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ANALYSIS OF TAX POLICY AND INCOME TAX EVASION IN DEVELOPING COUNTRIES: THE CASE OF ECUADOR

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Dedication

For all the Ecuadorian taxpayers who faced the limitations of the public health system and sadly lost their lives during the COVID-19 crisis, and for those of us who survived and continue dreaming of better days. For those public servants in the tax administration who still embody that spirit of service.

To my mother Concepción, my father Nelson, and my family and friends, who have stood by me through the most challenging times and supported me at every step.

Dedicatoria

Para todos los contribuyentes ecuatorianos que por las limitaciones del sistema público de salud perdieron sus vidas durante la crisis sanitaria del COVID-19, y para todos los que sobrevivimos y continuamos soñando en mejores días. Para esos servidores públicos que son parte de la administración tributaria y aún mantienen el espíritu de servicio.

A mi madre Concepción, a mi padre Nelson, a mi familia y amigos que estuvieron a mi lado en los momentos más difíciles y me apoyaron en cada paso.

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Quito, octubre de 2024

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Abstract

This research aims to review evasion tax models, policies, and interventions in a comparative scheme, starting with the universal economic theory and then reviewing the neoclassical normative standards and contrasting them with real-world tax practices. For the latter approach, it is essential to consider all the limitations and biases in economic and social contexts present in developing countries such as Ecuador. Even when this final document differs from the original plan, it was divided into two parts and four different strategies to reach the main objective of this investigation. The first scheme used was a systematic economic literature review of traditional and behavioral tax evasion models, evasion estimation methodologies, and a comparison. As a second tactic, administrative data from 2010 to 2018 evaluation of a specific Ecuadorian tax administration intervention between 2014 and 2018 was executed, and these particular results were explained mainly using behavioral approaches. The second part of the analysis used the ECUAMOD tax-transferences microsimulation model combined with the policies decomposition approach. Then, the third tactic also employed a historical and descriptive examination, starting in 1980 and continuing up to 2021, of socio-fiscal policies and their decomposition against other market factors for Ecuadorian data and measuring the effects on income poverty and income inequality. Finally, the fourth strategy combines the decomposition and evaluation of efficacy between Ecuadorian ad-hoc emergency policies versus automatic stabilizers. It was apprehended during the COVID-19 sanitary crisis, and we compare 2019 against 2020. Some of the results are in line with the neoclassical traditional theory expectations, while the rest of the results challenge or directly oppose what neoclassical economic theory predicts, which enriches the analysis and sheds light on what might be happening in tax policies and tax interventions for developing contexts, meaning limited regulation, lack of information and weak controls on the side of institutions. While on the side of citizens, there was an intrinsically low tax compliance culture and little respect for the rule of law compared with developed countries.

Resumen

Esta investigación tuvo como objetivo estudiar a profundidad las políticas e intervenciones tributarias enfocadas en el impuesto a la renta de personas, todo bajo un esquema comparativo y, partiendo desde la luz de la teoría económica tradicional que deriva en estándares normativos y contrastándolas con las prácticas de la economía tributaria real. Para este segundo enfoque, ha sido importante tomar en cuenta las limitaciones y los sesgos de los contextos tanto económicos como sociales presentes en países en vías de desarrollo como lo es el Ecuador. Si bien este documento final difiere del plan original, para alcanzar el objetivo principal propuesto, esta investigación se dividió en dos partes y se implementaron cuatro estrategias diferentes. La primera estrategia consistió en una revisión sistemática de la literatura universal económica y referente tanto a los modelos tradicionales como a los modelos comportamentales de evasión tributaria y las metodologías de medición de la misma. La segunda estrategia consistió en una evaluación de impacto con datos de panel de 2010 a 2018, sobre una intervención específica que tuvo lugar entre 2014 y 2018 en la administración tributaria ecuatoriana, la explicación más plausible de los resultados obtenidos fue realizada bajo componentes de la economía del comportamiento. Luego, para la segunda parte del documento se lo realizó mediante el modelo de simulación de impuestos y transferencias ECUAMOD y la descomposición de políticas. Como tercera estrategia se realizó un resumen histórico-descriptivo de las políticas socio-fiscales comenzando en 1980 y continuando hasta 2021, con su descomposición respecto de otros factores de mercado para datos de Ecuador y se miden los efectos sobre la pobreza por ingresos y desigualdad del ingreso. Finalmente, en la cuarta estrategia se combina la descomposición y evaluación de la eficiencia de las políticas ad-hoc durante la crisis sanitaria versus los mecanismos de estabilizadores automáticos. Este estudio fue realizado durante los momentos más difíciles de la crisis del COVID-19, entre 2019 y 2020. Algunos de los resultados si van en línea con lo que los modelos tradicionales predicen, pero el resto de los resultados desafían y en algunos casos incluso contradicen las expectativas del modelo neoclásico. En cualquier caso, los resultados enriquecen el análisis y aportan luces sobre lo que está pasando en materia tributaria en contextos de países en desarrollo, esto significa en términos institucionales, regulaciones limitadas, falta de acceso a la información y controles débiles. Mientras que, por el lado de la ciudadanía, se evidencia una baja cultura tributaria, bajo cumplimiento tributario y poco respeto por el imperio de la ley, todo esto comparado con países de mayor desarrollo relativo.

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Introduction

Although Benjamin Franklin conveyed a negative view of taxes by saying that "in this world, nothing is certain except death and taxes[1]," on the other hand, the jurist Holmes justified taxes as a necessary evil by expressing that "Taxes are the price we pay for living in a civilized society.[2]" Speculations aside, the truth is that modern states, apart from the notion of Weber (1919) of holding the monopoly of legitimate force, today modern democratic states have among their political primary functions of maintaining control and order, some economic functions, such as regulations and redistribution, this latter means leveling the market field failures, especially for the most vulnerable citizens (ECLAC 2014), and promote the social cohesion. At the end of the day, it implies that states have to generate well-being for the majority under the framework of the welfare state for all.

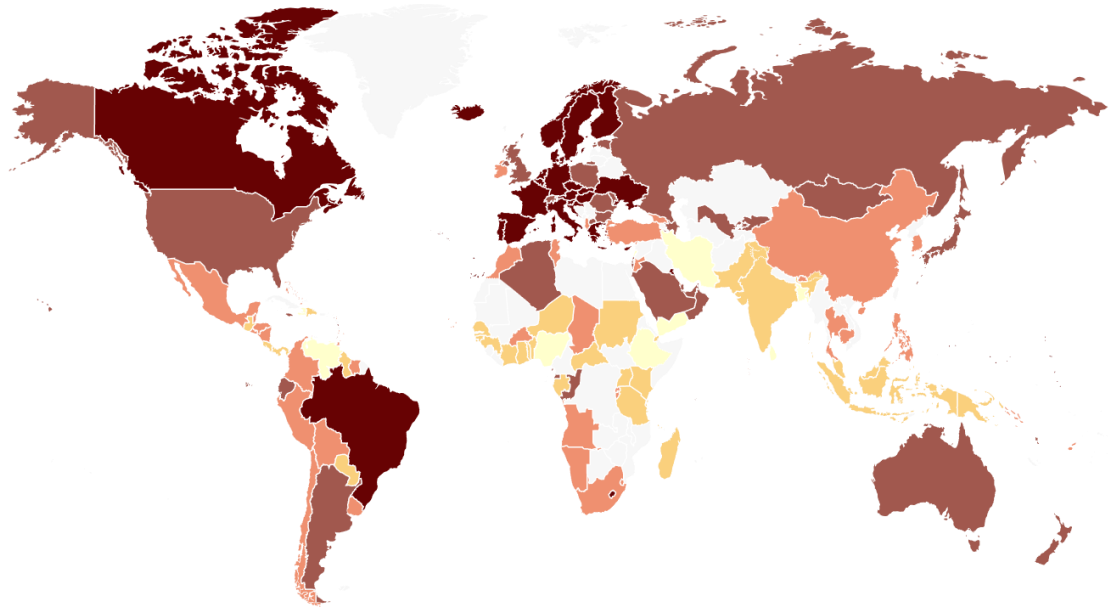
In a more practical and budgetary sense, States must be sufficiently founded, whether for their bureaucratic operations and regulations, which generate significant civil confrontation, or, perhaps in a more acceptable way that generates the least conceivable rejection, States must provide public goods for all and aid for vulnerable citizens. The first group comprises public health, education, basic infrastructure, and even electricity. The second group has a set of services for the social protection system, of which the two most essential subsections are the contributive and the non-contributive cash transfers.

Along similar lines, the options for States financing are limited, and among them, the one that contributes the most in developed countries is taxation, both direct and indirect taxes. In the case of Ecuador, during the last four decades, the contribution to the general state budget has been over 48% on average, and the contribution to the entire economy, measured by the tax burden indicator, has been up to 14% (BCE 2022). Those percentages contrast with the 20% average tax burden for OCDE countries; in Fig. 1, the dark colors represent a more significant tax burden (mainly EU and North America), while the lighter the color, the lower the tax contribution (many countries in Africa, Asia, and Latin America). Ecuador's tax burden is close to the world average, and according to the World Bank income classification, Ecuador is defined as a middle-income country.

