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LOW-LEVEL BALANCE: A BIBLIOMETRIC OVERVIEW OF PUBLICATIONS WITH THE HIGHEST IMPACT FACTOR

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Abstract: The objective of the research was to assess the 75-year evolution of studies on low-level equilibrium in specialized magazines. The low-level equilibrium trap is a concept in economics developed by Richard R. Nelson, in which, at low levels of per capita income, people are too poor to save and invest, and this low level of investment results in a lower growth in the economy and national income. When per capita income rises above a certain minimum level, an increasing proportion of income will be saved and invested, which will lead to a higher rate of income growth. The methodology used was exploratory bibliographic research, using the meta-analytical approach. The seven steps of the method were followed and the main journals and authors were identified.

Keywords: Low-Level Equilibrium, Meta-Analytical Approach, Bibliometry, Impact Factor

INTRODUCTION

In a study carried out by Spiller and Savedoff (1999), for some Latin American countries, it was observed that governments tend to set prices below financial equilibrium for the water supply sector. It was noticed that this causes an economic-financial imbalance for public and private companies regarding the offer of their respective services. With this

policy of low prices, companies do not make investments and the revenue is committed to the payment of salaries, making the expansion and quality of services unfeasible. When the system is operated by a public company, investments in the aforementioned sector are subject to budget transfers from the central government, that is, the public company needs assistance to meet the related financial commitments.

According to Spiller and Savedoff (1999) the result is the inefficiency of companies, low quality services and lack of expansion to new consumers. With this inefficient production model and without political support, an “opportunism” is created in which the government keeps prices low, causing a vicious model, generating a “Low Level Equilibrium” (EBN). The objective of the model by Spiller and Savedoff (1999, p. 2) and the studies by Farias, Nogueira and Mueller (2005) is to assess the financial balance of companies providing basic sanitation goods and services, as well as the impacts resulting from this imbalance. During this period, the country experienced water rationing and did not advance in the diffusion of sewage collection and treatment services at the planned speed. As a result, the wages paid to workers in that sector are very low and this can jeopardize the growth of the economy. Therefore, the objective of the present work is to measure and analyze the evolution of studies on low-level balance in the last 75 years in specialized journals.

LITERATURE REVIEW

The low-level equilibrium trap is a concept in economics developed by Richard R. Nelson, in which, at low levels of per capita income, people are too poor to save and invest, and this low level of investment results in an lower growth in the economy and national income. When per capita income rises above a certain minimum level, an increasing proportion

of income will be saved and invested, which will lead to a higher rate of income growth (NELSON, 1956).

In accordance with Nelson (1956), the problems of underdeveloped economies can be understood as a constant equilibrium level of per capita income or close to subsistence requirements. At this low stable equilibrium level, the rate of investment and savings are low. If per capita income is raised above the minimum subsistence level, this will encourage population growth. In Nelson's opinion, there are four conditions that are conducive to a low-level equilibrium trap: 1) A high correlation between the level of per capita income and the rate of population growth; 2) Low propensity to direct additional per capita income to increase per capita investment; 3) Scarcity of uncultivated arable land and 4) Inefficient production methods. It is worth noting that Nelson's hypotheses were designed for 1956, when the "technological" variable was not observed (NELSON, 1956).

According to Nelson (1956), the main causes of population growth in most underdeveloped countries in recent decades have been the reduction in mortality rates due to improvements in public health and in the control of epidemics and endemics, which were not closely related to the previous increase of the *per capita income* level. Therefore, it is essential that governments offer goods and services (basic sanitation) that can help to minimize these diseases caused by lack of basic infrastructure.

According to Rohit Bura (1998) Nelson's theory (1956) has at least 02 (two) problems: First, the theory assumes that an increase in per capita income up to a certain point leads to an increase in the population growth rate by midst of the decline of death. But the decline in the death rate in underdeveloped countries is due more to improvements in public health and medical facilities than to

rising per capita income levels. Second, the functional relationship between the level of per capita income and the growth rate of total income is not as simple as it is theoretically assumed (BURA, [n.d.], [1957?]).

