for the Non-Survey Regionalization Techniques: Ameliorating the Flegg's Location Quotients. *Ekonomika Regiona / Economy of Regions*, 21(4), pp. 1188-1206. DOI: https://doi.org/10.17059/ekon.reg.2025-4-18

Kolokontes, D.A., Kontogeorgos, A., Loizou, E. and Chatzitheodoridis, F., (2018). Key-Sectors Attractiveness of the Greek economy: An Input-Output Approach. *Applied Econometrics and International Development*, 18(1), pp. 35-54.

Kolokontes, D.A., Kontogeorgos, A., Loizou, E. and Chatzitheodoridis, F., (2019). Input-Output Models and Derived Indicators: A Critical Review. *Scientific Annals of Economics and Business*, 66(3), pp. 267-308. DOI: https://doi.org/10.47743/saeb-2019-0026

Kolokontes, D.A., Kontogeorgos, A., Loizou, E. and Chatzitheodoridis, F., (2020). Decomposition Analysis for the Comparison and the Comprehension of Conventional Input-Output Impacts' Indicators: An Empirical Paradigm. *Scientific Annals of Economics and Business*, 67(2), pp. 193-217. DOI: https://doi.org/10.47743/saeb-2020-0011

Koopmans, T.C., (1949a). Identification Problems in Economic Model Construction. *Econometrica*, 17(2), 125-144.

Koopmans, T.C., (1949b). Optimal Utilization of the Transportation System. Econometrica, 17(Supplement: Report of the Washington Meeting), pp. 136-146. DOI: https://doi.org/10.2307/1907301

Kuboniwa, M. (2008). Developments of Russia Input-Output Tables. In Inomata S. and Kuwamori, H. (Eds.), Compilation of the International Input-Output Table for the BRICs – A Feasibility Study (ch.2, pp.11-47), Asian International Input-Output Series, Institute of Developing Economies No.71.

Kurz, H.D. and Lager, C., (2000). Introduction: Input-Output Analysis and Classical Economic Theory. *Economic Systems*

Research, 12(2), pp. 139-140. DOI: https://doi.org/10.1080/09535310050005653

Kurz, H.D. and Salvadori, N., (2000a). 'Classical' Roots of Input-Output Analysis: A Short Account of Its Long Prehistory. *Economic Systems Research*, 12(2), pp. 153-179. DOI: https://doi.org/10.1080/09535310050005671

Kurz, H.D. and Salvadori, N., (2000b). The Dynamic Leontief Model and the Theory of Endogenous Growth. *Economic Systems Research*, 12(2), pp. 255-265. DOI: https://doi.org/10.1080/09535310050005734

Kymn, K.O. and Norsworthy, R.J., (1976). A Review of Industry Aggregation in Input-Output Models. *The American Economist*, 20(1), pp. 5-10. DOI: https://www.jstor.org/stable/25603043

Lahiri, S., 2000. Professor Wassily W. Leontief, 1905-1999. *The Economic Journal*, 110(4), pp. 695-707. DOI: https://www.jstor.org/stable/2667772

Lahr, M.L. and Stevens, B.H., (2002). A Study of the Role of Regionalization in the Generation of Aggregation Error in Regional Input-Output Models. *Journal of Regional Science*, 42(3), pp. 477-507. DOI: https://doi.org/10.1111/1467-9787.00268

Lange, O., (1949). The Practice of Economic Planning and the Optimum Allocation of Resources. Econometrica, 17(Supplement: Report of the Washington Meeting), pp. 166–171. DOI: 10.2307/1907304

Lange, O., (1957). Some Observations on Input–Output Analysis. *Sankhyā*: *The Indian Journal of Statistics*, 17(4), pp. 305-336. DOI: https://www.jstor.org/stable/25048319

Lange, O., (1978). Introduction to Econometrics. 4th ed. Oxford: Pergamon Press. (1st ed.: 1961).