[1] The extended quotation said: "Our new Constitution is now established, everything seems to promise it will be durable; but, in this world, nothing is certain except death and taxes*".*

[2] Compania General De Tabacos De Filipinas v. Collector of Internal Revenue, 275 U.S. 87, 100, dissenting; opinion (21 November 1927)

Map 1.1. Tax Burden, Including Social Security Contributions



Source: International Monetary Fund, IMF Datamapper (2024)

From a managerial point of view, tax evasion is still one of the most remarkable complications that Tax Administrations suffer nowadays worldwide. Also, tax evasion is often linked to the commission of other crimes, such as money laundering and the laundering of other assets, corruption, and organized crime (Storm 2013). Moreover, in countries of the global south, tax evasion is even more severe (Rosid et al. 2019; Besley and Persson 2013). For instance, in Latin America, evasion rates are more than double those in other regions like the European Union and especially the Nordic countries. It has been estimated that income tax evasion was 33% in Mexico, 46% in Bolivia, 58% in Ecuador, and 70% in Guatemala (CAF 2016; ECLAC 2018c). In contrast, the average for the OCDE countries is below 20% -excluding Mexico and Chile-.

The first part of this document emphasizes evasion models with a tax revenue optical. From analytical and methodological perspectives, tax evasion can be studied from various angles: legal, economic, entirely rational models, behavioral aspects, and organizational approaches, among others. Furthermore, as a field that has enabled different forms of intervention, it is a fertile ground for testing both the most rigid theories and economic models and some flexible models with even unorthodox explanations.

Apart from analytical and theoretical studies, empirical studies that contrast expected and actual observed results are essential. In this sense, although universal tax audits generate the most credible data regarding information reliability, they are also the costest regarding

financial and judicial resources. The practical and economical alternatives to these universal audits from the micro to the macro perspective are selective auditions through risk models and administrative data, lab experiments, field experiments, microsimulation models, and data obtained from household surveys. Data must be analyzed with econometrical and simulation techniques to extract valuable information and policy advice.

Studies using micro-simulation tools have become popular in the last two decades, especially in developing countries like Latin America (Bourguignon et al. 2004; Avellaneda et al. 2021). The second part of this document presents two empirical studies based on the micro-simulation tax-benefit model ECUAMOD. This public tool takes advantage of Ecuador's publicly available information and micro-simulation techniques combined with decomposition methods, resulting in a tool that is useful not only for tax policy design and analysis but also economically.

In the case of Ecuador, the micro-simulation tax-benefit model ECUAMOD uses two primary sources of information, which are representative household microdata that includes comprehensive data on families and personal characteristics, direct and indirect personal taxes, social contributions, public pensions, labor and no-labor income, cash transfers, and expenditures. The first input data information is the ENIGHUR 2011-2012 survey. It uses the prices index to update information up to 2018 and extrapolate information to 2003, keeping the expenditure and income economic structure fixed. Second, from 2019 to 2021, after evaluating data consistency, the primary source of information changed to the ENEMDU survey. To keep the principal results and use simple imputation techniques, the 13 groups of expenditures were simulated. At the same time, the labor market structure and income components data were obtained directly from the survey. At that point, the simulation app estimates three main components through arithmetical equations: cash benefits entitlements, direct and indirect personal taxes, and social insurance contribution liabilities. As a result, the tool creates one new output data, which lets us contrast base and simulated scenarios on the three most representative development indicators: fiscal changes, income poverty, and income inequality[3] (Jara et al. 2021-22).

In contrast to statistics extracted directly from the survey data, micro-simulation techniques showed better outcomes when both were validated with the official data, especially on simulated taxes and insurance payments. The validation process was applied to the total

[3] Additionally, with the output data and Stata programation, it is posible to expand de analysis to the redistributive effects both at micro level or agregate as well.

number of taxpayers and the total revenue amounts, again based on official statistics (Jara and Montesdeoca 2020). Furthermore, compared to simulated policies, the redistributive effect of taxes and social security contributions is underestimated when the simple survey data is reported. Those discrepancies include that all household survey data underreports the income components and the challenge of translating the eligibility requirements into equations, especially for cash transfer benefits in fixed and variable components.

In line with the above, the main research questions are: What tax models, policies, and interventions related to income tax have significantly reduced tax evasion or tax revenue and improved development indicators? What are the most universally recognized cost-effective tax policies and interventions, and what are their expected outcomes? What are the structural and behavioral differences in tax policies between developed and developing countries? Based on these questions, the research is guided by the following working hypothesis: Traditional tax analysis and management tools, developed in more advanced economies to maximize tax revenue, do not have the same effectiveness or scope when applied to developing countries such as Ecuador. Therefore, there is a need for both analytical and applied tools that incorporate cost-effective behavioral components to optimize personal income tax revenue in developing countries. Other secondary hypotheses are:

1. Many behavioral models of tax evasion provide better predictive results than the neoclassical tax evasion models, which, in turn, have acceptable analytical characteristics. There are various methodologies for estimating tax evasion, each with cost-effective interventions for tax evasion reduction. Each methodology and strategy have its advantages and disadvantages, and they produce differentiated effects depending on the type of country in which they are applied (high-income countries vs. middle- and low-income countries).
2. Nudging tax interventions have limited short-term effects on taxpayers' behavior and tax revenue. However, these interventions' positive and significant medium- and long-term effects have been observed.
3. Socio-fiscal policies have positive and significant effects on poverty and inequality, though the effects of other market factors have been more significant.
4. Ad-hoc COVID-19 policies had the desired effects -in direction- on poverty and inequality, at least in the short term (during the year of implementation). However, the effects of automatic mechanisms were more significant and are more advisable in designing tax and social policies.

Along the same lines, the main objective of the research is to analyze and quantify the effects of tax policy and interventions of the personal income tax, focus initially on their impact on tax revenue, and later examine their influence on poverty and inequality as key development goals. The four specific objectives are as follows:

1. To conduct an in-depth study of universal theories and models on tax evasion and the methods used to calculate tax evasion. Additionally, it analyzes interventions related to personal income tax and highlights the differences between middle and low-income countries.
2. To estimate the effect of a nudging intervention on taxpayer behavior and tax revenue in the short and medium term, with administrative data from 2010 to 2018.
3. To assess the impact on poverty and income inequality resulting from the decomposition of socio-fiscal policies and other market effects.
4. To evaluate the effects of the decomposition of automatic stabilizers and COVID-19 mitigation policies during the 2020 pandemic on poverty and income inequality.

This document is organized into two parts and four chapters or papers. Individually, each paper has its internal organization and consistency focused on publication objectives, but this compilatory text is the best effort to try to express a collective coherence. The first part shows two chapters of a systematic literature review and an impact evaluation application. The first chapter encompasses all the theoretical, methodological, and empirical application aspects related to the universal neoclassical tax evasion models, measurements, and interventions widely used in theoretical and analytical approaches and applied interventions by around-the-world tax administrations. However, the focus of this investigation is on developing countries like Ecuador. The second chapter evaluates a direct intervention made by the Ecuadorian tax administration through what are defined as reactive nudges. This evaluation was conducted by structuring panel data from 2010 to 2018, during which the intervention was implemented starting in 2014. Due to the imbalance between the intervention and control groups, a weighted propensity score matching model was applied to assess the outcomes over the entire series and year by year, combined with a fixed effects econometrical model. Initially, the intervention had no effects, but there was one year in which the differences were statistically significant in 2018. That year, but also in 2015 without effects, the Ecuadorian tax administration implemented a tax amnesty. Only previous behavioral actions explained those results in 2018.

The second part of this document includes two more chapters about empirical applications using mainly quantitative approaches, applying the ECUAMOD tax-benefit microsimulation model and household survey data from Ecuador. The third chapter begins with a documentary and historical review from 1980 to 2021 of antipoverty policies in Ecuador. Then, based on public data availability, a historical-descriptive analysis was conducted from 1988 to 2021, focusing on the two leading welfare objectives: eliminating extreme poverty and reducing income inequality. Also, using the ECUAMOD tax-benefit microsimulation model, a policy decomposition of socio-fiscal against market factors was performed. The fourth and last chapter evaluates automatic stabilizers (income tax and social security contribution) versus emergency policies applied during the COVID-19 sanitary crises in 2020. Both chapters showed that socio-fiscal policies help in part to alleviate poverty and inequality, but market factors or automatic stabilizers help more. Finally, a section for the general conclusion was added.

PART ONE. Optimal versus behavioral tax evasion models and evaluating tax interventions

This part of the thesis outlines analytical and applied approaches to tax policies and interventions under the evasion models frame, each captured and published in a scientific article.