Despite the criticism, Richard R. Nelson publishes in 1960, a study called: "*Growth Models and the Escape from the Low-Level Equilibrium Trap: The Case Of Japan*" in which aggregate growth models are perceived as problematic tools for analyzing economic growth. Thus, if economic growth is defined as an increase in per capita income, these models do not explain growth. As long as the parameters remain fixed, they impede growth. One can deduce an equilibrium rate of growth of national income and an equilibrium level of per capita income. While these models explain growth in total national income, growth in per capita income can only be explained as movements towards a new and greater equilibrium resulting from changes in the model's parameters. They can explain an "escape from the low-level equilibrium trap," and "self-sustaining growth" (NELSON, 1960).

For Strand (2012), he understands that the heterogeneity of public utilities is common in developing countries. In a "high-level" equilibrium, the quality of utility services (eg sanitation) is high, and as a result the consumer's willingness to pay for services is high, the utility is well financed and a well-paid staff to induce a High-quality performance. In a "low-level" equilibrium, the opposite occurs. Thus, the quality of the concessionaire's service delivery and the public's perception of service quality may indicate the existence of the Low-Level Balance.

According to Strand (2012) his model is related to several strands of the literature, however, no analysis is satisfactory and directly comparable with multiple equilibria in the existing infrastructure delivery

markets today. The mechanisms of “lock-in”, namely an inadequate level of funds to free the economy from the trap (in Nelson for investment; here to reward the concessionaire for the effort), are similar in the Strand model of 2012 and Nelson of 1956. literature deals with centralization versus decentralization of public utilities. Studies carried out in Latin American countries, to verify the existence of low-level equilibrium, showed, to a greater or lesser degree, the presence of a centralized management model, generating water supply systems with EBN characteristics. Walker et al. (1999) verified this circumstance in Honduras; Tamayo et al. (1999), in the Peruvian country; Ozuna and Gomez (1999), in the Mexico model; Morandé and Doña (1999), in the Chilean companies; and Artana; Navajas and Urbiztondo (1999), in the case of Argentina. Thus, in accordance with Spiller and Savedoff (1999), it was observed that governments tend to set prices below the financial balance for the water supply sector, causing an economic-financial imbalance for public when the system is operated by a public company, investments in the sector are conditioned to budget transfers from the central government (SPILLER; SAVEDOFF, 1999). Due to these policies and the lack of credibility, private companies do not make investments in the water supply sector. Private companies maximize profit and minimize risk. And if there are private companies in the sector, the policy of low prices, leads to the reduction of losses, costs and investments necessary for the maintenance and provision of services. Thus, this model causes the sector to maintain a Low Level Equilibrium with little possibility of change (FARIAS, NOGUEIRA and MUELLER, 2005).

Low-Level Equilibrium has high social costs and deserves priority on the government's agenda in order not to remain in this model. They also observe that the

lack of political support causes governments to keep prices low (FARIAS, NOGUEIRA and MUELLER, 2005). When analyzing this option of governments to use the EBN, Spiller and Savedoff (1999) question some of the solutions by identifying possible flaws. The main flaws identified are: first, the fact that a price increase, without defined rules, is not an efficient response; second, another solution that is not successful is the implementation of a new management model in public operators based on performance contracts. With these contracts, the government encourages the operator by offering a part of the profit increased by the good performance; a third solution is to promote contracts of the type: B.O.T.s – *Build, Operate and Transfer*, which is a form of project finance, in which a private entity receives a concession from the public or private sector to finance, design, build, own and operate a facility stated in the concession agreement. Thus, it is observed that the proposed solutions are insufficient to change the Evidence of Low-Level Equilibrium (SPILLER; SAVEDOFF, 1999).

For Spiller and Savedoff (1999, p. 20), the ideal would be to have a model in which the government's discretionary power is limited in determining prices, requiring the company to have financial and managerial autonomy based on three demonstrated mechanisms: i) important restrictions must be clearly included in the contract; ii) limitations on the possibility of contract amendments; and iii) and that there are control institutions to monitor the execution of the contract.

Faria, Faria and Mota (2003) present a study to understand the issue of sanitation services in Brazil, with good service indicators, if they are sustainable in the long term. To understand this theme, the authors used the Low-Level Equilibrium Theory (NBS) by Spiller and Savedoff (1999). Based on this theory and with some

initial conditions that do not limit political intervention in the sanitation companies, a “political opportunism” is generated with prices below the cost of services, causing several undesirable results and that repeat the vicious cycle of low performance of services. According to EBN’s hypotheses, companies with adequate service rates are not exempt from presenting low-level equilibrium indicators. In this sense - Faria, Nogueira and Mueller (2005) carried out a case study of the Basic Sanitation Company of the Federal District.

