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# THE IMPACT FACTOR OF HEALTH ON THE ECONOMY USING THE CYCLE OF MONEY

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***Abstract:*** *This paper is about the comparison of the cycle of money with the impact factor of health, and without it. Hence, this thesis is based on the cycle of money and on the impact factor of health. This means that we should have the appropriate health system for the support of the financial market and of the economy. Thus, the impact factor of the health is important as it enforces the economic dynamic of any economy. This is not obvious as there is taxation of factors which are not returned back to the market. Therefore, we extract conclusions about the importance of this impact factor, and for the purposes of the Q.E. method and a real case scenario are used.*

***Keywords:*** *health, the cycle of money, economy, robust*

## 1. Introduction

In this scrutiny using the Q.E. method extracted conclusions, about the behavior of the healthcare system on the economy. For the extraction of these conclusions needed to the one case to use the impact factor of health, and to the other case to avoid it. The health care impact factor is about the administration of the public sector, to the private sector, and the returns of taxes to the market. Additionally there should be mentioned that any other rewarding taxes are excluded from this study to estimate the utility of this factor. The sense of a generator and of multiple axiomatics in a fuzzy logic concept is crucial for this work. Health has a significant impact on the dynamic of the economy as would be shown in the next sections, using a quantification method by the appliance of computational tools and a real case approach. The purpose of the paper is to show the impact of the health on the economy from the point of view of the cycle of money, which is analyzed to the next sections. A real case scenario is also used to reveal the approximation of the Q.E. method about the health impact factor to the economy. The health system is not just a public expenditure about the taxation system, but provides crucial economic feedback to other economic units, empowering the dynamic of the economy. These topics are to be presented in the next section.

## 2. Cost sharing and the Applied Methodology

The contracts and agreements between the participants of control transactions are these which determine the allocation of profits and losses. To the agreements should be

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mentioned the changes which happen to the contracts, about the allocation of the profits and losses. This is the reason why tax authorities should make periodic inspections. The periodic specification of contracts is important for the comparability analysis. (Feinschreiber, 2004) These periodic inspections of the enterprises which participate in controlled transactions[2] are crucial for the arm's length principle. Then, the determination of the cost sharing depends on the periodic check of companies which are tested parties.[3] The purpose of the companies of controlled transactions is to face the issues that are connected with the taxation of their activities. Therefore, the requirements for the companies of controlled transactions with the tax authorities should be in the range of the arm's length principle. Thereupon, the appropriate agreement of the companies of controlled transactions is that which permits the maximization of their profits in tax environments with the low tax rate, and the maximization of costs in economic environments of high tax rates. (OECD, 1991)

Moreover companies of controlled transactions and the same time the inspections of tax authorities are done under the condition of the proportional adjustments.[4] The interpretation of the condition of these proportional adjustments is that the companies which participate in controlled transactions many times don't have the adequate data and the information about the uncontrolled transactions of similar circumstances to make comparisons, and therefore they adjust their data adequately. This means that if the companies which are tested parties conclude that the profits and losses of companies from uncontrolled transactions are much higher or much fewer then they make an adequate analogy to compare them with their data.

The production of goods or services creates profits and costs for the companies.[5] Based on the prior reasoning we have that[6]:

$$u = s(zf + \tilde{z}d) \tag{1}$$

$$\mathrm{z} = |\tilde{\mathrm{z}} - 1| \tag{2}$$

The symbol $u$ is about the impact factor of the comparability analysis which has any method to the $s$.[7] The symbol z is a coefficient which takes values between 0 and 1. The value it could receive is determined by the influence of the method (using the best method rule) to the $s$. The symbol of $f$ is about the cost which comes up from the production of goods, and the symbol of $d$ is about the cost which comes from the

[2] Controlled transactions are considered the transactions where the companies administrate their cost sharing and their profits to achieve higher profits and utility for them.

[3] As tested parties considered the companies which participate in control transactions.