The first paper reviews the theoretical, methodological, and empirical studies of traditional neoclassical evasion models and behavioral interventions, especially nudges related to income tax compliance. This analytical frame helps to explain some changes observed in income tax collection in general and in developing countries in particular, during the last two decades, taken as a pivot Ecuador. However, this is not a simple summary or review by itself; beyond that, it pretends to contrast the two main groups of income tax models identified in the economic literature on taxation. Then, a new tax evasion model alternative would outline combining the two main desirable characteristics, which are being more realistic without losing their analytical richness. One of the conclusions of this part is to highlight that the core idea under tax models explains the opposite idea of tax compliance, which is tax non-compliance or evasion. This fact evidences the prevalence of a hostile and punitive vision in this area of the economy. Another result is that four gaps in traditional evasion income tax models have been identified. The most significant gap is that both groups of income tax evasion models remain in low predictive power. Finally, from the review of the methodological and applied studies, it can be established that some weaknesses are viewed independently. However, these disadvantages could be collectively improved and enhanced, especially for developing countries.

The second paper presents the results of an impact evaluation study about reactive nudges applied by the SRI since 2014. To achieve that evaluation, administrative panel data was built with information on real taxpayers' declarations in three anonymized datasets from 2010 to 2018, with a cutoff of data information in May 2021. To balance the control and intervention groups, a Covariate Balancing Propensity Score (CBPS) permits them to reach both objectives simultaneously; here, the CBPS approach is used combined with Fix Effects estimators to determine the impact of SRI intervention. At first, if only the period before the intervention (2010-2014) is compared with the intervention period (2015-2018), no statistically significant effects were found. Those results were not expected under the light of the traditional evasion models. Also, this implies that no

effects were found in the short to medium term. However, there is only one year that is significant on its own and that is 2018, which represents a medium to long-term effect and only under certain prior conditions. The unique year of effect found is explained in a behavioral frame for developing countries such as Ecuador.

Chapter 1. Income Tax Compliance or Non-Compliance: A Three Components Review*

1.1. Introduction of the Chapter

Tax evasion, tax avoidance, and tax fraud behavior are still the major tax administration problems in developingcountries and worldwide. Together, those three offenseses might be defined as tax non-compliance in a broadermanner for the current research. Furthermore, tax non-compliance is often linked to committing other crimessuch as money and assets laundering, corruption, and organized crime (Storm 2013; WIDER 2023b). Those types of crimes represent a double loss for public administrations.First, they reduce government revenues, and second, tax non-compliance decreases public institutions' regulatory and control capacity. Ultimately reducing the credibility of the states as institutions. Also, it is essential to emphasizethat improving capacities for tax and other domestic revenue collection is the critical target 17 of the Sustainable Development Goals (WIDER 2023a).

In developing countries, tax non-compliance is even worse (Rosid et al. 2019; Besley and Persson 2013); for example, statistics from CAF (2016) and ECLAC (2018) reported that rates of tax evasion in Latin America are as highest as more than twice compared to other regions like the European Union. In 2012, for instance, it was estimated that the evasion rates for income taxes were 33% in Mexico, 46% in Bolivia, 58% in Ecuador, and up to 70% in Guatemala. Meanwhile, developed countries, like the OECD, show non-compliance rates below 20% on average[4]. Along the same line, in China, for instance, the Tax Administration estimated losses of around 20% of its GDP during the 2020 pandemic period (OECD 2022)[5]. On the opposite side of Latin America are the Nordic countries like Denmark, where, according to Kleven et al. (2011), it is shown, through a small-scale random audit tax gap exercise, an evasion rate of as low as 2.2%for income taxes.

Then, the study of tax policy is outstanding for both developed and developing countries, but mostly in middle- and low-income countries like those in Latin America. Becauseof that, there is abundant literature regarding searching for and implementing cost-effective interventions for tax administrations worldwide. Recently, multiple interventions have been implemented, mainly under the traditional tax evasion model focused on reducing

[4] These facts may have gotten worse in the last decade.
[5] This percentage does not include Mexico for whom individual percentage was already shown.

non-compliance and a few under behavioral approaches like *nudges* (Alves and Afonso 2019; Weber et al. 2014; Thaler and Sunstein, 2008).

Under the traditional tax evasion model, it is well known thatsince 1972, most studies are based on the optimization seminal model known as A-S-Y (Allingham and Sandmo 1972; Yitzhaki 1974). This is a model under two essential premises: first, the criminal approach of taxpayer-evaders (Becker 1974), and second, the idea of money-alone maximizing portfolios under hazardous environments (Mossin 1968; Stiglitz 1969 and Arrow 1970). Challenging the A-S-Ytax evasion model, there are two alternatives to address this kind of problem nowadays. Firstly, move towards a definite conception using strategies like the carrot tactic, incentives, and behavioral approaches, where *nudges* might be considered one of the most cost-effective alternatives to increase tax compliance (Weber, Fooken and Herrmann 2014). Secondly, money maximizing can be extended to other types of non-monetary rewards (or punishments), such as social recognition (or shame) (Ajzen 1985).

From a methodological and econometrical point of view,beyond the positive results that tax interventions had taken over tax revenues, two harms are actively incorporated into this critical analysis. One is the aggregation problem, and two is the persistence of effects. Regarding the latter topic, Lee and McCrary (2017) state that it is hard to dissuade impatient individuals from using prison awe. Also, people who are myopic and engage in hyperbolic discounting will be less dissuasive by the threat of punishment, which will occur or not in the future.

The remainder of this paper is organized as follows. In the second section, a systematic review of the leading models in the economic literature on tax non-compliance is set in two groups: those based on the optimization A-S-Y evasion model and those models that incorporate behavioral approaches. Here, a subsection reviewing the nudge interventions in taxes is carried out. The third section is amethodological review of the measurement of tax non-compliance, where six methodologies are described. The fourth section summarizes the main empirical applications of developing countries, trying to identify the most relevant variables that explain tax compliance and contrasting interventions restricted to the past decade, from 2010to 2019[6]. The fifth section discusses and evaluatesprevious reviews, highlighting the main explanatory variables of tax compliance for each methodology and possible explanatory variables of tax non-compliance. Finally, the sixth section concludes.

[6] Just before the COVID-19 crises arrived.

1.2. A Review of Income Tax Non-ComplianceModels

For this section, the scheme presented by Tilahun (2019) is the reference. He proposes a structure that starts with a positive view of the definition of *tax compliance*. Here, there are at least two approaches: the first one is attending to the tax returns on time and the entirely correct amount, and the second is attending to the characteristics of voluntary enforcement actions (James and Alley 2004). Thus, as Kirchler et al. (2008) also note, compliance depends intensely on the absolute control and power of the tax authorities or, the perception of the citizen or a mix of both.

The most widely accepted definition of tax compliance is law enforcement, and therefore, non-compliance is established as breaking the law following the seminal idea of Becker (1974) of criminalizing tax evaders. As Feige (2016) stated, in developed countries, it is perceived that people consider any non-compliant actions, and this, in turn, defines the tax morale of the whole society. This is the first remarkable difference between developed and developing countries; according to the World Values survey (2017-2022), almost 12% of people in Latin America may justify some form of tax evasion or even the whole. Then, individuals, as well as organizations or, in general, taxpayers who increase their profits from breaking the law, have strong motivations to hide fraudulent activities and avoid possible social exposure, even when this is not as heavy as pure moral approaches say. These definitions complement each other and align with Allingham and Sandmo's original ideas (1972). In contrast to the optimization model and specifically the rational agent, behavioral models have been proposed (Hashimzadeet al. 2013). These two groups of models are described below.

1.2.1. The A-S-Y Optimization Model and its Extensions

As mentioned, the A-S-Y model is still the benchmark for almost all tax studies under analytical and optimization models. This fundamental approach was established on autility consumption model based on the criminal nature (and therefore punishable) of tax evasion and optimization under risk. However, two limitations show this approach. The first one is that imprisonment is a relatively rare real punishment for tax evasion issues. The second one is thelow predictive power of this model.

Also, Slemrod (2019) argues that this assumption crowds outthe intrinsic motivation that most people could feel to comply with the law. The author states that taxpayers may be willing to comply with their obligations because they perceive it to be fair instead of being

forced to do it. Furthermore, he challenges the *idea of risky choices* from an optimal portfolio and purely money benefits (Mossin, 1968; Stiglitz 1969 and Arrow 1970). This ideaassumes that being caught evading and then being punishedis a risk to which a specifically known probability distribution can be associated. This approach leaves out the possibility that citizens could find any benefit and utility from the creation and use of public goods beyond the pure money point of view.

From the neoclassical tradition, the model presupposes a) the idea of rational and homogeneous taxpayers (the representative agent), b) the presence of selfish agents and maximizers in only monetary terms, and c) the fact that the utility of these agents obtains comes only and directly from the disposition of individual income and private goods. As a result, one of the extreme consequences of this approach is that if taxpayers perceive that the probability of detention is one hundred percent, the model predicts that they will not evade. Then,for intervention proposes, the deep effect of receivinga letter in a randomly designed experiment to the treated group is highly correlated with the prior belief over the audit probability (*p*).

