
THE PHENOMENON OF CONCENTRATION - DIVERSIFICATION IN CONTEMPORARY GLOBALIZATION

- Theories and stratified coefficients statistics

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Abstract

This paper intends to analyze from the mathematical, statistical and physical point of view the economic process of concentration – diversification specific to the cotemporary globalization, providing a further approach alternative which is more extended, but also correlated on macro, mezzo and microeconomic layers. Its main original aspects related o the equilibrated integrity of the concentration – diversification phenomenon in the contemporary globalization seen as a rigorous contradictory and progressive phenomenon, from the company’s level, at the regional, national and worldwide level, valorizing the theory of nodes and antinodes from physics or the theory of classic standing waves. The initial part of the paper uses one of the basic principles of the Renaissance, connected to the pictorial perspectives, principle initially formulated by Leonardo da Vinci, and its content briefly presents both the classic static theory of the measurement, and the theory of standing waves, in order to identify a permanent balance solution in the analysis of the concentration – diversification phenomena from the economy. Several final remarks related to the further development directions of these original ideas conclude in a symmetrical manner the article and they open at the same time new approach perspectives in a relativist or quantum manner.

Key words: Concentration and diversification, theory of standing waves, Hirschmann concentration – diversification coefficient, Gini-Struck, stratified or in-depth static coefficients (correlated).

A basic principle of the perspective from the pictorial and sculptural art, principle initially formulated by Leonardo da Vinci, balanced the nature and accommodated the painter’s or sculptor’s eye, being exemplified through the diameter of a tree’s crown, and if all of its branches could be concentrated or pressed, they should identify themselves with the diameter of the crown

and vice – versa, but within the balance conditions which allowed the inner circulation within the tree of its vegetative life. The same thing seems to dominate the current economic life, with globalization tendencies in its trunk, balanced by the diversification tendencies from the crown's layers.

While the university and academic society has permanently awarded prizes for the perfectionists, the actual economy frequently rewarded everyone who led the things to an adequate end, respectively who closed the cycle, providing the manufactures with raw materials and new technologies, bringing their products and services on the market and thus leading to the satisfaction of the demand through final consumption. Throughout time, phenomenon of incentives and rewards generated national and transnational corporations, and the layers of the economic tissue, seen as local, regional, national and global structural and energetic networks, acquired increasingly interesting trends, similar to certain physical phenomena from the theory of standing waves, being in a continuous interlayer contradictory structural dynamics, but also deeply balanced as an apparently inevitable permanent trend.

The classic static hypothesis of the analysis of concentration – diversification extracts, within a series of chronological data series of moments, structures of the local, regional, national and global economies, to which it assigns specific structural energies (g_i^2) and carefully quantified them, tracing their evolution throughout time. First of all, the local, regional, national and global economies can be investigated as balance conditions of the two major flows, the micro or macroeconomically materialized demand, as well as the offer realized at the company's level or aggregated at the regional, national or global level, with the support of the regional, national corporation, and especially of the international corporation, flows which are compensated throughout time, resulting in the formation of a specific balance price, which stratifies all these markets and structures them, permanently eliminating the economically inefficient company or corporation. The diversification phenomena shape the requirements of the demand flow, and the concentration ones become desiderates of the offer, and the statistical evaluation of these concentrations and diversification phenomena highlights the structural changes, thresholds or limits, through a broad instrumental range, from the Gini index, whose applications continuously improved throughout the last hundred years, the result of this process through territorial evaluation forms of concentration and specialization, through shapes with more explicit delimitation purpose, respectively with the support of the Gini-Struck or Gini-Struck coefficients registered in the ABC curve (Săvoiu et al., 2010). The multiple interventions on one and the same statistical concentration instrument generated increasingly dedicated specializations through destination and construction, through the

detailing degree of the analyses extending the population of these statistical measurement instruments. The analysis of the concentration – diversification phenomena also multiplied the statistical methods and instruments, particularizing the approaches, but thus generating the necessity of a detailed methodological and instrumental knowledge and their careful selection, as limits, hierarchically, structurally, as compensation and impact degree.