Lau, J.L, Chen, H. Cheng, K.L., Fung, C.K., Pei, J., Sung, Y-W., Tang, Z., Xiong, Y., Yang, C. and Zhu, K. (2006). Estimates of U.S.-China Trade Balances in Terms of Domestic Value-Added. Stanford University, Working paper No.295.

https://kingcenter.stanford.edu/sites/g/files/sbiybj16611/files/media/file/295wp_0.pdf

Lau, J.L, Chen, H., Yang, C., Cheng, K.L., Fung, C.K., Pei, J., Sung, Y-W., Zhu, K., Pei, J., Tang, Z. (2010). Input-Occupancy-Output Models for the Non-Competitive Type and Their Application – An Examination of China-US Trade Surplus. *Social Sciences in China*, 31(1), pp. 35-54. DOI: https://doi.org/10.1080/02529200903565079

Lenzen, M., (2003). Environmentally Important Paths, Linkages and Key Sectors in the Australian Economy. *Structural Change and Economic Dynamics,* 14(1), pp. 1-34. DOI: https://doi.org/10.1016/S0954-349X(02)00025-5

Leontief, W.W., (1936a). Quantitative Input and Output Relations in the Economic System of the United States. *The Review of Economic Statistics*, 18(3), pp. 105-125. DOI: https://www.jstor.org/stable/1927837

Leontief, W.W., (1936b). Composite Commodities and the Problem of Index Numbers. *Econometrica*, 4(1), pp. 39-59. DOI: https://www.jstor.org/stable/1907120

Leontief, W.W., (1937). Interrelation of Prices, Output, Savings and Investment. *The Review of Economic Statistics*, 19(3), pp.

109-132. DOI: https://www.jstor.org/stable/1927343

Leontief, W.W., (1938). The Significance of Marxian Economics for Present-Day Economic Theory. *The American Economic Review*, 28(1), pp. 1-9. DOI: https://www.jstor.org/stable/1804482

Leontief, W.W., (1941). The Structure of American Economy, 1919-1929: An Empirical Application of Equilibrium Analysis. Cambridge, Mass: Harvard University Press.

Leontief, W.W., (1947). Introduction to a Theory of the Internal Structure of Functional Relationships. *Econometrica*, 15(4), pp. 361-373. DOI: https://www.jstor.org/stable/1905335

Leontief, W.W., (1951). Input-Output Economics. *Scientific American*, 185(4), pp. 15-21. DOI: https://www.jstor.org/stable/24945285

Leontief, W.W., (1961). Lags and Stability of Dynamic Systems. *Econometrica*, 29(4), pp. 659-669. DOI: https://www.jstor.org/stable/1911811

Leontief, W.W., (1986). Input-Output Economics. 2nd ed. New York, Oxford: Oxford University Press. (1st ed.: 1966).

Leontief, W.W., (1991). The Economy as a Circular Flow. Structural Change and Economic Dynamics, 2(1), 181-212. DOI: https://doi.org/10.1016/0954-349X(91)90012-H. [1st publication in German language: Leontief, W.W., (1928). Die wirtschaftals kreislauf. Archiv für Sozialwissenschaft und Sozialpolitik, 60, 577–623].

Lofgren, H., Harris-Lee, R. and Robinson, S., (2002). A Standard Computable General Equilibrium (CGE) Model in GAMS. Washington, D.C.: International Food Policy Research institute. Retrieved from: https://ebrary.ifpri.org/digital/collection/p15738coll2/id/74845/.

Long, B.N.Jr. (1970). An Input -Output Comparison of the Economic Structure of the U.S. and the U.S.S.R. *The Review of Economics and Statistics*, 52(4), pp.434-441. DOI: https://doi.org/10.2307/1926321

Lopes, C.T. and Neder, D.H., (2017). Sraffa, Leontief, Lange: The Political Economy of Input-Output Economics. EconomiA, 18(2), pp. 192-211. DOI: https://doi.org/10.1016/j.econ.2016.08.001

Madsen, B. and Jensen-Butler, V. (2005). Spatial Accounting Methods and the Construction of Spatial Social Accounting Matrices. *Economic Systems Research*, 17(2), pp.187-210. DOI: https://doi.org/10.1080/09535310500114994

Mainar-Causapé, A.J., Ferrari, E. and McDonald, S., (2018). Social Accounting Matrices: Basic Aspects and Main Steps for Estimation. Luxembourg: Publications Office of the European Union. DOI: 10.2760/010600

Mastronardi, LJ., Romero. C.A. and Chisari, O.O., (2012). Local Taxes in Buenos Aires City: A Computable General Equilibrium Approach. Munich Personal RePEc Archive (MPRA), No.40029: posted 13. Retrieved from: https://mpra.ub.uni-muenchen.de/40029/

Meng, B., and Qu, C. (2008). Application on the Input-Output Decomposition Technique to China's Regional Economies. *Journal of Applied Regional Science*, 13, pp. 27-46.

Meng, B., Fang, Y., Guo, J., and Zhang, Y., (2017). Measuring China's Domestic Production Networks Through Trade in

Value-Added Perspectives. *Economic System Research*, 29(1), pp. 48-65. DOI: https://doi.org/10.1080/09535314.2017.1282435

Morishima, M., (1973). Marx's Economics: A Dual Theory of Value and Growth. Cambridge: Cambridge University Press.