The optimization of the A-S-Y model is formalized as follows: Each taxpayer is treated as a maximizer consumer with a utility expectation model. Then, he has two types of incomes: the exogenously defined market income (Y) and the declared income (D); the remaining between the market and declared income is the non-declared income (A=Y-D). Over the reported income[7] (D), taxpayers must pay a tax rate (π) and money in income tax: $H=D*\pi$. Nevertheless, the Tax Administration could perform random or systematic audit processes to detect evasion with a known probability (p), in which case taxpayers might be fined (*f*) for non-compliance.

A first limitation that derives from this seminal model is that it starts from the strategy of declaring or not the total market income when, in most tax systems, it is paid on net income. It means the market income (Y) minus the business costs and/or personal expenses (X). Then, the seminal approach did notconsider current deductible expenses in the case of self-employed and personal expenses in the case of individual dependent income receivers. This

[7] If the market income and the declared income are equal (A=0), the case is compliance. On the other hand, if A>0, there is a positive gap, and we have acase of non-compliance. While it is relatively scarce literature analyzing the case of A<0, where the gap is harmful, even do real cases are marginal, they exist like a black swam. It may also be classified as non-compliance; however, the taxpayer cannot be classified as a dishonest citizen, but only someone clueless. When A<0, most of the time a tax return form is filled and sent to the tax administration, but not always. It may depend on the taxpayer's preferences and attention, which is directly related to the bureaucratic tasks and time it takes. Therefore, here is a clear example of no-money preferences.

limitation might be a secondary form of tax reduction. This strategy has two parts: the first one is the minimization of income declared, and the second one is the maximization of expenses or even a mix between costs and expenses. For instance, field experiments have shown that some individuals tend to underreport income and overreport expenses to compensate for any possible tax pay increase (Chiliquinga and Ramirez 2017; Carrillo et al. 2017).

The dynamic of the tax evasion model could be described as follows. The taxpayer should choose between two alternatives. One is declaring his real income (where Y=D and A=0), and two is not declaring his real income (where Y>D and A>0). Then, the decision of the latter strategy will be determined by the expectation of not being audited (*p*), detected, and fined (*f*) by the Tax Administration. If the explanation of not being audited is correct, the taxpayer is in a better position under election two. However, if his expectation is inaccurate, he is worse because he may face fines (f) and an interest rate (*r*). If the taxpayer is risk-averse, he can declare his real market income (Y=D) to maximize his expected utility[8].

So far, according to the seminal proposal, the declared income (D) may be established as a function of six variables: the market income (Y^+), the probability of audit and detection (p^+)[9], the fine amount (f^+) plus interest rate (r^+), and thetax rate (π^-) where the framework of the model is shown in equation [1]. The first extension of the A-S-Y model incorporates government expenditure perception (G^+) (Yitzhaki 1974). Here the choice of compliance from taxpayers alsodirectly relates to the government expenditure perception or the expected benefits from social or public goods and services financed with taxes, which is directly related to the declared income. Then, the taxpayer decides under uncertainty, which characterizes the total utility expectation $E[U]$ as shown in equation [1] and depends on the individual preference for risk aversion. Under this formulation, to maximize the result, the highest probability will be chosen.

$$E[U] = (1-p) * U(Y - \pi D) + p * U(Y - \pi D - f(Y - D)) \quad [1]$$

Here, taxpayers choose between the utility gained from the evasion choice ($W = Y - \pi D$) or the utility obtained from declaring all income and paying taxes[10]

[8] Another way of looking at this frame is called the evasion gamble, under a game theory approach.
[9] For this analysis, the audit probability α and the detection probability p have been separated into two parameters. However, in the initial proposal, there is only one parameter: p. Therefore, in the absence of α, it is collected by p.
[10] In the earliest formulations, income reporting and tax payment were taken as a single step; however, in future developments, these were separated in two events and behavioral elements such as procrastination were incorporated to describe the possible non-payment of taxes, even after having previously declared them.

$Z = Y - \pi D - f(Y - D)$. At this point, as was noted above, the probability (p) of audits and detection plays a remarkable role not only in a money-based model but also in taxpayer behavior. Then, the first-order conditions (FOC)for a maximum interior solution in equation 2. and second-order conditions (SOC) for the concavity condition equation 3. are:

$$-\pi(1-p)U'(W) - (\pi - f)pU'(Z) = 0 \qquad [2]$$

$$C = \pi^2(1-p)U''(W) + (\pi - f)^2 pU''(Z) \qquad [3]$$

The expected marginal utility decreases in D, as shown in equations [4] for total non-compliance and [4a] for total compliance; however, there are ample combinations between both.

$$\frac{dE[U]}{dD}|_{D=0} = -\pi(1-p)U'(W) - (\pi - f)pU'(Z) > 0 \qquad [4]$$

$$\frac{dE[U]}{dD}|_{D=Y} = -\pi(1-p)U'(W) - (\pi - f)pU'(Z) < 0 \qquad [4a]$$

From equation [5] is derived that the taxpayers are going to declare less than their real market income Y when they expected that tax payment on undeclared income is less than their regular tax rate:

$$p * f < \pi \qquad [5]$$

The seminal authors incorporated one attempt to solve the only monetary assumption, trying to value the taxpayer's reputation as a valuable and desirable outcome. Then, the expected utility function might be as equation [6], where s0 is defined as affecting the social reputation and s1 otherwise. Here, a better reputation reduces the marginal utility of income, so reputation and income could be treated as substitutes in a cardinal form.

$$E[U] = (1-p)U(W, s_0) + pU(Z, s_1) \qquad [6]$$

Another problem detected in the original A-S model was that ifthe tax rate (π) rises, the utility of the evasion choice increases. On the other hand, if the evader is caught, the fine (f) for evasion remains invariable. Then, the asymmetry could incentivize evaders to cheat more, overestimating the non-compliance effect. The dominant effect hangs on how fast absolute risk aversion decays; this effect could be seen onthe third derivative of the utility function. To fix the contra- intuitive result, Yitzhaki (1974) aggregates a fine (f) form asa proportion of the amount of tax evaded: f*π*A. With this modification, the model

forecasts that evasion may decrease when the tax rate as well as the proportional fine increase, as it has seeing empirically.

From the A-S-Y tax evasion model version, some extensionshave been developed. One of the most remarkable attemptsis *A dynamic version* of the A-S-Y tax model of Engel and Hines (1994 y 1999). They started under the assumption thattaxpayers are no longer risk averse. Instead, they are risk neutral. Consequently, taxpayers choose evasion or cheating options, which reduce the expected discounted sum of tax payments and penalties. In this dynamic version, the model estates as market income over time (Y_t) and declared income (D_t). The evasion rate (e_t) is a proportion of the unreported income (A_t) taken as constant (e) over time.

$$e_t = \frac{A_t}{Y_t} = \frac{Y_t - D_t}{Y_t} = e \qquad [7]$$

No essential differences are evident with the static model beyond the time subscript. When the subscript t does not appear, the referred variable is constant over time. Besides, the tax rate in a dynamic frame is π_t. On the other hand, the individual self-reported tax liability is expressed in equation [8], where the duty of a taxpayer in case of auditand penalty, is excluded:

$$\pi_t D_t = \pi_t Y_t (1 - e) \qquad [8]$$

Then, analysing from the scenario where the tax evader is identified and captured (p=1), the evader must pay interest over the previous periods that he had unreported income (r_{t-1})plus the fine (f_t), over time. An anchoring rate for the fine, mostly in developed countries, equals 25% of the previous period of the undeclared and unpaid taxes ($A_{t-1}=Y_{t-1} - D_{t-1}$). The function $Y_t(p_t, e)$ shows the likelihood that an evader will be audited and fined. Here, p_t represents the strength of enforcement efforts, and e is the individual evasion rate.They also used a one-period subjective discount factor. Given that the taxpayer evades more than once, the total utility amount has the form of an actual value function [$V_t(e)$] using the principle of optimality of Bellman (1957), V_t satisfies:

$$V_t(e) = min_e \left\{ \begin{array}{c} \pi_t Y_t (1 - e) + \beta\big(1 - \Omega_t(e)\big) E[V_{t+1}(e)] + \\ \Omega_t(e) \left[\begin{array}{c} (1 + f)(\pi_t Y_t e + (1 + r_{t-1})\pi_{t-1} Y_{t-1} e_{t-1}) + \\ \beta E[V_{t+1}(0)] \end{array} \right] \end{array} \right\} \qquad [9]$$

In equation [9], it is stated that the total actual value function of evasion depends on three terms. The first one is the tax expenses in period t, where the taxpayer has not yet had any

audits. This expense is directly related to the tax rate (π) and inversely associated with the constant level of evasion (*e*), which was selected individually in the previous and present times. The second term is the anticipated tax expenditures for the next period (t+1), but discounted. Nonetheless, previously, a condition may be that the taxpayer has not been audited and fined in the current period (t). The expectation operator is applied for variables like future income and tax rates[11]. The third term is the option when the taxpayer has been audited and fined at the current time.