[4] Sections II and III become from the analysis of paper "Challoumis, Constantinos, The Theory of Cycle of Money (March 25, 2018). SSRN: https://ssrn.com/abstract=/", as they use the same base for their analysis.

[5] See paper: Challoumis, Constantinos, Arm's Length Principle and Fix Length Principle Mathematical Approach (March 23, 2018). Available at SSRN: https://ssrn.com/abstract=

[6] See paper: Challoumis, Constantinos, Analysis of Tangibles and Intangibles Transactions Subject to the Fixed Length Principle (March 17, 2018). Available at SSRN: https://ssrn.com/abstract=3142960

[7] See paper: Challoumis, Constantinos, Analysis of Tangibles and Intangibles Transactions Subject to the Fixed Length Principle (March 17, 2018). Available at SSRN: https://ssrn.com/abstract=3142960

distribution of the goods.[8] According to prior scrutiny is plausible to determine the following equations, which are:

$$u_c = zf + \tilde{z}d \tag{3}$$

and

$$b = (p\text{-}u_c)^* j_1 \tag{4}$$

The symbol of $b$ in the prior equation is about the amount of taxes that should pay the companies of controlled transactions in the application of the arm's length principle. The $u_c$ is the amount of tax obligations that can avoid through the allocations of profits and losses. Moreover, $j_1$ is a coefficient about the rate of taxes. Then, the equation (4) shows the case of the arm's length principle. In addition to the case of fixed length principle we have the next equation:

$$v = p^* j_2 \tag{5}$$

The symbol of $v$ in the previous equation shows the taxes which should pay the enterprises of controlled transactions in the application of the fixed length principle. Then, $j_2$ is a coefficient for the rate of taxes to the case of the fixed length principle. Thereupon, according to the prior theory we conclude that:

$$\mathbf{v} \geq \mathbf{b} \tag{6}$$

The tax for the companies which participate in controlled transactions of transfer pricing in the case of fixed length principle is higher or at least equal to that of the case of the arm's length principle.

Thus, with the fixed length principle the enterprises of controlled transactions are able to tackle issues which come from the allocation of profits and losses. Thence, the tax authorities are able to face the transfer pricing effects to the global tax revenue. The fixed length allows the recovery of tax losses of the global tax revenue from the controlled transactions of the transfer pricing. In the next figure we see the procedure that companies of controlled transactions follow for their allocations of profits and losses, the proportional adjustments of data, and the fixed length principle. Therefore, we have that:

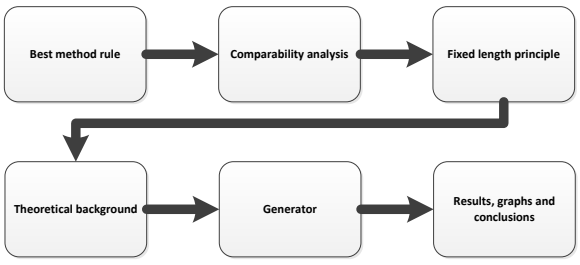



Fig. 1. *Cost sharing and application of fixed length principle*

[8] See paper*: Challoumis, Constantinos, Impact Factor of Health to the Cycle of Money* (April 3, 2018). Available at SSRN: https://ssrn.com/abstract=3155246 or http://dx.doi.org/10.2139/ssrn.3155246

Figure 1 shows the procedure of the fixed length principle and its quantity analysis for the determination of the behaviour of the model. The next section deals with the theory of cycle of money. Moreover, the methodology which followed stands on the Q.E. method, and presented below.