In order to evaluate the structural limits and to find out the impact of the structural modifications, the Hirschman, Gini – Struck index was used, and additionally their values were circumscribed to the ABC curve, to allow the identification of certain concentration and diversification limits on the international markets, thus creating a new statistical instrument. The determination of the Hirschman index can be performed by two methods (classic and simplified):

$$H = \frac{m}{m-100} - \frac{100}{m-100} \times \sqrt{\sum_{i=1}^n g_i^2} \quad (1)$$

$$H = \sqrt{\sum_{i=1}^n g_i^2}, \text{ unde } m = \frac{100}{\sqrt{n}} \quad (2)$$

and it highlights the lowest level of concentration “n” and it defines the number of structures generated by destinations, sources, products, etc. and “g_i” represents the overall weight of the destination, product “i”. The Gini index was improved by Stuck R. in view of rigorously stabilizing its belonging and thus it became the Gini-Struck through a transformation of the inferior instable limit into a constant limit, which determined its field of values $\left[\frac{1}{\sqrt{n}}; 1 \right]$ to become. [0,1]. The identification of certain concentration

and diversification limits was initially performed by us and published in the pages of these magazine (Săvoiu *at al.*, 2010), and subsequently in TIBE 2012 (Săvoiu & Dinu, 2012), valorizing structures and theory of the ABC curve in order to provide restrictions of limit values:

**Evaluations with delimitation character of concentration –
diversification within the ABC curve**

Table no. 1.

Structure	Weight (g_i) on the market		Excessively diversified market		Excessively concentrated market	
	diversified	concentrated	g_i (%)	$(g_i)^2$	g_i (%)	$(g_i)^2$
A	0.60	0.334	60.0	0.3600	33.34	0.1111
B	0.25	0.333	25.0	0.0625	33.33	0.1111
C	0.15	0.333	15.0	0.0225	33.33	0.1111
Total	1.00	1.000	100.0	0.4450	100.00	0.3333

starting from the Hirschman coefficient in the formula ($H = \sqrt{\sum_{i=1}^n g_i^2}$)

and from the relation which became classic for the calculation of the Gini –

$$\text{Struck coefficient (G-S)} = \sqrt{\frac{n \sum_{i=1}^n g_i^2 - 1}{n - 1}}$$

**Typologies or micro and macroeconomic markets, relativized
and structured according to the ABC curve (following the analysis of the
concentration – diversification phenomena)**

Table no. 2.

Index limits	Concentrated markets	Diversified markets
Hirschman Coefficient (n = 3)	0.212	0
Simplified Hirschman Coefficient	0.667	0.577
Gini-Struck Coefficient	0.409	0

The result of this methodical improvement attempt represents a statistical instrument with signaling role or structural threshold of concentrations and diversifications (specializations). Another trend of statistical instrument is to identify the main source or destination, respectively concentration or diversification factor, executed in 1995, through the new calculation methodology proposed by the Damien Neven index, determined through the calculation relation which subsequently became classic for World Bank Institute:

$$\text{RCAI} = \left(\frac{X_i}{\sum X_i} - \frac{M_i}{\sum M_i} \right) \quad (3)$$

where i represents the structures generated by destinations, sources, products, etc. and whose concrete determinations are introduced based on their value within the theoretical range (-1,1), with a much narrower empirical range (-0.1, 0.1).

Following this brief presentation of the approach, investigation and understanding area of the contemporary economic phenomenon represented by the concentration – diversification and of the statistical measurement instruments, it is necessary to conduct both a redefinition of the globalizing and structuring context of the world economy (upwards delimitating the local company, the regional corporation, the national corporation and the transnational or international corporation, each individual entity generating a specific layer to analyze the concentration of diversification) and a more particular analysis of the results of a research conducted by the Swiss Federal Institute of Technology in Zurich following the processing of a data base of 37 million worldwide companies and investors, as well as of all 43.060 transnational corporations existing at the reference moment (Vitali, Glattfelder and Battiston, 2011), taking into account also their property share reuniting and customizing them at the same time.