Here, the evader must pay fines plus interests on both periods (t and t − 1). Also, future tax expenditures are evaluated in the scenario where the taxpayer already learned and there will be no cheating next time $V_{t+1}(0)$.

Another critical improvement to the A-S-Y optimization model is incorporating the moral costs of evasion(Andreoni et al. 1998). On the taxpayers' side, the idea is to add their costs when they have been audited and fined. It is the case where A>0, and if individuals are audited and fined (*f*), they may have to pay the fine on each dollar of non-declared income (*f***A*) plus the non-declared tax [(*f*+π) *A]. The latter is the total evasion cost, and it has to be smaller than if the taxpayer is fully compliant to choose non-complain. Assuming that taxpayers are risk-averse, and if thecheater is audited, his expected utility function is representedin equation [10]:

$$E[U] = (1-p)U[Y(1-\pi)+\pi A] + pU[Y(1-\pi)-\pi A] \qquad [10]$$

In practice, tax administrations regularly perform expensive audits because they need to learn about households' actual market incomes (Y) and maintain a high perception of audits (*p*). Complementarily and following most of the economic literature, it is stated that the objective function of government as a whole, including the tax administration, is to maximize the projected revenue in net terms. It is the revenue for taxes plus penalty with as few audit costs as possible. Then, a cost-effective strategy might be:

$$R^g = \int_{\underline{D}}^{\overline{Y}} [p(D)\{E[(\pi(Y) + f[\pi(Y) - \pi(D)])/D]\} + (1 - p(D))\pi(D)]dF_D(D) \quad [11]$$

Where the expression E {□… / D} characterizes the conditional expectation of the non-declared income (A) knowing the declared income (D). Here $\underline{D}$ is the lowest reported income made individually and $\overline{Y}$ is the highest reported value of the market income (Y).

[11] For current tax legislation there are no infinite periods of audits and fines. It last, in the case of Ecuador for example, 6 previous years of audits (t-6) and no more.

Also, $F_D(D)$ is the induced distribution function over D, which is assumed to be a continuum.

Lastly, other innovations in the optimization evasion A-S-Y model include: 1. a labor supply function as an endogenous variable within the utility maximization function of taxpayers (Cowell 2004; Scotchmer 1989; and Scotchmer and Slemrod (1989). 2. incorporate the perceived uncertainty of the correct tax liability, which forms a probability distribution. 3. Mayshar (1991) introduces the concept of tax technology, analyzing tax authorities' activity towards the operation of the taxpayers, which nowadays can be neutralized by tax accountants. 4. Collins and Plumlee (1991) examine the decreased compliance among participants with higher income, which connects with the previous point,[12] and 5. Erard and Feinstein (1994) extend to a game-theoretical model, allowing for two types of taxpayers: one completely honest and his opposite, the entirely dishonest taxpayer, in a dichotomic approach. However, it is proposed to increase the types of possible evaders, using a Likert scale, with 5 or more categories in a discrete manner instead of a continuous one.

1.2.2. Income Tax Evasion Models under Behavioral Approaches

Behavioral approaches have been present in economic analysis since its foundations. However, it regained strength in the second half of the last century, having as two of themost notable references to Kahneman and Tversky (1979). They offer a general explanation of decision digression from the canonical complete rationality. In doingso, Kahneman et al. (1982) present some illustrative concepts in the behavioral approach, such as *overconfidence*, *optimism*, *anchoring,* and *extrapolation*. Also, judgments (*beliefs*) and *cognitive biases* are represented in the prospect theory and the two systems models of thinking, system one, which is called automatic, compared to system two,called reflexive (Kahneman 2011).

Another essential reference in this area is Richard Thaler (1980 and 1988), who used synonyms as *anomalies*, *biased*, *irrationality*, or *puzzling* to describe all economic phenomena incapable of explaining the traditional complete rational idea, the core of neoclassical optimization models. Also, together with Sunstein, they differentiate the existence oftwo types of agents, the first type they called Econs, and the second one Humans. Furthermore, Thaler and Sustein (2008) developed in deep the nudge theory as a cost-effective public policy instrument, including their use in tax interventions. A remarkable

[12] This is so because most of the tax legislation has progressive rates and even if the tax rate were flat, the tax amount is directly related to the market and/or declared income. At some point, the richer the taxpayer the optimal for him is to contract an accountant or even a buffet of layers. That is why tax havens exist.

notion is that those paternalistic interventions are applied without affecting freedom of choice.

Under the empirical results of optimization models, the incorporation of behavioral components has resulted not only in better analysis frames but also in better predictive power.This is so because the behavioral approach reduces some of the biases already enlisted (Leicester *et al. 2012*; Congdon *et al. 2009*; James 2017). The seminal studies of tax models applying behavioral approaches come from Benjamini and Maital (1985). They study the implications of tax evasion under three components: subjective probability bias, perception *of environmental behavior, and social stigma*. In the same way, Samuelson and Zeckhauser (1988) add another behavioral concept: the *status quo bias*, which represents the enormous preference of people to continue selecting existing or historical choices, also known as *inertia*. Later, Levi andSuddle (1989) stressed the role of *reciprocal altruism* in tax compliance, for which some evaders' behavior depends on the response, motivations, and intentions. This idea was combined with the concept of *psychological attitudes* to other individuals, which may differ from the reaction to other economic agents like the government or any other organization, including firms.

Following Hashimzade et al. (2013), the leading behavioral components in tax evasion models have been proposed in *prospect theory and social interactions*. Under Prospect theory instead of expected utility theory, Dhami andAl-Nowaihi (2007) present an alternative tax compliance model, where the model inserts biases of the perceptions of people in two forms: *the inclination of people to overestimate insignificant probabilities* (like tax audits); and *the proclivity of people to overuse a money estimation of losing cost for the choice process* (known as loss aversion[13]). Related to the first form, Hashimzade *et al.* (2013) argue that the real possibility of tax audition is not understandable to average taxpayers. Then, they argue that taxpayers' choice is under ambiguity rather than under risk or uncertainty[14]. These authors referenced the Ellsberg Paradox (1961) as a clear example of the tendency of people to avoid ambiguity. This factor influences the taxpayers' choice process and is called *ambiguity aversion.* Under ambiguity-aversion, individuals comply less if the tax administration hides specific audit procedures and probabilities

[13] From an econometrical point of view, loss aversion could be split into two metrical components: one is risk aversion and the other is inequality aversion. Both are key elements in the latest tax evasion models.
[14] The difference between ambiguity and risk is the knowledge of probabilities associated with each choice. For the former, those are unknown; while, for the latter, those are well known.

information. Inthis case, information interventions like nudges are expected to have a high positive effect.

Under the second group, the social interactions contrast with a purely individualistic attitude. Some psychosocial concepts are developed here, such as *the desire for social justice, fairness, ethics -and tax morals-* (Alm 2018; Weber,Fooken and Herrmann 2014). Those models introduce to the tax analysis some relevant evidence that is well known, which taxpayers usually are biased not only for their specific perceptions but also for their community, religion, cultural, and general group influences *(*also known as herd effect*)*. Then, that sort of characteristic explains that the same interventions for different environments (regions or countries) might result in different outcomes. This model includes individual aspects as control variables, like *emotional costs, status, and perception of social justice.* These models' essential and analytical result is that emotionalcosts increase when people are anxious about being discovered, fined, or shamed publicly.

Introducing the behavioral elements in the structure of the optimization model (from equation [5] in this document), individual behavioral factors could be inserted where equation [12] represents this expansion, and ι_0 describes behavioral elements that increase compliance, and ι_1 defines all behavioral components that increase non-compliance. Further, these behavioral elements could include other socio-demographic variables such as age, sex, ethnicity, and years of schooling, among others, called control variables in an econometric approach.

$$E[U] = (1-p)U(W, s_0, \iota_0) + pU(Z, s_1, \iota_1) \qquad [12]$$

Summarizing the ι components and following Fischer et al. (1992), four major features affect tax evasion: 1. demographic factors (like age, sex, and ethnicity); 2. the nature of taxes (self-employment, source, and level of income); 3. perceptions and attitudes (e.g., sense of social justice); and 4. institutional characteristics of the tax administration (like simplicity, service-oriented, information about the probability ofaudits, sense of control). However, recent studies based on surveys and for developed countries mainly show that some individual socio-demographic characteristics have *minor or no impact* on evasion. Nevertheless, that group factor still must be included as a control variable to improve estimation outcomes (Hofman et al. 2017). First-order conditions and evaluation for D<Y for equation [12] state as follows:

$$-\pi(1-p){U_1}'(W, s_0, i_0) - (\pi - f)p{U_1}'(Z, s_1, i_1) = 0 \qquad [12a]$$

$$\frac{dE[U]}{dD}|_{D<Y}: p * f < \pi\left[p + (1-p)\frac{U_1(D(1-\pi), s_0, i_0)}{U_1(D(1-\pi), s_1, i_1)}\right] \qquad [12b]$$

Here U_1 is the partial differential on actual income, and assuming that

$$U_1(D(1-\pi), s_0, i_0) < U_1(D(1-\pi), s_1, i_1) \qquad [13]$$

The second component on the right-hand side is higher than the basic model formulation; therefore, adding behavioral components might increase the utility expected on undeclared income and become less than their regular tax rate. Additionally, Hashimzade et al. (2013) reviewed the recent models in which behavioral economics techniques have beenapplied. These contemporary approaches have dealt mainly with *social interaction*. Those alternative models are better at forecasting the observed degree of compliance. They almost correctly predict the fiscal or dodging effect. However, the question remains about the difference between developedand developing countries, not only for tax revenue outcomes but also given the previous structural characteristics, which also affect the behavioral frames and outcomes.