Considering the hypotheses of the Low Level Equilibrium Theory, the study can be reflected for other companies that work in an institutionally similar way with the absence of direct or indirect political support. In the first case, the government does not achieve or delays the economic-financial balance, reducing the company’s cash flow, causing the reallocation of public resources for the maintenance of services. In the second case, readjustments occur, but with the absence of direct political support, contrary manifestations occur and generate a deterioration of very representative political capital (FARIA, FARIA, MOTA, op. cit.).

Corroborating the Low-Level Equilibrium Theory, Faria, Nogueira and Mueller (2005) present an article examining the EBN in the follow-up of Brazilian urban sanitation, according to the model of Spiller and Savedoff (1999). Based on the EBN and its premises of opportunism bias of the government, the use of prices below the production costs of the services, the deficiency of investments and the precariousness of the services available to society can be seen. The results presented demonstrate the existence of a Low Level Equilibrium, for Brazil, as in Latin American countries, for the quality of urban water supply and sanitary sewage services.

METHODS

The methodology adopted was the bibliographic research of an exploratory nature through the meta-analytic approach. The meta-analytic approach uses the impact criteria of journals and articles to choose the material to be used. Its objective is to combine reputable databases, in order to present a contribution of valid material. The meta-analytic approach makes it possible to obtain the best authors, articles and journals, and to carry out an analysis of statistical techniques, samples, the most researched lines and the approaches used (MARIANO, GARCIA CRUZ, ARENAS GAITAN, 2011).

According to Ramirez Correa and Garcia Cruz (2005), the meta-analytic approach can be carried out in 4 stages: 1) Determination of base articles for study; 2) Reading articles, exclusion and inclusion of studies; 3) Construction of the database and 4) Analysis and display of results. On the other hand, Mariano, Garcia Cruz and Arenas Gaitan (2011), understand that the study can be expanded in up to 7 stages. In this work, the 7 steps described were adopted as follows: 1) Analysis and presentation of the journals of the discipline, and recognizing the journals most used in the studied context; 2) Select significant journals on the topic, using the ISI impact factor, which is calculated by adding up the citations of articles received in the year in which the impact factor was calculated and dividing this number by the number of articles published in the two years prior to this calculation, Institute for Scientific Information (1998) apud Calazans, Masson and Mariano (2015), and number of citations according to SCImo Journal&Country; 3) Data collection to feed the database - consists of the filter, the keywords of the topic and the publications chosen previously; 4) Analysis of authors and articles – it comprises the calculation of the annual average of articles on the researched

topic, and their citations. Identifying the authors who published the most on the topic; 5) Determination of Theoretical Approaches of Research – it tries to identify the main theoretical approaches on the subject; 6) Analysis of Keywords – it provides important subsidies regarding the development of the theme in question and the lines of research and 7) Study of the relationships of previously selected articles.

ANALYSIS AND PRESENTATION

As it was presented before, we will demonstrate the stages of work with a meta-analytic approach.

Step 1 - Analysis and presentation of the discipline journals

This study was developed using the ISI Web of Science (WoS) platform databases from 1945 to 2020, accessed on 11/30/2020, using the descriptor “low level equilibrium”, based on the 452 journals in the WoS platform’s main collection. According to Garcia; Ramirez, (2004) apud Calazans; Paldês and Mariano, (2015) the ISI Web of Science is designated worldwide as one of the most excellent and complete databases in the world (INSTITUTE FOR SCIENTIFIC INFORMATION, 1998) apud (MARIANO;

GARCIA CRUZ; ARENAS GAITAN, op. cit.) . The study searched the journals related to the main congresses and meetings related to the research keyword theme. The base of the ISI Journal Citation Report Edition presented 452 journals, considering the domain related to the topic.

Step 2 - Selection of relevant journals of the discipline

Journals were selected according to the ISI (Institute for Scientific Information) impact factor. From this base, the journals with the highest impact factor presented in table 1 were selected.

Step 3 - Data collection to feed the database

Once the journals with the highest impact factor and/or citations were identified, a search for “low level equilibrium” was carried out over a period of seventy-five years (1945-2020). The result in the consulted journals was 34 articles in the Web of Science on the topic. Table 2. Presents the Journals that were most cited on this topic. It is worth noting that of the 34 articles, only 24 received 01 (one) or more citations.