These two correlated aspects allowed the elaboration of a hypothesis which also determined the current article and we hope that it would subsequently generate, at its turn, many other hypotheses, according to the concentration – diversification balance, described below.

The five major features of the contemporary globalization reunite in this concept the internationalization (initiated in the trade and finalized in the politics, etc.), the liberalization (generating an opened economic world through the modification of the restrictions imposed to the government in the interstate dynamics of economies), the universalization (resulted from the process of fast innovation and technological change), the modernization, (through the extension of the social structures of the capitalist world, etc.), the deterioration of the world (consequence of a new reality where the spaces tends not to include distances and borders anymore). Nowadays, the globalization became an “inexorable integration of the markets, states – nations and technologies at a level which has not been reached before, in a manner which capacitates the individuals, corporations and nations – states to perform the extension of free capitalist markets virtually in all the countries of the world, as farthest, fastest, deepest and cheapest possible compared to everything we had up to present”

(Friedman, 1999; Friedman, 2005), but also the most detailed (deep) integration of the world's countries and people... caused by the enormous reduction of the transportation and communication costs and by the bankruptcy of the barriers in front of the flows of goods, services, knowledge and individuals across the borders" (Stiglitz, 2002), considered as a "historical process result of the human innovation and of the technological progress, of the increase of integration of economies across the world, especially through the trade and financial flows (FMI, 2009).

Essentially, the globalization is defined as the most intense economic phenomenon of concentration of the national macroeconomies. However, this also triggers the question regarding the parallel dynamics of two layers (global and national, national and regional, regional and local), and by generalization, of all the structures interpreted and correlated as layers, two by two, in a successive manner.

Returning to the second aspect, respectively the conclusions of the research conducted by the Swiss Federal Institute of Technology in Zurich following the processing of a data base of 37 million worldwide companies and investors, as well as of all 43.060 transnational corporations, they underline a concentration process of network control and revenues from exploitation, or, in other words, a control of the transnational companies on the national companies, of the national companies on the regional companies, as well as of the regional companies on the local companies. Essentially, the research with global cover of the concentration – diversification conducted (Vitali, Glattfelder and Battiston, 2011), underlines the fact that on the first concentration level of the transnational companies there already appear only 147 of such transnational corporations or companies which hold around 40% of the exploitation revenues, but they also generate a second concentration ring or network of 737 corporations which hold around 80%.

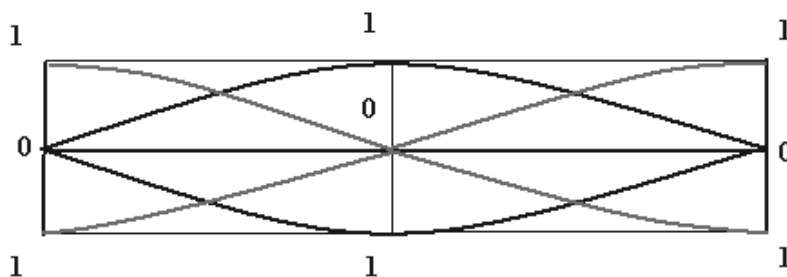
If in physics, in order to identify what determines the mass of a substance, the first element has to be defined as product of acceleration with a closed surface at the macroscopic level, in the same manner, at the economic level, in order to provide actual content to the economic activity aggregated as economy, this also has to be described as product between prices and quantities (turnovers at micro level, becoming JEEP aggregates at the macroeconomic level). Unfortunately, the economic or statistical – mathematical analyses are static, inert and they hold energy quantifiable through an evaluation which valorizes the square of the frequency's dimension (in the two-dimensional system of the physical measures). This research invariably references the theory of standing waves or the theory of nodes and antinodes. In physics, the theory of standing waves defines these waves as including the wave of a photon

(or the transnational corporation from a global economy state) and the wave of an anti-photon (the national corporations belonging to the state called, for example, national economy), which are opposite, but which have exactly the same vibration speed (tendency towards profit on the market). All the atoms from our universe bathe in these standing waves or vacuum's waves. They exercise a pressure on the atom, which sends back through reflex a part of these waves (the two economic layers behave in opposition or contradictorily). Assuming that the atom can only absorb half of the energy of these standing waves, half of the energy absorbing it creates its mass. The pressure difference of the standing waves and the counter-pressure transmitted through the atoms is at the origin of their mass. Practically, the theory of standing waves allows another introspection means in the economy's concentration – diversification phenomenon.