## 3. The Methodology of Axiomatics and the Q.E. Method[9]

The axiomatics stands on the assumption that we don't know the result of one hypothesis. This is the key to the scrutiny of an economic theory which is under examination. The hypothesis of an economic theory is the basis for the further study of each economic model that is under examination. Therefore, the axiomatics is trying to answer to the background of an economic analysis and to confirm that the initial hypothesis of the model is satisfied. If the hypothesis is fine then the model is consistent with the principles of the model which are under examination (Meier et. al., 2000). There are two cases for the results of the axiomatics. According to the first case, the axiomatics is satisfied, because the hypothesis of the model after the examination of the model is adequate. The second case is about the incident that the axiomatics is not satisfied, because the initial hypothesis of the model is not adequate. Therefore, in this case, we conclude that the economic model is not sufficient. Then, the main concept of axiomatics stands on the correspondence of the initial hypothesis with the mathematical and economic result of the scrutiny, inasmuch as it is plausible for the scientist to clarify the theory about the chosen model (Boland 1991).

The concept of the Q.E. theory is based on a methodology which stands on the determination of mathematic equations subject to conditions which also considered. One more important thing is the determination of the upper and the lower limit of the values of the independent variables. Forasmuch as, the dependent variable represents the behaviour of a selected model, pending on a generator which produces random values to all the independent variables to configure the interaction between them and their behaviour under different conditions. At least the basic study includes two facets which are:

- The analysis of the behaviour of the model which stands on the scrutiny of the structural characteristics of each model accordingly allowing with that way the extraction of general conclusions about the model which is under examination.
- The frequency analysis behaviour scrutinizes the behaviour of the dependent variables, but from the view of the number of appearances of a variable than another, estimating basically the impact that one independent variable has with one or more independent variables.[10]

The dependent variables are these which are modified for the generator. Thereupon, the generator produces values for the dependent variables. The extracted values of the generator allow the creation of magnitudes, which are the base for comparisons, and for

[9] *See the paper: Challoumis, Constantinos, Multiple Axiomatics Method Through the Q.E. Methodology (July 31, 2018). Available at SSRN: https://ssrn.com/abstract=3223642*

[10] See the paper*: Challoumis, Constantinos, Analysis of Axiomatic Methods in Economics (April 24, 2018). Available at SSRN: https://ssrn.com/abstract=3168087 or http://dx.doi.org/10.2139/ssrn.3168087*

the analysis of mathematical equations. With that way is plausible to quantify quality data and theoretical terms. Moreover, according to this methodology, the created magnitudes allow proceeding furthermore to econometrical analyses. In general it is a methodology for quantification of quality data. Thus, using the Quantification of Everything (Q.E.) methodology is plausible to clarify the behaviour of any model and to determine its standalone behaviour, or its comparative behaviour, between different models. Therefore, this methodology as index permits the study of the following issues:

- The possibility of the scrutiny and the examination of theoretical themes, from a qualitative analysis to quantitative analysis.[11]
- The creation of magnitudes can be used for any other analysis using that data as an axis for further estimations with different scientific tools, and sciences.
- The created magnitudes allow an econometric analysis.
- These units are "virtual units" if they are not determined. The term "virtual units" means that are used only for the purpose of each study and for comparability analysis.
- This methodology of the transformation of quality data into quantitative data allows a completely different approach of theoretical studies, as it permits the mathematical determination of terminologies, and the study of them in a different scientific field.

Hence, the Q.E. methodology follows four basic steps. These steps are described below:

- The first step is about the hypothesis. This point presents the purpose of the analysis of each study. Thus, the mathematical determination is the main point of this step.
- The second step is about the generator, which produces the values for the independent variable. This procedure takes into account the upper and the lower limit, which are used for the production of values through randomization. This technique allows the formation of the quality data into a quantified form. Thence, after a crucial number of irritations it is plausible to sketch the appropriate mathematical equation. This illustrates the behaviour of the equation which is under study. Therefore, the procedure needs at least two mathematical equations, with a lack of some variables, or more variables to the existing equation to understand how the equation reacts in different forms.
- The third step gives the conclusions, and through a feedback with the hypothesis, it is plausible to confirm an existing theory, or to submit a new scientific view.
- The feedback is the fourth step as it permits the repetitions and the appropriate adjustment of the model (Challoumis, 2018).