Müller-Hansen, F, Schlüter, M, Mäs, M., Donges, J.F., Kolb, J.J., Thonicke, K. and Heitzig, J., (2017). How to Represent Human Behavior and Decision Making in Earth System Models? A Guide to Techniques and Approaches. Earth System Dynamics Discussions, 18, pp. 977-1007. DOI: https://doi.org/10.5194/esd-8-977-2017

Pereira, A.M. and Shoven, J.B., (1988). Survey of Dynamic Computational General Equilibrium Models for the Tax Policy Evaluation. *Journal of Policy Modeling*, 10(3), pp. 401-436. DOI: https://doi.org/10.1016/0161-8938(88)90029-4

Phillips, A., (1955). The Tableau Ėconomique as a Simple Leontief Model. *The Quarterly Journal of Economic*s, 69(1), pp. 137-144. DOI: https://doi.org/10.2307/1884854

Plane, D.A. and Rogerson, P.A., (1986). Dynamic Flow Modeling With Interregional Dependency Effects: An Application to Structural Change in the U.S. Migration System. *Demography*, 23(1), pp. 91-104. DOI: https://doi.org/10.2307/2061411

Puttanapong, N., (2016). Tracing Thailand's Linkages to Global Supply Chain: Applications of World Input-Output Database (WIOD) and Structural Path Analysis. *International Journal of Applied Business and Economic Research*, 14(1), pp. 411-438.

Pyatt, G. and Thorbecke, E., (1976). Planning Techniques for a Better Future: A Summary of a Research Project on Planning for Growth, Redistribution and Employment. Geneva: International Labour Office.

Pyatt, G. and Round, J.I., (1979) Accounting and Fixed Price Multipliers in a Social Accounting Framework. *The Economic Journal*, 89(4), pp. 850-873. DOI: https://www.jstor.org/stable/2231503

Pyatt, G. and Round, J.I., (1985). Social Accounting Matrices: A Basis for Planning. Washington, D,C,: The World Bank. Retrieved from: https://www.un.org/en/development/desa/policy/mdg_workshops/eclac_training_mdgs/pyatt_round_1985_sams.pdf.

Pyatt, G., (1988). A SAM Approach to Modeling. *Journal of Policy Modeling*, 10(3), pp. 327-352. DOI: https://doi.org/10.1016/0161-8938(88)90026-9

Quesnay, F. (1958) [1766]. Premier problème économique. In: *François Quesnay et la Physiocratie*, 2 vols. Paris: L'Institute Nationale d'Etudes Démographie, pp. 859-878.

Rizvi, T.A.S., (1994). The Microfoundations Project in General Equilibrium Theory. *Cambridge Journal of Economics*, 18(4), pp. 357–377. DOI: https://doi.org/10.1093/oxfordjournals.cje.a035280

Robinson, S. and Roland-Holst, D.W., 1988. Macroeconomic Structure and Computable General Equilibrium Models. *Journal of Policy Modeling*, 10(3), pp. 353-375. DOI: https://doi.org/10.1016/0161-8938(88)90027-0

Robinson, S., Cattaneo, A. and El-Said, M., (2001). Updating and Estimating a Social Accounting Matrix Using Cross Entropy

Methods. *Economic Systems Research*, 13(1), pp. 47-64. DOI: https://doi.org/10.1080/09535310120026247

Robinson, S., (2006). Macro Models and Multipliers: Leontief, Stone, Keynes and CGE models. In de Janvry, A. and Kanbur, R. (Eds), Poverty, Inequality and Development: Essays in Honor of Eric Thorbecke (pp. 205-232). Springer Science. DOI: 10.1007/0-387-29748-0_11

Roemer, J.E., (1981). Analytical Foundations of Marxian Economics. Cambridge: Cambridge University Press. DOI: https://doi.org/10.1017/CBO9780511528286

Rogerson, P.A. and Plane, D.A., (1984). Modeling Temporal Change in Flow Matrices. *Papers in Regional Science*, 54(1), pp. 147-164. DOI: https://doi.org/10.1111/j.1435-5597.1984.tb00821.x

Romero, I., Dietzenbacher, E., and Hewings, D.J.G., (2009). Fragmentation and Complexity: Analyzing Structural Change in the Chicago Regional Economy. *Revista de Economia Mundial*, 23, pp. 263-282.