Magazine	Impact factor
ENERGY & ENVIRONMENTAL SCIENCE	30.289
NATURE CLIMATE CHANGE	20.893
NATURE SUSTAINABILITY	12.080
GLOBAL ENVIRONMENTAL CHANGE-HUMAN AND POLICY DIMENSIONS	10.466
FRONTIERS IN ECOLOGY AND THE ENVIRONMENT	9.295
WATER RESEARCH	9.130
REMOTE SENSING OF ENVIRONMENT	9.085
JOURNAL OF HAZARDOUS MATERIALS	9.038
ENERGY POLICY	5.042
APPLIED CATALYSIS A-GENERAL	5.006

Table 1. Journals with the highest impact factor (above 5.0)

Source: Web of Science (2020) - Own elaboration

Magazines	Citations
AMERICAN ECONOMIC REVIEW	184
BRITISH JOURNAL OF POLITICAL SCIENCE	141
JOURNAL OF ECONOMIC GROWTH	104
INTEGRATIVE AND COMPARATIVE BIOLOGY	94
ARCHIVES OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY	76
WATER RESOURCES RESEARCH	40
SOIL & TILLAGE RESEARCH	28
JOURNAL OF MACROECONOMICS	11
EUROPEAN ECONOMIC REVIEW	10

Table 2. Most cited journals (over 10)

Source: Web of Science (2020) - Own elaboration

Articles	Authors	Citations	Year
A THEORY OF THE LOW-LEVEL EQUILIBRIUM TRAP IN UNDERDEVELOPED ECONOMIES	NELSON, RR	184	1956
DEMOCRATIZATION BACKWARDS: THE PROBLEM OF THIRD-WAVE DEMOCRACIES	ROSE, R; SHIN, DC	141	2001
CONTINUOUS SURVEILLANCE OF ORGANOCHLORINE COMPOUNDS IN HUMAN BREAST MILK FROM 1972 TO 1998 IN OSAKA, JAPAN	KONISHI, Y; KUWABARA, K; HORI, S	76	2001

Table 3. Authors with most cited articles/year

Source: Web of Science (2020) - Own elaboration

Regarding the number of publications and citations, per year, referring to the theme, we observed that the first record was in 1956 and 1960, with a gap without publications and citations until 2003. However, it was possible to find literature on the theme “low level equilibrium”, in the years 1999, 2003, 2004 and 2005.

Step 4 - Analysis of authors and articles

The authors, who have the most cited articles, are shown in Table 3. It is possible to infer from this information that, over the period from 1945 to 2020, there was an oscillation in the number of authors versus citations, and it is not possible to project a

trend as to how much to the theme.

In Graph 1, we can see that from 1956 to 2009, there were several oscillations regarding the citations related to the theme. In 2010, we noticed a downward trend in the number of citations dealing with the keywords “low level equilibrium”, in the entire period studied, 741 citations were counted.



Chart 1. Citations versus Years related to the topic

Source: Web of Science (2020) - Own elaboration

Lines of research	Registers	% of 34
BUSINESS ECONOMICS	13	38.235
ENVIRONMENTAL SCIENCES ECOLOGY	7	20.588
DEVELOPMENT STUDIES	4	11.765
TOXICOLOGY	3	8.824
WATER RESOURCES	2	5.882