1.2.3. Restricting Behavioral Components on Tax Models

Even so, several elements from the behavioral economics literature have been shortlisted following and summarizing recent literature about behavioral components in tax models and nudges (Halpern and Gallagher 2017; James 2017; Ariely 2016 and 2014; Wendel 2016; Thaler and Sunstein, 2008). Here, eight concepts arepresented in two sets: individual factors (from 1 to 6) and social or collective factors (7 and 8).

Individual Behavioral Factors (i)

1. *Immediate Time Preference***,** including myopia, as was pointed out previously by Kahneman and Tversky (1979) recognized the fact that most peopleare impatient. They prefer immediate utility towaiting for something similar or even better outcomes in the future. One of the tremendous psychological studies about this subject is called the marshmallow experiment, which tests the attitude called self-control or self-awareness (Mischel, Ebbesen, and Raskoff 1972). Seminal authors and posterior implementations find that self-control is highly related to better outcomes later in life. Applying this for tax compliance might result in choosing a good taxpayer attitude and considering incentives or regards from tax administrations. For instance, some recent studies have implemented reducing late payments through the automatization process

(Boning 2018).

2. *Anchoring,* from a consumer approach, is a method of priming or taking an orientation number, which guides any following choice involving a specific price, value, or amount. The process proposed by Kahneman and Tversky (1974) explains that it takes place without our consciousness or rationality. Applying this for tax compliance may affect knowing in what proportion citizens pay taxes, giving the taxpayers a number to remember. One of the most frequent messages inthe letters sent from the Tax Administrations is the percentage of taxpayers who pay those taxes on time.

3. *Default* or inertial options are pre-set choices that take a result if nothing else happens or is indicated. Default is also a possible result of the choice process or decision-making under uncertainty (Thaler and Sunstein, 2008). If anyone wantsto change the default option, he must place the order or change it, incurring transaction costs. For instance, in the taxes field, some experiences of suggested statements or the tax withholding mechanism exist. (Van Dalen and Henkens 2014).

4. *Loss Aversion* is one of the essential concepts associated with prospect theory, and it is summarized as *losses loom larger than gains* (Kahneman and Tversky 1979). Psychologically, the effect of losing is as high as one hundred percent more painful than the pleasure of winning. Then again, individuals are more eager to take risks to avoid losses. Also, loss aversion could explicate variances between risk-seeking people and more conservator ones. After that, the elementary principle of loss aversion may be applied in behavioral changes where fine frames are often more effective than reward frames. The most common tax strategy is a monetary fine if evasion is detected.From a pure money view, most citizens see taxes as an income loss, then changing this perception could be a good strategy for increasing compliance.

5. *Framing* is related to how you present a situation; even when the quantifiable results may be the same, how all possible solutions are shown matters. Then, choices could be expressed to highlight eitherthe affirmative or the adverse facts of the same choice frame. A typical example applied in the tax area is this: encouraging taxpayers by proposing a monetary reward for entirely complaining shows better results than imposing the same amount of money as a fine for non-compliance (Kettle et al. 2016).

6. *Mental accounting is a first term, together with the fungibility of money, but it is* treated in its different components: assets, current income, or propensityto consume (Thaler

1990). For example, small, unexpected gains of a small amount of money from a tax return are commonly treated as pocket money, which will probably be consumed almost immediately. On the contrary, a big-money amount (lottery wins) is seen as wealth or asset (Thaler and Sustein, 2008) and invested (in a rational approach). Another example applied to money management is using credit cards, where decomposing the purchase of an expensive item makes the customer feel better by reducing the current payment in small peperiodical parts (Thaler 1999).

Social or Collective Behavioral Factors (s)

1. *Fairness* is interconnected with opinions that individuals may have respect for their peers or other taxpayers (James 2017). Also, it is associated with the perception or sense of social justice. Where identical conditions may derive in equal treatment and vice versa. In tax studies, the former is called horizontal equity, while the opposite is called vertical equity. Some behavioral studies show that unfair perceptions of the tax system lead to less compliance from individuals and firms (Mascagni 2018).This perception is typical of developing economies like those in Latin America.

2. *Social Norms* involve many simple concepts like cultural environments or group effects**.** All those linked concepts bind people to behave properly and are based on non-write rules or behavioral expectations shared into a group of people, who often have many other factors in common[15] (Dolan et al. 2010), sum up as values, including morality.Other relevant categories are, among others, *status*, *prestige*, and *hierarchy*. One economic implementation of these concepts is the feedback that some service companies give their customers. Often, thisis considered an effective mechanism used in behavioral modification programs (Allcott 2011). Also, this mechanism has many variants: e.g., it can be either descriptive statistics or a number demonstrating most of the good behavior or normative behavior expected. The primary strategy is to give information that allows individuals to compare themselves to the rest of their close environment. At the same time, the main objective is to reduce harmful or unwanted collective behaviors. The normative behavior expected is advantageous when undesirable behavior is predominant in a society or group (Cialdini, 2008); non-compliance might be, in principle, a non-

[15] They probably share general aspects like socio-demographic factors (related with patriotism, for instance); as well as more close relations like kinship or family ties.

desired social behavior.

1.2.4. Nudges Interventions for Tax Compliance

Even though the *nudge* approach is part of the behavioral framework, it is slightly more specific than other behavioral instruments. First, the nudge objective is to win and keep a positive change. Also, the core idea of the nudges tool is taking distance from assumptions like complete rationality of what Thaler and Sustein (2008) called econs, which isattributed to the traditional neoclassic economic theory in general and the A-S-Y evasion tax model in particular. Then,the actual individual taxpayers act more like *human*s. Thus, other concepts, such as predictable irrationality, challenge the complete rationality idea.

Nowadays, economic analysis has been gaining ground from the behavioral perspective, of which instruments suchas *nudges* stand out for their cost-effectiveness. In this sense, nudges might be defined as indirect suggestions and positive interventions, which look for reinforcement to accomplish compliance fully and could affect taxpayers' motivations, economic incentives, and choice process for both groups and individuals (Brent et al. 2016). Another functional characterization of nudges from a general perspective says:

Any aspect of the choice architecture that predictably alters the behavior of people without forbidding any options or significantly changing their economic incentives or limiting options. Counting an intervention as a mere nudgemust be easy and cheap to avoid (Thaler and Sustein, 2008: 6).

Also, nudges may be defined as transfer with less regulation, which characterizes a mixture or *middle ground between sticks and carrots,* offering an intermediate group of potential interventions (Bradley 2013, 842). Moreover, to understand the concept of nudges and how they operate, it is vital to comprehend taxpayers' economic incentives or tax attitudes. Thus, following the Compliance Model developed by the Australian (Australian Tax Office 2002) and the New Zealand government (2003), there are four types of taxpayer attitudes and motivations. Hence, four appropriate official or strategic responses (see Table **1.1**).

Thus, the first challenge of any tax administration is to observe, identify, measure, and classify their taxpayers' attitudes; only after that can they implement the recommended strategies. Then, nudges are recommended only for third and fourth taxpayers' attitudes, viewed as entirely or at least almost positive attitudes. On the contrary, bad behavior or attitudes need direct and substantial interventions; in the extreme, criminal attitudes need the full force of law and police.

Also, from the Tax Administration's point of view, interventions and audits generate high costs. Then, once characteristics of *taxpayer citizens* are identified, the Tax Administrations can manage those to influence contributors themselveswho wish to be classified in this group, reducing administrative costs. However, as Damgaard and Gravert (2016) pointed out, the incomplete application of *nudges* could also cause distortions in the expected effects of the interventions. Because of that, they propose and estimate a structural modelto analyse the expected results on welfare, and their findings show that if these adverse effects are not considered, the possible *good results* may be overestimated (Bicchieri and Dimant 2019).

Table 1.1. Taxpayer Actitudes and Recommended Intervention Strategy

Group	Observed Taxpayers' Attitudes	Recommended Tax Administration Strategies
1	It is not compliance at all. It includes formalization and illegal activities (thismust have a pure criminalization approach).	Apply full power of the law and government to identify evaders fully, formalize the economic activities if possible, or fullpunishment.
2	Absence of compliance, but legal activities and some kind of formalization.	Dissuade through audits or other means of identification and fines.
3	Most economic activities are formal but sometimes make minor mistakes.	Implement help mechanisms such as manuals, training courses, or customer service desks.
4	The taxpayer, willing to do the right thing, who is concerned about hisreputation and social influence.	Seek simplification mechanisms and indirect suggestions (nudge).

