

# Tributary Incidence

## The Application of Bayesian Mechanisms to Evaluate the Performance of the Formal Tax Policies Among Different Honduran Productive Sectors

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### Abstract:

The evolution of economics has stated that the importance of the Tributary Incidences derives from its direct impact, over the countries social welfare, who collide with the government's optimal use of the resources gathered through these processes. Across this research, we must be able to answer the interrogation ¿What sector of the Honduran Economy, really undergoes the tributary processes among the formal tax policies, in an efficient manner?

This research aims, to approach an empirical analysis towards the study of the various economic agents in Honduras and their interaction, with the different macroeconomic chains, with the use of a Mathematical perspective (in a cause-effect approach, that shall evaluate the relationship between the present financial crisis and the absence of a proper tax policy code book) such as the Bayesian Forecasting tools, that will theoretically support and evaluate the direct and indirect bonds, among the different organizations that somehow alter the Honduran Economic scenarios.

This phenomenon has raised complex doubts, over a series of questionable events thought the countries macroeconomic context, thereby, combining two common perspectives of Liquidity management, such as the revenues/incoming asset overflows versus expenses.

**Key Words:** Taxes, Forecasting, Tributary System, Value at Risk, Expected Short Fall

### Main Objective of this Study:

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The purpose of this research is to prove over the fundamentals of the Bayesian Forecasting and Dynamic Financial Models, the existence of the progressive Regressiness tributary slope, who can evaluate the deviations held, among the direct tributary policies (define by the tributary codes) and the Excessive tributary policies (held by the loyal contributors, who cancel their taxes in a responsible manner).

### Specific Goals of the Investigation:

- Determine which Sector of the Honduran economy, really fulfills the tax policies requirements, defined in the Honduran Tributary framework.

- Determine the Performance of the Liquidity management patterns obtained by Tributary System, such as the revenues/incoming asset overflows versus expenses, through the use of various Bayesian Analysis Mechanisms.

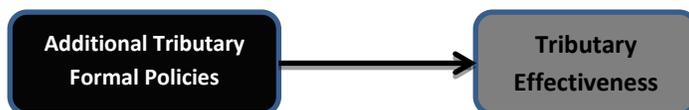
### **The Methodology Applied in this Research:**

This Investigations methodology is based upon a Dynamic Modeling of time series analysis over the Gaussian structure, who embraces the comparison over 2 different environments, one of them, considering the time period before the new taxes application and one after the deployment of the taxes over the different productive sectors of the Honduran economy, with the use of econometric models who evaluate the dynamic transition of monetary equilibrium.

The Categorization of these of financial entities is due over 5 mayor links across the Honduran Monetary Chain:

- The financial agents that are pressured by the legislative chamber dissertations, to transfer the current expenditure to the public.
- The agents who absorb and capture the remittances taxes.
- The Commercial Banking Agents, who capture the appositive tax rates, from the various private sector sources.
- The Civilian contributors, who fulfill their tax payments.
- The several government entities en charge of the Countries Budgeting, treasury and other monetary administrations.

The research, relates to the interpretation of the various financial indicators that evaluate the impact and intensity of the additional tributary formal policies and its performance, in the tax capturing processes, with the use of the GBM tool, in the Bayesian framework, such as Value at Risk (VAR) and Expected Short Fall (ES).



Based upon the model proposed that mediate over the models proposed “Who Pays the Taxes in Honduras”, by RodulioPerdomo and Mauricio Diaz Burdett (Foro Social de DeudaExterna y Desarrollo de Honduras (FOSDEH)), who expanded the Analysis of the Tributary Incidence of Jose Yañez, from the Universidad de Chile (Yañez, 2011).

The approaches for computing the VAR and ES estimates can be divided into 3 groups:

1. Non Parametric Historical Simulation.
2. Fully Parametric Simulation Methods.
3. Methods based upon the Extreme Value Theory.

On this investigation, we are focused on the second group, although some ideas can be useful in the simulation based approaches for the 3<sup>rd</sup> method. Bayesian Forecasting simply takes a subset of unknown quantities to be future values of some variables of interests.

As we may assume, forecasting involves the use of information at hand, hunches, formal models, statistic projections, etc. to generate approximated statements about the likely course of future

events, but, with use of the Bayesian Methods of inference (GBM), the forecasting precision tends to sharpen, particularly with the application of two simple principles.