Round, I.J. (2003). Constructing SAMs for Development Policy Analysis: Lessons Learned and Challenges Ahead. *Economic Systems Research*, 15(2), pp.161-183. DOI: https://doi.org/10.1080/09535310320000091153

Serck-Hanssen, J. (1962). Input-output tables in the U.S.S.R. and Eastern Europe. *Economic Change and Restructuring*, 2(1), pp. 65-72. DOI: https://doi.org/10.1007/BF02506039

Shapiro, T.H. (1977). Macroeconometric Models of the Soviet Union and Eastern European Economies: A Tabular Survey. *Econometrica*, 45(8), pp. 1747-1766. DOI: https://doi.org/10.2307/1914108

Shishido, S., Nobukuni, M., Kawamura, K., Akita, T., & Furukawa, S. (2000). An International Comparison of Leontief Input-Output Coefficients and its Application to Structural Growth Patterns. *Economic Systems Research*, 12(1), pp. 45-64. DOI: https://doi.org/10.1080/095353100111272

Smith, P., & Morrison, W.I. (1974). Simulating the urban economy: experiments with Input-output techniques. London: Pion Limited.

Soklis, G., (2013). The Conversion of Supply and Use Tables to Symmetric Input-Output Tables: A Critical Review. Munich Personal RePEc Archive (MPRA), Paper No.46873: posted 11. Retrieved from: https://mpra.ub.uni-muenchen.de/46873/1/MPRA_paper_46873.pdf

Sonis, M. and Hewings, D.J.G. (2007). On the Sraffa-Leontief Model. *Review of Regional Studies*,37(1), pp. 39-63. DOI: https://doi.org/10.52324/001c.8287

Sraffa, P., (1963). Production of Commodities by Means of Commodities: Prelude to a Critique of Economic Theory. Vora and Co, Publishers Pvt. Ltd. (1st ed.: 1960). Retrieved from: https://www.nuevatribuna.es/media/nuevatribuna/files/2013/04/15/production_of_commodities_by_means_of_commodities.pdf

Staller, J.G. (1965). The Soviet Input-Output Table and Measures of Growth: Industrial Weights. *Soviet Studies*, 16(4), pp.422-431. http://www.jstor.org/stable/149896

Taylor, E.E., (2010). Technical Guidelines for Evaluating the Impacts of Tourism Using Simulation Models: Impact Evaluation Guidelines. Inter-American Development Bank: Technical Notes, No.IDB-TN-229. Retrieved from: https://publications.iadb.

org/en/technical-guidelines-evaluating-impacts-tourism-using-simulation-models

Tesfatsion, L., (2006). Agent-based Computational Economics: A Constructive Approach to Economic Theory. In Tesfatsion, L. and Judd, K.L. (Eds.), Handbook of Computational Economics, Agent-Based Computational Economics (vol.2: pp. 831-880). Elsevier. DOI: https://doi.org/10.1016/S1574-0021(05)02016-2

Tretyakova, A. and Birman, I. (1976). Input-Output Analysis in the U.S.S.R. *Soviet Studies*, 28(2), pp. 157-186. DOI: https://doi.org/10.1080/09668137608411056

United Nations, (2018). Handbook on Supply, Use and Input-Output Tables With Extensions and Publications. New York: United Nations Publications. Retrieved from: https://unstats.un.org/unsd/nationalaccount/docs/SUT_IOT_HB_Final_Cover.pdf.

Von Neumann, J., (1945). A Model of General Economic Equilibrium. *The Review of Economic Studies*, 13(1), pp. 1–9. DOI: https://doi.org/10.2307/2296111

Walras, L., (1874). Elements d' Economie Politique Pure (Ou Thoerie de la Richesse Sociale). Imprimerie L. Corbaz and C^{ie} Editeurs. Retrieved from: http://ecocritique.free.fr/walras74.pdf.

Wing, S.I., (2004). Computable General Equilibrium Models and Their Use in Economy-Wide Policy Analysis: Everything You Ever Wanted to Know (But Were Afraid to Ask). MIT Joint Program on the Science and Policy of Global Change, Technical Report No.6. Retrieved from: http://web.mit.edu/globalchange/www/MITJPSPGC_TechNote6.pdf

Yang, C., Dietzenbacher, E., Pei, J., Chen. X., Zhu, K. and Tang, Z. (2015). Processing Trade Biases the Measurement of Vertical Specialization in China. *Economic Systems Research*, 27(1), pp. 60-76. DOI: https://doi.org/10.1080/09535314.2014.955463