The superposition phenomenon of two or more waves which reach a point of the elastic environment is called interference, which takes place within an interference area, characterized through the existence of certain points which oscillate with different amplitudes. The waves produced on the surface of a liquid at rest two bodies which periodically touch that surface constructively interfere in the maximum amplitude points and destructively interfere in the minimum amplitude points. The interference is stationary in the points from the interference field (the amplitude remains constant throughout time), if the wave sources are coherent (the phase difference maintains itself constant throughout time). The new wave includes antinodes and nodes which do not displace throughout time and it is called standing wave. *The stationary wave can be chosen as a model because it best expresses the overall system stability and its substructures. Physical system is characterized by fundamental vibration and it can be in other vibration modes not compatible with its fundamental state.*

The points with maximum oscillation amplitude are called antinodes and the points with minimum oscillation amplitude are called nodes. The antinodes become concentration maxima and the nodes become concentration minima, implicitly maxima of diversification. The following figure clarifies this formulation, the maximum being 1 and the minimum being 0.

**SIMILITUDE BETWEEN THE ECONOMIC LAYERS
AND THE STANDING WAVES
(maximum = 1; minimum = 0)**



Note: Fundamental sound (personal pulsation) = general trend (global economy) and ω_0 is included in $[0,1]$

Harmonic sound = harmonic 1 and ω is included in $[0,1]$

Fundamental vibration or the self pulsation from physics are completely similar to the general concentration trend from the global economy and $\omega_0^{TM} [0,1]$ is similar to Gini – Struck is also included in $[0,1]$

The processes described in physics through stationary waves allow to determine the T periodicity of the phenomenon (with major impact regarding the retake of certain post crisis or post recession concentration tendencies with a certain periodicity also in economy).

A second similarity is in the calculation procedure, derived from this reality, in which when an economic layer is concentrated, the immediately following layer is diversified. Thus, the Hirschman coefficient in the formula

$(H = \sqrt{\sum_{i=1}^n g_i^2})$ which underlies the more elaborated Gini-Struck coefficient,

coincides in its dispersion logics with the evaluation of the energy of the standing wave $E = k v^2$.

A first careful evaluation indicates that if in the layers of the economy simultaneously and consecutively interpreted (global and national, national and regional, regional and local, etc.) concentration – diversification trend evaluations are conducted, contradictory tendencies will be registered, similar to the standing waves which configure a broader balance of concentration – diversification through the simultaneous aggregation or interpretation of the layers. In the paper, two purely theoretical models are built, in order to clarify these aspects and to formulate a law of balance in concentration – diversification at the level of economic phenomenon (table no. 3 and table no.4).

In a tabular quantification of the concentration – diversification at the level of the layers of the transnational corporations or companies (5 initially and 2 CT-N at the end) and national corporations or companies (2 initially controlled and subsequently 5 CN), the evaluations within structural equidistribution with impossibility of hierarchical system on the market, the situation is theoretically presented with the upwards trend of the concentration from the node towards the antinodes, parallel with the diversification trend from the second layer from the antinodes towards the node:

Concentration – diversification in a market with differentiated structural distribution and with hierarchical system in the first layer and with structural equidistribution in the second layer