- Principle of Explicit Formulation: Express all assumptions using formal probability statements, about the joint distribution of events of interest.
- Principle of Relevant Conditioning: Uses the Distribution of future events conditional on observed relevant events and explicit loss function.

From the data stated above and the original main interrogation, we firmly sustain, that the research, condensed in this document, pursues the depiction of the Honduran tributary reality, from an academic view.

### **Tributary Incidence Conceptual Approach**

Before undergoing a profound analysis, over the Statutory and Economic tributary incidence and its impacts, over the Honduran Population, it is of great importance to define the specific traits that support the structure of this term's definition.

For instance, let's consider the following interrogation ¿What do we understand by the term Fiscal Charge? The definitions obtained on the pursuit, of the most suitable answer to this question across the revision of different Public Finance literature, demonstrate that the Fiscal Charges represent the portions of the taxes paid per each market side (Consumers and Producers), determined by the deviations among the:

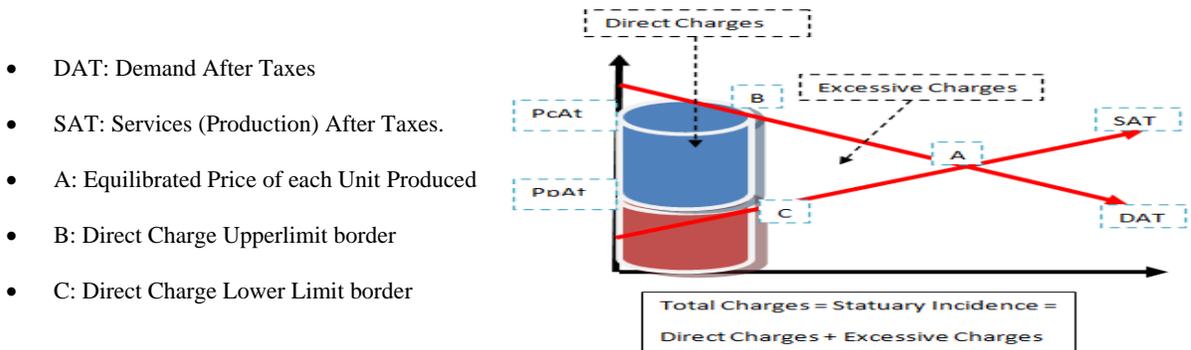
- Equilibrium Price of each unit produced before taxes
- The Price of the Consumers reaction (demands) after taxes.
- The Marginal Price of each unit, determined by the manufacturers after taxes

Several studies developed by Metcalf (2006), Salaine (2003) and Myles (2006), state that the Fiscal Charges can be categorized among two main blocks:

- Direct Tributary Charges.
- Excessive Tributary Charges/ Indirect Charges.

The Direct Charges represent the total taxes claimed by the government's instances, as the Accumulated Tributary Recalls; on the other hand, the Excessive Tributary Charges, are defined as the extra taxes claimed by the government institutions that lower the efficiency rates of the tax collection processes, by either, over taxing the population with inappropriate fiscal requirements + the diminishment of the consumers/producers economic benefits due to the tributary measures imposed, that are not compensated by a suitable administration of these resources + the tributary recall expenses (Figure No 1 Tributary Performance Analysis, based upon the charges on the Production Honduran Rates).

**Figure No 1 Tributary Performance Analysis, based upon the charges on the Production Honduran Rates**



Source: José Enríquez, Centro de Estudios Tributarios, Universidad de Chile, Santiago 2011

In Economics, the term tax incidence refers to the analysis of the effect of a particular tax, and its distribution on a particular economic welfare; in which the tax sequels are said to “fall”, upon a group that ultimately absorbs the tax burdens. The key concept on this topic refers to the autonomy of the variable define as “the tax burden”, but on the other hand, the reliance upon the price elasticity of the demand and the price elasticity of the supply after the tax protocol stimuli application (Yañez, 2011).