Elaboration: Author based on James (2017)

1.2.5. The Aggregation Problem: Income Tax Non-compliance for Firms

There is an essential difference between non-compliance between individuals and firms (Badertscher, Katz, and Rego 2013; Givoly, Hayn, and Katz 2010). While individual tax evasion has been studied mainly as a risk issue and portfolio selection problem, corporate income tax evasion could be viewed as a multilevel strategy. The strategic behavior of multiple people and different hierarchies change the economic relationship between firm owners, chief executive officers (CEOs), and accountants. Moreover, institutional factors (inside the firms) may have a significant role in deciding compliance. This process distorts the traditional financial incentives derived from the A-S-Y model. Sadmo (2005) defines firm evasionas a managerial decision not adequately reporting a taxable corporate profit to reduce tax payments. In this line, Chen and Chu (2005) find evidence that tax evasion increases the profit retained by firms not only at the expense of the risk of being detected, as individuals also do, but the efficiency of internal control is lost.

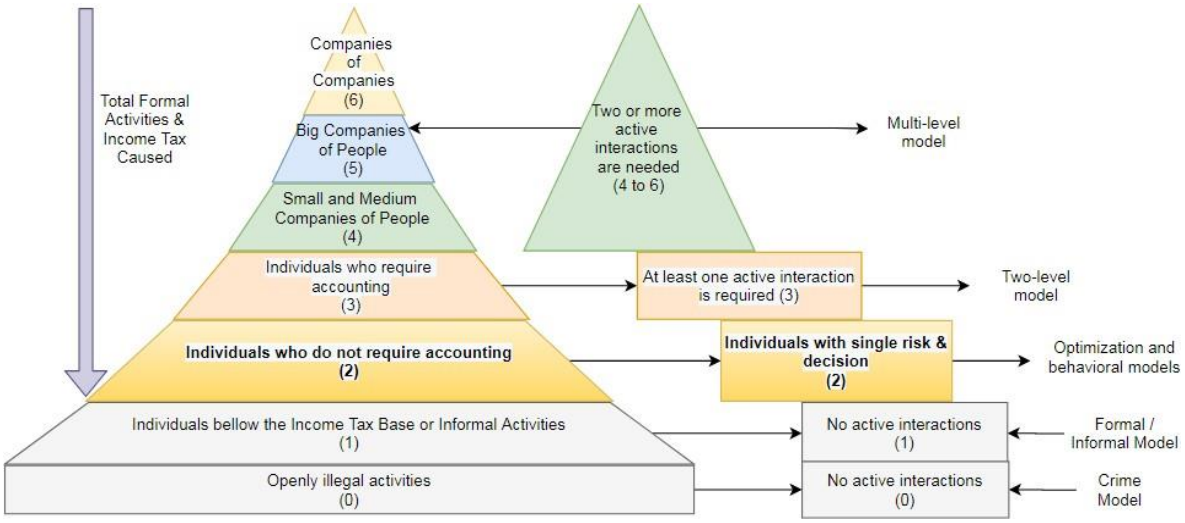
To illustrate the aggregation problem, a pyramid of economic units is shown (Fig. **1**). It summarizes the levels of aggregation concerning income tax. It presents the segmentation information from the SRI (2019 and 2018). Here, six levels of aggregation have been identified, and it is derived that optimization and behavioral models would only explain the second level, leaving out most groups and the taxpayers. On the left side, the purple arrow represents the inverse relationship between the number of economic units per group and the level of economic activity and, therefore, the income tax caused and paid[16].

On the right-hand side of Fig. (2), four blocks highlight the number of internal interactions required in economic units before even declaring taxes and later paying them. Thus, the interactions are defined internally as a unique institution where the compliance or non-compliance decision is made. These interactions, when they exist, are relevant since, as indicated by Givoly, Hayn, and Katz (2010), the higher the number of people involved, the less risk aversion or, in other words, the higher the probability of evading taxes. Beyond the traditional income tax evasion model with the risk trade-off, there is an additional trade-off or cost: the internal firm control. A new problem arises when the cost of corporate evasion tax cannot be formulated in the standard individual tax evasion model. Consequently, some interactivemechanisms must be analyzed.

As Kleven et al. (2011), together with other authors (Hsieh and Klenow 2009; Restuccia and Rogerson, 2008), point out that firms tend to declare as little net income as they can, in the sense that they tend to underreport their total income and costs simultaneously. This type of behavior generates many institutional problems such as horizontal inequities between firms, tax morale affectation, and the deprivation to tax authorities of third-party information.

[16] There is an apparent paradox here, because the major percentage of taxesis paid by firms but, at the same time, firms account for the bulk of tax evasion too (Abdixhiku et al, 2017)

Figure 1.1 Pyramid of Types and Levels of Economic Units that Should Pay Income Tax



Elaboration: Author

Summarizing the literature on this matter, the likelihood of firm tax compliance depends on, 1. the tax rates and penalties (Bayer and Cowell 2009; Cowell 2004); 2. the general perception of social fairness and government corruption (Goerke, 2008); 3. the firm governance mechanisms (Desai, Dyck, and Zingales, 2007), and 4. the interactions between formal and informal firms (Mathias et al. 2015). The latter characteristic is also examined by Brockmeyer et al. (2019), among other authors, constituting another level of interactionthat takes place outside the firms' structure and occurs instead between firms. In the following sub-sections, the characteristics related only to firms are reviewed.

1.2.5.1. The Difference between Ownerships, Administrative Staffand Internal Firm Control

Starting from a risk aversion approach, the relationship with evasion is that the smaller the number of ownerships, the more risk averse. Where one extreme approach may be, the individual ownerships on the other side must be firmed asownerships of other firms. In this scheme, another critical variable may be the control capacity, meaning that who hasat least 51% of the shareholding and, above all, decisions. Then, ownership participation in administrative decisions like tax paying is crucial in this research. There is another controversy about the CEO's power, like the firm's officers, directors, and accountants, i.e., insiders (Badertscher, Katz, and Rego 2013; Givoly, Hayn, and Katz 2010).

In each case, it was found that firms with higher rates of managerial stock ownership avoid less income tax than firmswith lower rates of managerial stock ownership, consistent with

tax avoidance increasing in the separation of ownership and control. Second, firms may select firms to acquire based on specific observable attributes. Badertscher et al. performed a test based on propensity score-matched samples of management-owned and another kind of firm address,both with and without the Heckman (1979) endogeneity procedure. They found that higher concentrations of ownership and control are associated with less corporate tax avoidance. From these results, they linked marginal costs with tax planning, together with a tax avoidance increase.

Nevertheless, they also considered an alternative explanationfor these findings. Individual private firms achieve lower marginal costs from tax planning, facilitating more significant income tax avoidance (Badertscher, Katz, and Rego 2013).

1.2.5.2. The Agency Theory of Corporate Tax Avoidance

Another approach was scanned by Chen and Chu (2005) onthe agency theory in corporate governance. This approach states that managers should act in the best interest of the firms' stakeholders, who have no direct voice. The foundationof the agency theory is that corporate executives have a moral and monetary duty to act in the best interest of all involved parties. Thus, the direct relation is high pay, and massive bonuses for executives motivate and reward CEOs for quality work and compromises that bring in extra income for themselves as well as for all shareholders. This relation and feedback might directly affect the totalavoidance tax.

In this sense, Chen and Chu (2005) found that the higher the number of ownerships, the greater the probability of tax avoidance, or tax non-compliance. For their study, they used the Russell Index reconstitution firms. This scheme shows that tax avoidance is related to higher profit margins. Also, it is stated that individual executives play an essential role in determining the level or share of tax avoidance that firms undertake. They took an approach developed by Hölmström (1979), where two possibilities were analyzed: the completely honest taxpayer versus the evading principal combined with the management contract strategy.

The strategy model is based on two stages: the contract agreement and the income finally realized (Y) and declared (D). Finally, they found that penalties imposed on the tax manager are more effective in reducing evasion than those imposed on shareholders.

1.3. Methodological Review of Income Tax Evasion

From the seminal A-S-Y tax evasion model up to now, there have been lots of attends of measurement and, above all, to reducethis unwanted social behavior. Thus, according to Weber et al. (2014), in the literature, there are at least six (plus one) current trends in studying tax evasion and attached to them are the interventions to measure and increase tax compliance for any type of society, with particular emphasis on developing economies. But one of the most significant problems in middle and low-income economies is the high level of informality of the economy (CEPAL 2018; Gómez Sabaini et al. 2017). An alternative approach to the standard deterrencemodel would report the selection between formal/informal sectors (Fig. 1).