Then, based on that methodology, we are able to identify the behaviour of the model.

[11] *Challoumis, Constantinos, Quantification of Everything (A Methodology for Quantification of Quality Data with Application and to Social and Theoretical Sciences) (November 12, 2017). Available at SSRN: https://ssrn.com/abstract=3136014 or http://dx.doi.org/10.2139/ssrn.3136014*

**4. The Cycle of Money and the Ideal Case of the Cycle of Money**

The tax revenues correspond to the savings that the companies could have if the taxes were avoided. The way that these savings are administrated is different from case to case. Then the benefits of the companies could be managed in a completely different way, as could be saved or could be taxed. The theory of the cycle of money shows when the savings robust the economy and when the taxes robust the economy. It is crucial for this determination to be a separation of savings into the non-returned savings (or escaped savings) and into the returned savings (or enforcement savings). For the scope of this analysis below are demonstrated the equations which are:

$$\alpha = \alpha_s + \alpha_t, \text{ or, } \frac{1}{v} + \alpha_t \tag{7}$$

$$x_m = m - a \tag{8}$$

$$m = \mu + \alpha_p \tag{9}$$

$$\mu = \sum_{i=0}^{n} \mu_i \tag{10}$$

$$\alpha_p = \sum_{j=0}^{m} \alpha_{pj} \tag{11}$$

$$c_m = \frac{dx_m}{da} \tag{12}$$

$$c_\alpha = \frac{dx_m}{dm} \tag{13}$$

$$c_y = c_m - c_\alpha \tag{14}$$

The variable of α has symbolized the case of the escaped savings. This means that we have savings which are not returned back to the economy or come back after a long-term period. The variable of $\alpha_s$ symbolizes the case that we have escaped savings which come from transfer pricing activities. The variable of $\alpha_t$ is symbolizes the case that we have escaped savings not from transfer pricing activities but from any other commercial activity. For instance $\alpha_t$ could refer to the commercial activities which come from the uncontrolled transactions. (Challoumis, 1998) The variable of $m$ symbolizes the financial liquidity in an economy. The variable of $\mu$ symbolizes the consumption in an economy. The variable of $\alpha_p$ symbolizes the enforcement savings, which come from the citizens and from small and medium sized enterprises. The variable of $x_m$ symbolizes the condition of financial liquidity in an economy. The variable of $c_m$ symbolizes the velocity of financial liquidity increases or decreases. The variable of $c_\alpha$ symbolizes the velocity of escaped savings. Therefore, the variable of $c_y$ symbolizes the term of the cycle of money. Thereupon, the cycle of money shows the level of the dynamic of an economy, and its robustness.

Then, we have the following basic principles about the cycle of money:

- The citizens, the small and the middle sized enterprises substitute the services and the property of the companies which save their money and not invest them or consume it proportionally in the economy. Thereupon, the companies of the controlled transactions are the main cause for the escape savings.
- The escaped savings are responsible for the decline of the economic dynamic of the economy. The key point of escape savings is that the companies of controlled transactions of transfer pricing are responsible for not re-entering these amounts of money in the market. This situation causes a lack of financial liquidity in an economy.
- The substitution of controlled transactions is not substituted from the citizens and from the small and middle size companies when it is not plausible to offer the same added value to the products and services. This case happens especially in the instance of factories, in research centres etc. Therefore, these cases in the appropriate tax policy should be taxed as uncontrolled transactions independently if they participate in controlled transactions (using the fixed length principle).
- The enforcement savings are responsible for the high economic dynamic of the economy. Therefore, the investments and the consumption are these elements which come from the savings of the citizens and the small and the middle size companies.
- The velocity of financial liquidity shows how rapidly the economy robustness grows or declines accordingly. Then is an index for how well structured is any economy.
- The velocity of escaped savings shows how rapidly the non-return savings are lost from the market, or by the lack of investments, or by the lack of consumption.
- The cycle of money represents the condition of the economy. More precisely it shows the level of the well-structured tax system and in general the dynamic of the economy. If this indicator is high then the economy could have high robustness, or otherwise low financial liquidity.
- As controlled transactions in the theory of cycle of money are considered not only the cases of transfer pricing but any kind of administration of profits and losses to avoid taxation.
- As uncontrolled transactions in the theory of cycle of money are the cases of commercial activity of citizens, the small and medium-sized enterprises, the factories, the research centres, and any kind of commercial activity that cannot be substituted by the companies of controlled transactions.
- The fixed length principle tackles issues subjects like the case cycle of money. But, this doesn't mean that restrictive should apply the fixed length principle as the cycle of money is a wide theory which exceeds the transfer pricing scope.