This research, aware of the tributary incidence effect over the redistributive properties of the taxes deployed, won’t be approaching the governments administrative procedures of wealth distribution, there for, this analysis, associates a legal scope, as well as an economic holistic perspective, towards these tributary phenomena’s, which derive into two concepts:

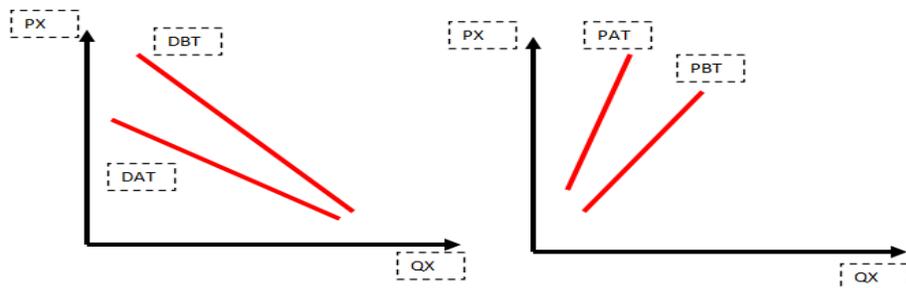
- Statuary Incidence
- Economic Incidence

As previously described on the document, the statutory incidence, is based upon the legal obligations, that each company, consumer or employee undergoes, determining the agents that execute the fiscal recalls, the tributary protocols and processes involved on their execution, the identification of contributors, as well as the legal framework that surrounds the governments financial politics. On the other hand, the economic incidence of a tax, consists on the determination of the Honduran context who dictate the elasticity of the countries market evolution upon the resources gathered through taxation (Fullerton, 1991).

In the practice, only the comparison between the Statutory and the Economic Incidence, determines who really covers the excessive taxes + the direct margins that the Honduran Tributary code describes. On this investigation, the main focus, relies on the Statutory incidence deviation vs. an holistic economic incidence perspective of the Honduran economic scenarios. Since the legal framework by itself isn’t enough to determine who pays the taxes or in what proportion, it is more than evident that the markets background must be fully comprehend (please revise Figure No 2), in order to evaluate if the statutory politics and goals are being accomplish,

thereby, the economic incidence tributary regressiveness must be articulated with the tributary statutory protocols (Canton, 1997).

**Figure No 2 Statutory Incidences over Taxes**



Source: José Enríquez  
 Centro de Estudios Tributarios,  
 Universidad de Chile, Santiago 2011

Unfortunately, in the Honduran Fiscal practice, there is few empirical evidence of an integral comprehension among the differences between the Economic and the Statutory Incidences among the few contributors, public organizations and government fiscal agents involved (FOSDEH, 2011). This phenomenon can be appreciated, in a more explicit manner through the various difficulties among the incorporation of a new tax (particularly over the new security tax), specifically, over the patterns the fiscal charges are going to be fractioned across the different market contributors/agents, producers, consumers, employees, investors, etc. But as expressed before, the analysis of fiscal incidence distribution is not going to be developed by this research, whose essential components are based among the legal and economic framework of the taxation regressiveness and the sectors benefited by the fiscal exonerations around 12,000-16,000 , million lempiras a year (Perdomo, 2011).

**Statutory Incidence vs. Economic Incidence**

“Economic incidence differs from the statutory incidence due to the changes in the behavior and consequent variations in its equilibrium prices. Thereby, limiting consumers to buy less of a taxed product, so firms produce less and buy fewer inputs – which changes the net price of each product. Thus the job of the incidence analyst is to determine how those other prices change and how those changes will affect different kinds of individuals” (Metcalf, 2006).

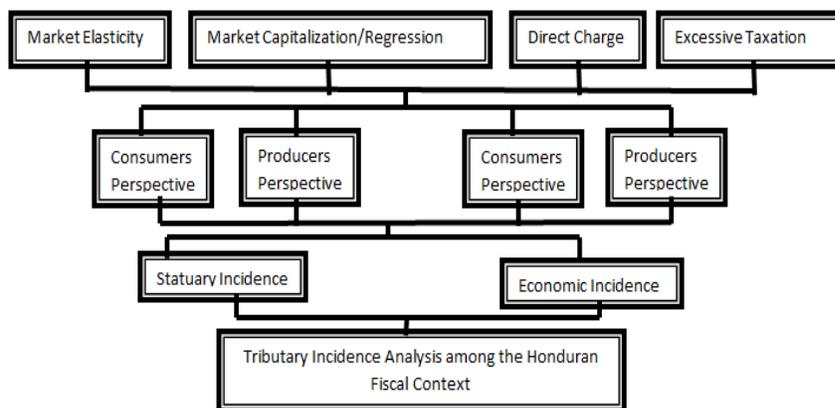
**Theoretical Approach towards a Tax Base Incidence**

The differences in the elasticity’s of Supply Chain Management (SCM) over the labor and capital variables, suggest that a tax imposed evenly on labor and capital income will reduce the stock of capital by more than the quantity of labor supplied. Such a tax is a more distorting alternative, for the economic behavior than a tax imposed chiefly on labor income.