Table no.3

Case I 5 CT-N* and 2CN** per CT-N					
CT-Ni	g_i	g_i^2	CNi	g_i	g_i^2
CT-N1	0.01	0.0001	CN1	0.1	0.01
CT-N2	0.10	0.0100	CN2	0.1	0.01
CT-N3	0.20	0.0200	CN3	0.1	0.01
CT-N4	0.30	0.0900	CN4	0.1	0.01
CT-N5	0.39	0.1521	CN5	0.1	0.01
Σ	1.0	0.2722	CN6	0.1	0.01
Simplified Hirschman coefficient = 0,5217			CN7	0.1	0.01
Gini-Struck coefficient = 0,3004			CN8	0.1	0.01
			CN9	0.1	0.01
			CN10	0.1	0.01
			Σ	1.0	0.10
			Simplified Hirschman coefficient = 0,3162		
			Gini-Struck coefficient = 0 (absolute diversification or specialization)		

Note* CT-N = transnational corporation
Note** CN = national corporation

In the reverse situation, equiponderate at the level of the first layer and with weight and hierarchical system changes on the market in the second layer, 2CT-N and 5CN per CT-N, the final data are the following:

**Concentration – diversification in a market with structural
equidistribution in the first layer and with differentiated structural
distribution and hierarchical system in the second layer**

Table no.4

Case II 2 CT-N* and 5CN** per CT-N					
CT-N _i	g_i	g_i^2	CN _i	g_i	g_i^2
CT-N1	0,5	0,25	CN1	0,01	0,0001
			CN2	0,02	0,0004
			CN3	0,03	0,0009
CT-N2	0,5	0,25	CN4	0,04	0,0016
			CN5	0,05	0,0025
			CN6	0,07	0,0049
Σ	1,0	0,50	CN7	0,08	0,0064
Simplified Hirschman coefficient = 0,7071			CN8	0,10	0,0100
Gini-Struck coefficient = 0 (absolute diversification or specialization)			CN9	0,20	0,0400
			CN10	0,40	0,1600
			Σ	1,00	0,2268
Note* CT-N = transnational corporation			Simplified Hirschman coefficient = 0,4762		
Note** CN = national corporation			Gini-Struck coefficient = 0,3754		

The hierarchical systems from the first layer are supported by the standardizations from the second layer and vice – versa, and at the same time the excessive concentrations from the first layer are based on the diversifications from the second layer. A complex law derived from this point for the economic layers (territorial, progressive and even of composition with sense of reunited activities and products, etc.) can be statistically – mathematically formulated either using the Hirschman coefficient

$$\sqrt{\sum_{i=1}^n g_1^2} = k \sqrt{\sum_{i=1}^n g_2^2} \quad (4)$$

or the Gini-Struck coefficient:

$$\sqrt{\frac{n \sum_{i=1}^n g_1^2 - 1}{n-1}} = k \sqrt{\frac{n \sum_{i=1}^n g_2^2 - 1}{n-1}} \quad (5)$$

where k is a specific equilibrium or transfer coefficient from layer to layer, determined by the density in the layer, as well as by other residual variables.

These statistics stratified and correlated factors (in-depth static coefficients) can be mutually determined in each layer (level) by the first layer

provided that one of them to be measured and parameter k is known.

The concentration – diversification law in successive layers (dependent and contradictory) proposed in this article, similar to the concentration – deconcentration from physics, indicates that a concentration in a superior layer generates a diversification in an inferior layer, and the hierarchical structures from a layer are supported by standardizations from the immediately inferior layer.

Conclusions

The remarkable investigation of the Swiss researchers (Vitali, Glattfelder and Battiston, 2011), confirmed by the strength of the results related to concentration – diversification as stratified globalization process, can be used in order to deduce various types of control over the observance of property rights, efficiently exercised by the financial institutions, but it simultaneously confirms new principles or laws of the concentration – diversification in economy.

According to the principles of Leonardo da Vinci, but also to the stratified aspects quantified and theorized in this paper, there is an almost perfect similitude between the theory of standing waves and the concentration – diversification in the layers of the world economy, and the perspectives allow a more nuanced analysis through the valorization of the quantum physics.

The energy is localized in the oscillation antinodes in the theory of standing waves and in the economic theory, it remains in the concentration performed through the transnational companies.

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