Therefrom, we obtain that the cycle of money grows when there is a tax system like the case of fixed length principle which permits the low taxation of the uncontrolled transactions and the higher taxation of controlled transactions. Should be mentioned that to the uncontrolled transactions are considered the same factors which have been used to the cases of the financial liquidity of citizens and of the small, and middle size companies. Moreover, there are three basic impact factors of the rewarding taxes. The rewarding taxes are the only taxes which have an immediate and important role in the market of any economy. These factors are affiliated with the education, with the health

system of each society, and with the rest relevant structural economic factors of the prior two impact factors. This theme is illustrated in the next scheme:

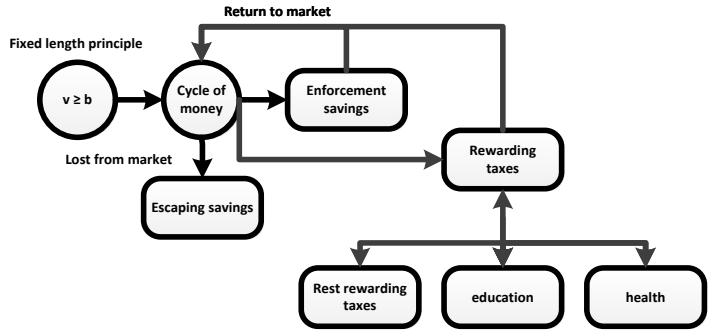



Fig. 2. *The cycle of money with rewarding taxes*

In the previous figure, we have the case that in the tax system are included all the tax factors and with all the rewarding tax factors. In this study we used only one impact:

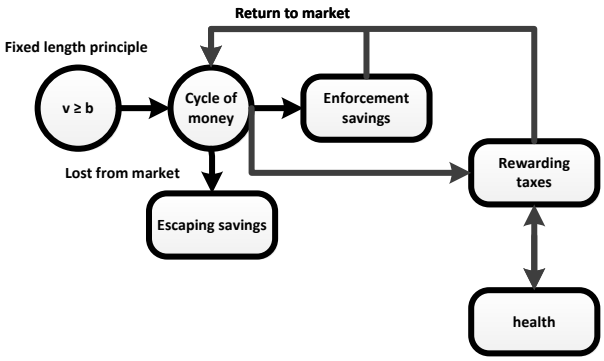



Fig. 3. *The cycle of money only with the impact factor of health*

We see from the previous figure that we have the case of only one impact factor, which is about health. Therefore, it is able to proceed to a mathematical and quantitative analysis of the cycle of money in the case of rewarding taxes.