This suggests an economic advantage of the strategy that tends to move away from the so-called broad-based income tax, which actually taxes the income used for savings and capital formation in a *heavier manner* than income used for consumption, to various taxes that are saving-consumption-neutral. Such neutral taxes are often labeled as consumption-based or consumed-income-based and are often, somewhat erroneously, described as taxing labor and exempting returns on capital income. These taxes do, in fact, tax abnormal returns to capital that exceed the cost of the savings required to obtain the assets.

One argument against major reform of the tax system (moving to a saving-consumption-neutral tax) states the following: If labor is truly in a highly inelastic supply stage, the sweeping tax rate reductions would do little to boost the labor force participation and the hours worked would only count with limited economic benefits. Advocates of the tax status quo, or of higher tax rates on upper-income workers, should be careful in making such arguments. A highly inelastic supply of labor would also mean that there is a relatively small reduction in employment from taxes on labor income at all levels, which would make such taxes relatively non-distorting to the economic activity.

**Figure No 3 Tributary Incidences Conceptual Framework**



Source: Self Interpretation

***Participating sectors among the Honduran Economy***

According to official statistics, the Honduran country possess 862 mayor contributors, who should consolidate a grand total tax recall of 4,743.8 million Lempiras, but their reality only reflects 1,170.6 million Lempiras of tax payment, whose barley 1.6% of the country’s 72,552.1 million Lempiras net income consolidated taxes (Perdomo, 2011).

By continuing with the previously mentioned calculus, we state that the Sabini analysis refers to the sectors who undergo a stronger charge among it’s scale tax references plus a lower or negative charge over its procurement activities, particularly:

- Manufacturing Sector (36.6%)
- Logistics and Communication (17.3%)
- Distribution and Commercial Activities (25.7%)

Who together add a grand total of approximately 80% of the taxation recalls, Table No 1, on the annexes, reflects the net taxing recalls, in relation to its sector and its balance between the taxation credit- taxation debts.

***Honduran State Tributary Contribution Analysis***

In relation to the analysis developed by RodulioPerdomo and Mauricio Burdett, on their research define as “Quienrealmentepaga los impuestos en Honduras”, based on a series of calculus compiled and determined by the Honduran Income Executive Directory (DEI) from the 2005-2010 time periods, we are able to confirm that the Honduran states who count with the most

significant tributary recalls are the ones held by the states who count with a greater population, private sector conglomerations, logistic services, infrastructure and government support on social welfare, particularly in the states of Francisco Morazán and Cortez, who in the year of 2000, collected around 84% of the countries tributary resources and continue expanding towards a 94% in the year 2010 (Perdomo, 2011).

On the other hand the states who are collecting the fewest amounts of fiscal resources are Lempira, La Paz and Yoro, who match with the smallest amounts of financial support granted by the government on social welfare investments (FOSDEH, 2011).

### ***Honduran Statutory Reform Frequencies***

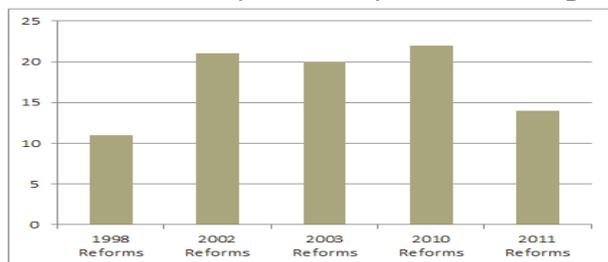
One of the main indicators of the Honduran Fiscal Crisis and tributary inefficiency, refers to the frequency of how the statutory reformations are held, leading the country to an acute fiscal regressiveness. The analysis developed by Rodulio Perdomo on 2011, depicts the Honduran fiscal reformations on a 1998-2011 timeline, who reflects the years and number of modifications executed between this years.

Table No 4, allocated in the documents attachments, defines the rate at which modifications are processed, revealing that the proportion at which the new statutory reforms are made, clearly influence the excessive tax rates upgrading (Honduras, 2011) who generate an even greater gap, between the Direct taxing efficiency and the honduran social welfare investing probabilities.