Table 6. Lines of research

Source: Web of Science (2020) - Own elaboration

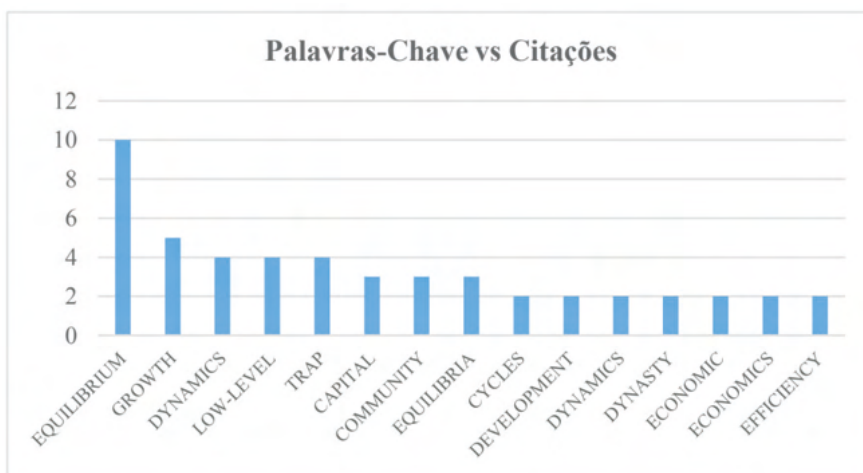


Chart 2. Keywords versus Citations

Source: Web of Science (2020) - Own elaboration

In all, the articles for the period received 697 citations, out of a total of 741 citations from the entire Web of Science database. This corresponds to 94.46% of the citations. Of the 10 authors, only 1 author produced two articles in the selected period. These data allow us to conclude that all these authors have a significant impact factor in the literature on “low level equilibrium”.

Step 5 - Determine Theoretical Lines of Research and Approaches

In Table 6, we present the main lines of research and approaches that addressed the topic of “low level equilibrium”. The Lines of research that most addressed the proposed study were: business economics (13 citations) and environmental sciences ecology, responsible for 7 citations, representing 58.82% of the total Lines of research.

Step 6 - Keyword Analysis

In order to know the direction of new research, objective criteria were used through

a search for keywords. These words reveal specific characteristics of each work, allowing the grouping of studies and classifying them. Graph 2 presents the 15 keywords that received the most citations.

Step 7: Study of Relationships

It is important to investigate which approaches were most discussed, in which places the research has been applied (academic or industry), which sample, among other information. The analysis was performed considering all 17 authors who addressed the topic with their articles. Table 7 presents part of the analysis considering the most cited authors in the period from 1956 to 2020.

CONSIDERATIONS

The purpose of the study was to evaluate the evolution of publications on the topic “Low-Level Equilibrium” in the period from 1945 to 2020, using the meta-analytic approach. The research methodology was

Authors	Articles/year	Focus
NELSON, RR	A theory of the low-level equilibrium trap in underdeveloped economies/1956	The study assesses the problems of underdeveloped economies that can be understood as a constant equilibrium level of per capita income or close to subsistence requirements. At this low stable equilibrium level, the rate of investment and savings are low.
Rose, R; Shin, DC	Democratization backwards: The problem of third-wave democracies/2001	Third-wave democratization countries introduced competitive elections before establishing basic institutions of a modern state, such as the rule of law, civil society institutions, and the accountability of governors. In contrast, countries in the first wave of democratization became modern states before the introduction of universal suffrage. Because they have democratized, unlike these, most third-wave countries are incomplete democracies. Incomplete democracies can develop in three different ways: they can complete democratization; repudiate free elections and turn to an undemocratic alternative; or falling into a low-level equilibrium trap in which elite inadequacies are accompanied by low popular demands and expectations.
Bloom, DE; Canning, D; Sevilla, J	Geography and poverty traps/2003	It tests the view that the vast differences in income levels we see across the world are due to differences in the intrinsic geography of each country compared to the alternative view that poverty traps exist. Rejecting simple geographic determinism in favor of a poverty trap model with high and low level equilibria. The high-level equilibrium state is considered to be the same for all countries, while the low-level equilibrium income and the probability of being in the high-level equilibrium are higher in cold and coastal countries.

Table 7. Lines of research

Source: Web of Science (2020) - Own elaboration

the bibliographic of exploratory specificity, carrying out a review with a meta-analytic approach. The seven steps of this method were used and, initially, we identified and selected the journals with the highest impact factor in the domain studied. The data allowed us to identify that the growth in the number of articles on this subject shows several oscillations during the period observed, with a sign of decline in the first two decades of the 21st century, demonstrating the importance of resuming the theme in the research agendas and/or revisiting the studies already presented for a better understanding, questioning and substantive contributions to the state of the arts.

Regarding the authors and articles, the interest of 7 countries in relation to the proposed theme was verified. The determination of approaches and the analysis

of keywords and relationships allowed us to infer that some articles present the Low-Level Balance theme in other research fields (health, agriculture, labor market, chemistry and others). It was possible to identify that most of the cited articles carry out an empirical evaluation or experimental study regarding the topic.

Applying the seven phases of the meta-analytic approach, it was possible to identify the articles by the most cited authors in the journals with the highest impact factor, which follow the trends of studies on a declining topic. This way, we leave with a suggestion for future work, the resumption of the theme in the research agendas, as we believe in the possibility of improved debate in new studies and/or revisiting and application of the theory in the area of public policies.

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