## 5. Definition and Mathematical Approach of the Cycle of Money with and without the Impact Factor of Health

For the purposes of the mathematical approach of the cycle of money we use the prior equations subject to the next conditions which are about rewarding taxes:

$$\alpha_p = \alpha_r + \alpha_n * h_n + \alpha_m * h_m \tag{15}$$

and

$$\alpha_r \geq \alpha_n * h_n \geq \alpha_m * h_m \tag{16}$$

In the prior two equations we used some impact factors, which are the $\alpha_p$ which was also demonstrated in previous equation (11), moreover in these equations have shown the variables of $\alpha_r$, $\alpha_n$, $h_n$, $\alpha_m$ and the $h_m$. The variable $\alpha_r$ symbolizes the impact factor of the rest rewarding taxes. The symbol of $\alpha_n$ is the impact factor of the education and of any technical knowledge. The symbol of $\alpha_m$ is about the impact factor of health and anything relevant and supporting of this issue. The symbol of $h_n$, and of the $h_m$, are the coefficients of the health and the health impact factor accordingly. Therefore, we use the equation from (7) to (16) and the next table for the coefficients of the values of the cycle of money with and without some impact factors of the rewarding taxes. Then, we have that:

*Compiling coefficients* Table 1

| Factors | Values | Values' |
|---|---|---|
| $\alpha_s$ | 0.6 | 0.6 |
| $\alpha_t$ | 0.7 | 0.7 |
| $\mu$ | 0.9 | 0.9 |
| $\alpha_r$ | - | - |
| $\alpha_n * h_n$ | - | - |
| $\alpha_m * h_m$ | 0.2 | - |

We received from the compiling of the generator the following graph, and table:

*Extracted values of the model* Table 2

| Factors | Values (for 1) | Values' (for 421) |
|---|---|---|
| $c_y$ | 0.7 | 8.9 |
| $c_y'$ (without $\alpha_m h_m$) | 0.3 | 7.2 |

The previous table shows the extracted values of the generator for two points, the initial and the final one of the repetitions. Moreover, we have all the values between these points, as shown in figure 4. The same happens to a real case scenario in figure 5 (b). The generator of this procedure used the coefficients which appeared on the previous table. Therefrom, the factors have an upper limit of 1, and a lower limit of 0, but $\mathbf{s}$ and $\tilde{\mathbf{s}}$ are plausible to receive values greater than one as their mathematical structure allow this. After 461 iterations, we extracted the following diagram:

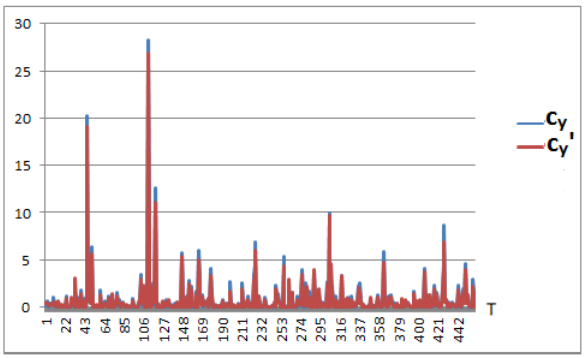



Fig. 4. *Comparison of the cycle of money with and without the impact factor of health*

In the previous scheme, we see that the impact factor of health has an effect on the cycle of money. An economy with the absence of the appropriate health services has a declined cycle of money, showing that the distribution of money is lower than in the case where there is an adequate health system for the citizens. Therefore, this economy would have lower consumption and lower investments. We conclude that the healthcare system follows the cycle of money.

## 6. A Real Case Scenario of the Cycle of Money with and without the Impact Factor of Health

Based on the prior analysis, we proceed to a paradigm about the case of Greece using data from the OECD (2018)[12]. Thence, we proceed to a comparison between two different periods. Then, we have that:

1. Health spending = 2,325 US dollars/capita, for 2017
2. Health spending = 2,895 US dollars/capita for 2008
3. GDP = 27,967 US dollars/capita for 2017
4. GDP = 29,263 US dollars/capita for 2008

Therefore, we have from equations (7) to (16), that:

$$c_m = \frac{dx_m}{da} \cong \text{GDP} \tag{17}$$

$da$ =a, for one period (18)

$dx_m = x_m$, for one period (19)

$$c_\alpha = \frac{dx_m}{dm}, \tag{20}$$

intentionally avoided to that case for the comparison of two periods

$$c_y = c_m \tag{21}$$

As we see from the prior data, and equations we proceed to the following analysis. Then, we have the next table:

*Application of real values to the extracted model* Table 3

| Factors | Values (dollars/capita, for 2008) | Values'(dollars/capita, for 2017) |
|---|---|---|
| $c_m, c_y$ | 29,263 | 27,967 |
| $c_\alpha$ | - | - |
| $\alpha_m * h_m$ | 2,895 | 2,325 (it is 0.2 in the Q.E. approach of table 1) |

[12] See data*: OECD (2018), Health spending (indicator*). DOI 10.1787/8643de7e-en (Accessed on 25 October 2018)

According to the prior table, we have the next graphs. One for the extracted model, which came up from the Q.E. method, and a real application of that:

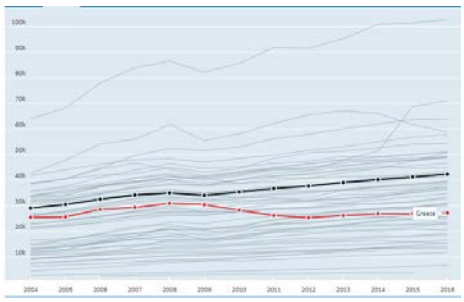
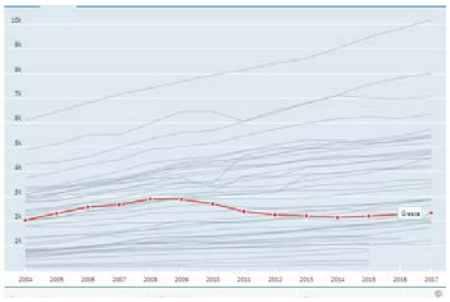
(a)  (b) 

Fig. 5

(a*) GDP diagram of Greece*[13] (b) *Healthcare spending diagram of Greece*[14]

We perceive from the red lines, of GDP of figure 5 (a), and of spending of health care system of figure 5 (b), that the cycle of money as shown to the extracted model of the Q.E. method, by the simulation using the multiple axiomatics principles with fuzzy logic concepts, that the real case scenario complies with the quantification method. As axes points are used for the years of 2008 and of 2017 for the determination of track of the GDP, and of the health care spending. The health spending supports the cycle of the money, as we expected from figure 4. The orientation of GDP complies with the orientation of spending in the healthcare system. Moreover, this work represents the cycle of money as the GDP, considered as more representative of the quantity of money with the savings to be used as constant or omitted. Thereupon, there could be extremely complicated scenarios according to the constraints. We see from figure 4 and figure 5 that the health system supports the cycle of money of each country, as the general quality-quantified method adjusts to the real data under the constraints presented in the previous sections.

## 7. Conclusions

As we expected, an economy with the absence of the appropriate health system has a lower economic dynamic, in contradiction with an economy without this factor. This means that the taxes of this economy return to the market, and the taxation has not a negative effect on the market. An economy without an appropriate health system would have less consumption and the investments of this economy would be declined. Then, an economic system without these taxes will be in a lower dynamic than an economy which has an adequate health system. This means that as most taxes have a bad effect on the economy, the same time the health taxes have a positive effect on the economy, as they return back to the market, for consumption and investments. This is the difference in general between the three rewarding taxes (rest-structural taxes,

[13] See data*: OECD (2018), Gross domestic product (GDP) (indicator). doi: 10.1787/dc2f7aec-en (Accessed on 26 October 2018)*

[14] See data: *OECD (2018), Health spending (indicator). doi: 10.1787/8643de7e-en (Accessed on 26 October 2018)*

education taxes, and health taxes), and the rest of the taxes. This reasoning shows that health taxes help the economy. The health of people is also the health of the economy, as in economic theory the people are the basic economic units and the source of economic development. Forasmuch as the health is returning to the economy through the analysis that is given using the theory of the cycle of money, showing that taxes about the health factor have a positive impact on the economy.

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