By considering the following... statutory conditioning, in addition to the honduran general budget, must be regulated and revised upon its impacts over the honduran welfare equilibrated dsitribution, the private sectors solvency compensations, as well as the ad-valorem taxtion procedures, instead of the bare comparison between the government annual financial requirements and the statutory recalls (regularly modified, illustrated by table No 4 on the annexes).

“The main, difficultly over this phenomena, is based upon the misinformation over the fiscal contributors, where the governments acknowledgement over the amount of contributors is still uncertain, to the point where, none of the governments organizations, contains accurate databases over the secondary or primary contributors”, Jorge Yescas (DEI External Consultant 2012).

**Table No 4 Tributary Statutory Reform Frequencies**



Source:

FOSDEH, BCH 1950-2010 Memories

### ***Progressive Regressiveness of the Countries***

### ***Tributary Incidence***

Statutory Modifications	1998 Reforms	2002 Reforms	2003 Reforms	2010 Reforms	2011 Reforms
	11	21	20	22	14

In Honduras, the lack of information, transparency and access to the government’s administrative files, impact on the scope of almost every macroeconomic and microeconomic analysis, nonetheless our study will be based, over the net income of an average Honduran home, compiled

by the National Statistics Institute (INE) (Perdomo, 2011), who developed this study on a 1-10 scale, determining the following:

- The wealthiest families are the ones depicted on the 9-10 segments of the Honduran family classifications.
- The families grouped in a 1-4 scale where the ones who were aligned as the ones with fewest economic incomes.
- The families grouped in a scale 5-8 are the ones allocated in a middle class segment, with a moderate taxing availability.

Parting from the RodulioPerdomo Scale, we are able to perceive, that the tributary pressures over this particular sectors of the Honduran economy, are unequal, unbalanced and unfair, due to the incongruent taxing pressure, undergone by the segments 1-8 that literary absorb more than 87% of the taxes paid by the regular families on the Honduran primary tributary system (Perdomo, 2011).

On this issue it's imperative to state that the segments 1-8 absorb 80% of their primary taxes, in correspondance to their taxation obligations, plus a 7% tax, of an excessive fiscal requirement, due to the 9<sup>th</sup> and 10<sup>th</sup> tributary wealthy families "exonerations" (FOSDEH, 2011).

Stating, that on the honduran context, the wealthiest families, only contribute with the 13% of the countries fiscal support, who undergo only a 65% of their regular tax basis margins (accroding to the Honduran Statutory Protocols (Perdomo, Quien Paga los Impuestos en Honduras, 2011).

### **Stochastic overview of the Honduran Tributary Phenomena**

The following mathematical models assemble the fundamental economic incidence equation of a tax in a stage of particular equilibrium (Yañez, 2011).

The Equation A

$$\blacktriangle P_c/T = N_s/(N_s-N_d)$$

- In the equation defined as A, the variables bonded, represent the fraction of the function of economic incidence charge to the consumers.
- In the equation defined as B, the variables bonded, represent the fraction of economic incidence change to the producers.
- $N_s$  = the prices level of elasticity, parting from the producers price function
- $N_d$  = the prices elasticity level, parting from the consumers price function
- $T$  = Taxation measured in Lempiras
- $\blacktriangle P_c$  = the significant increase, relevant to the consumers tax price per unit purchased
- $\blacktriangle P_p$  = the diminishment on the products price significant to the producers.

The Equation B

$$\blacktriangle P_p/T=N_d / ( N_d-N_s)$$

By considering the recently stated, we can infer the following for equation A:

**When  $N_s \rightarrow \infty$  it means that the tax charges are fully transferred to the consumers (from the manufacturing perspective)**

**When  $N_s \rightarrow 0$  it means that the tax charges are fully transferred to the producers (from the manufacturing perspective)**

**For Equation B:**

**When  $N_d \rightarrow \infty$  it means that the tax charges are fully transferred to the consumers (from the contributors perspective)**

**When  $N_d \rightarrow 0$  it means that the tax charges are fully transferred to the producers (from the contributors perspective)**

Nonetheless, the real stochastic application that will run this investigation derives from the Vera PetrovaFranson Analysis that proposes a model for optimal tax depreciation by a geometric Brownian Motion, articulated to this analysis(Fransson, 2007).

Before undergoing the research over the application of an already validated stochastic model, it is of great importance to know what it is? and what it does?

In our quest, to find an adequate model for this phenomena “A method of financial modeling in which one or more variables within the model are random. We have classified, that the Stochastic GBM modeling, reunites all requirements and characteristic’s, that fulfill the purpose of estimating the probability of outcomes, within a forecast comparison to predict what conditions might be likely to face, under a particular situation” (Peckman, 1974).

“As we previously define on the document, uncertainty is a fact across any economic landscape. There by, the elaboration of a stochastic model of an optimal tax depreciation analysis, must contemplate the quantification of the risks, directly or indirectly involved, since the iterative outcomes of the income cash flows tend to represent a random variable , defined on this document as “ the *X factor*”. Rather than just accepting the fact that the future is always uncertain and unpredictable, probability models and algorithms have been developed in the attempt to predict and mitigate the foreseeing unexpected events”.

The one used on this investigation (GBM), will evaluate the income cash flows (in the form of direct tax charges) vs. the Tax value processes (in the form of Excessive taxes). The Geometric Brownian Motion (GBM) is simply a set of multiple random walks forming a continuous random trajectory, which depict the main statutory reforms, the markets solvency capabilities and the taxation tendencies over a specific time period.

A stochastic process  $S_t$  is said to follow a GBM if it satisfies the following stochastic differential equation (SDE):

$$dX_t = \mu X_t dt + \sigma X_t dZ_t$$
$$X_0 = x_0$$

in which:

$X_t$  - a local random outcome of a particular revenue cash flow

$\mu dt$ - the expected drift velocity of  $\mu$ - the expected value, per unit of time  $dt$

$\sigma dZ_t$ - the diffusion or random noise, where,  $dZ_t$  is the uncertainty (Wiener component)  
 $\mu$  and  $\sigma$ - constant numbers measuring the expected rate of return and risk.  
 $X_0 = x_0$ - the process initial condition, a predetermined starting point

$t \in [0, T]$  - the planning time horizon anticipated by the agent

Once we depict the Tributary Incidence Frequency, towards a 40 year time period (Direct and Excessive Tax deviation. please revise table No 5) and evaluate its tendencies over time the GBM analysis over the direct and excessive tax charges, So basically what we obtain is a linear frequency who counts with a certain slope defined by the local market, which for Honduras is  $dx_t = 0.0648X_t(\mu + \sigma Z_t)$ .

The slope was obtained, over a deviation analysis, parting from the direct and excessive charges deviations and frequency behavior, that were interpreted, over each quarter of the whole time line analyzed, depicting the mayor limits approached, as well as the standard postures adopted among taxation efficiency.

### Conclusions:

Although the tributary incidence on this investigation refers specifically to the search for the state of equilibrium, among the various taxation recalls, held by the government's administrative procedures, in order to clearly quantify this tributary phenomenon, we strongly recommend further investigations, over several macro-economic elements such as:

- The social welfare distribution procedures.
- The Statutory incongruences on taxation symmetry.
- The Honduran financial markets points of elasticity.

This research approaches the tributary excessiveness quantification, as a mean to stochastically evaluate the direct-excessive charges efficiency, by calculating the dependence of the government's taxation recalls over the indirect charges. Thus, the tributary incidence slope, over the excessive charges represents the comprehension of the progressive regressiveness of the fiscal inefficient regulations among the Honduran context, resembling the following frequency:  $dx_t = 0.0648X_t(\mu + \sigma Z_t)$ , based upon the X factor, who embraces the risk management randomness components on the countries financial scenarios.

It is imperative to contrast the impact of the Honduran Statutory modification frequencies vs. the government's annual general budget (164,000 million Lempiras, for the 2013 period according to FOSDEH) who eventually generate an overwhelming debt, that continue stimulating the tributary regressiveness, which compromises the future of the Honduran economic fiscal deficit recovery.

Finally the breaking point, of this investigation, refers to the empirical demonstration, of the existence of a strong tributary regressiveness, reflected on the 3 general factors presented on this research, such as:

- The Tributary incidence slope, based upon direct and excessive taxation charges

- The Statutory framework alterations, who tend to follow the country's general budget upgrades in practically the same proportions, in an effort to attend the SCR2 solvency risk exposure who limits the private sectors expansion, foreign investment, entrepreneurship initiatives and the average middle class Honduran contributor lifestyle.
- The absorption of the first degree contributions (salary payroll taxation), who depict the fiscal pressure undergone by the middle and low class Honduran families.

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