Then the reasoning of an economic agent in informality regarding income taxes is that the taxpayer receives a higher pre-tax wage rate for formal-sector work. Still, the income is taxed at the mandatory rate where it cannot be evaded, opposite to the informal sector, where wages are untaxed unless detected by a random audit. Then, tax pressure depends on the detection capacity and the perceived probability of audition. Bellow, the seven principal evasion detection methodologies are described, from the most general, starting from a macro level to more specific detention.

1.3.1. Currency Demand Approach

Starting with the idea that non-compliance is an ethically andsocially unacceptable behavior, the worst-case scenario not only for tax base but also for regulation and control is whatis known as a shadow economy or unobserved economy, where nothing is regulated, so neither is taxed. Feige (2016) includes in this category "the unreported, no observed, unduground, illegal, informal and unrecorded economies" (1). He also estimates for developing countries that up to one-third of the monetary value of all economic activities could fall in this category[17]. For instance, Dybka et al. (2019) estimated the shadow economy for 43 countries, and they found that it is in the range of 2.8–29.9% of GD This approach is not only concerned with tax base reduction, but it also lowers the quantity and quality of public goods. Also, this issue distorts market competition, deteriorates economic as well as social institutions, and ultimately reduces economic growth.

[17] According to the ECLAC report (April 2020), regarding the labor market, the informal sector represents up to 60% of workers on average in Latin America.

Thus, estimations of the magnitude of the unobserved economy could be used to broadly estimate tax evasion (Schneider 2005), one of the most used methodologies in this issue is the currency demand approach. But, given the nature of these activities, and because unobserved factors are often outof sight, these kinds of estimations suffer from serious measurement and accuracy problems, together with the difficulty of assuming the velocity of money as constant, both "over time and between the official and the unofficial economy" (Weber et al. 2014).

On the other hand, interventions performed to reduce non-compliance under this approximation have a higher objectivethan only reducing tax non-compliance. The main aim is to fight illegal economic activities in general; here, the powerof law is mandatory. An application made by Dybka et al. (2019) uses a Multiple-indicator Multiple-case model with panel-structured information on the latent variable with both parameters: the mean and the variance obtained from the Currency Demand Analysis estimation. Today, technology can improve estimates from this issue, e.g., through the development of electronic payment bill systems. In the taxfield, electronic invoicing is spreading all over the world especially in Latin America (Barreix et al. 2018). It could bean opportunity if it can be used in the best way, fighting crimes or assets laundering.

1.3.2. Consumption-Based Estimations

A second stage is related to the nature of the evasion opportunity factor, where a pattern of overconsumption of self-employed individuals is commonly observed compared to employees with similar declared incomes but underthe employment dependency relationship. Then, the gap between declared income (D) and consumption (C) is used to estimate tax evasion rates (*e*). Classic examples are food survey data and analysis from developed and developing countries (Alves and Alfonso 2019; Weber et al. 2014; Pissarides and Weber 1989). Another measurement that complements food consumption to other goods and servicesis the consumer loan data, which uses information from significant banks to approximate the households' real income (Artavanis *et al. 2012*), usually called third-party information. The advantage of this second method overthe consumption surveys is that this one identifies evident features that are intensely associated with accurate andunobservable market income (Weber et al. 2014).

The arrival of better, more powerful computers and data analysis methodologies like Big Data is becoming increasingly common. In this sense, electronic invoicing also would offer

detailed information from third parties, like supermarkets, which can help to identify this gap between income and consumption with a much higher level of detail, even at the product level of consumption (Barreix et al. 2018). More recent studies also point out that consumers may act as auditors. Naritomi (2019), for instance, one study in Brazil exploits a quasi-experimental application and administrative data on firms and consumers from the antitax evasion program in São Paulo, finding an increase in 9.3 percent of cleared income (D).

1.3.3. Tax Moral Surveys of Perception

Most of the studies about tax morale use two primary survey sources for both developed and developing countries: The World Value Survey (WVS) and the European Value Survey (EVS), which cover more than 400,000 observations across more or less 108 countries (Matthaei et al. 2022; Richarson 2016; Lago-Peñas and Lago-Peñas 2010; Frey and Torgler, 2007). Usually, the EVS and WVS contain one or various questions about the tendency of the people to justify or not justify evasion if they have the opportunity to do so. This measurement is called selfreported tax morale and is discussed to be directly associated with tax compliance or inversely associated with tax evasion (Weber et al. 2014).This measurement could act as a proxy of social norms in a descriptive form. From those studies, authors also observethe close relationship between tax administration confidence and tax morale at the macro or country level and micro or individual level. They point out that even though vertical confidence matters, horizontal confidence in the form of system confidence is not linked to tax morale (Matthaei et al. 2022).

Also, inter-country variances, which include cultural and institutional differences, were identified. Furthermore, this survey evidence generalizes that confidence diverges in different vertical and authority circumstances. However, they brought this methodology as incapable of identifying any indirect path from generalized belief to tax morale using the *governance quality index* as a reliable measurement. EMV, for example, in four meta-analyses aboutthat kind of study that comprise more than four hundred samples with a population of six thousand and a hundred countries, issued from 1958 to 2012, shows that the predictable effect sizes remained small. There is less than 15% for relationships between evasion and socio-demographic characteristics or market income. Another significant result is that those estimated effects were more significant in Westerncountries than non-Western countries, showing that *culture matters* (Matthaei et al. 2022; Richarson 2016).

In contrast, beyond statistical descriptions, a regression analysis based on data from 45 countries showed that economic determinants are less critical than non-economic determinants or social determinants, those latter having the most massive impact on tax evasion (Richarson 2016), where the simplicity of tax system is the most significant determinant of tax compliance. Other tax compliance factors are socio-demographic control variables like education, nature of income, fairness, and tax morale. Moreover, regression results indicate that the lower the level of complexity and the higher the level of education and tax morale, the higher the level of tax compliance.

However, a weakness of this kind of study is that surveys with self-reported attitudes towards evasion of compliance may bias people's objective perspective because they may not report dishonest or illegal behaviors by themselves (Weber et al. 2014). Durlauf and Nagin (2011) say that, in countries where the perceived probability of detection is very low, any slight modification in the perceived likelihood of audit could have a significant effect. So, messages from Tax Administration letters are advantageous in this sense.

1.3.4. Tax Audits: Randomized or Selective

In general, the tax administration did not know if taxpayers reported a positive gap (A) between the market income (Y) and declared income (D). To estimate this gap with precision, costly tax audits are necessary. They provide more accurate information and a direct measure of individual compliance; later, it could be aggregated. However, audit data is reserved and only available for very few developed countries (Weber et al. 2014). Besides, even costly audits may not detect evasion with one hundred percent certainty, and it is budgetary impossible to audit all taxpayers. Because of that, there is a need for randomized audits (Schneider 2005). A more cost-effective institutional intervention could be selective audits based on indexes orrisk models to segment taxpayers based on variables such as importance or income, amount of tax, and evasion records. In the case of Ecuador, for example, for individual taxpayers, there are two groups: required and not required to keep accounting (Graph 1). In the case of firms, there are particular taxpayers and the rest of the firms. One of the advantages of this type of methodology, with risk indexes, is that impact evaluation strategies such as discontinuous regression for impact evaluations. On the other hand,in tax evasion literature, audits are measured by audit probability and rate (Cason et al. 2016), regularity and times of audit, and audit cost (Beck and Lisowsky 2014).

Also, as was pointed out before, third-party information is possible to use to identify non-compliance or a suspicion of it for the calculation of risk indexes. To do so, two approaches

may be used: a macro level through the control of the corruption index (COI), and an individual evasion index (IEI). The COI is used as a proxy for the measurement of a country's corruption level, where it reveals the views and the magnitude to which public power is exercised for private gain or government capture by a few, often wealthy or influential people called *elites* and individual interestsover the public interest. The index uses survey informationon minor and outstanding corruption forms (Murshed and Saadat 2018).

1.3.5. Laboratory Experiments

In recent years, the use of lab experiments in social sciences has risen, and a new field of study has emerged: *experimental economics*, which includes both lab and field experiments. Most of this kind of research follows an elaborate protocol, which includes filling out questionnaires in a controlled environment and frequently more than a single trial (Behavioral Science Lab 2019).

Thus, there are advantages as well as disadvantages to using lab experiments for measuring tax compliance (Alm 2012; Torgler, 2007 and 2002). The first and most remarkable advantage is the possibility of testing theoretical assumptions and concepts in an environment controlled by the researcher at a cheaper cost than field experiments. Also, compliance may be quantifiable; here, most institutional alterations might be easily testable, and it islaid back to scrutinize the causality of effects. Likewise, laboratory experiments have clear advantages compared to only analytical models or the opposite, like round estimations and self-reported survey evidence. Alm (2012, 65) says that laboratory experiments allow for direct observation of decisions to evade, making it possible to classify taxpayers and observe other characteristics like loss aversion, risk-neutrality, *or inequality aversion*, plus all sociodemographic characteristics. While only analytical models regularly do not take account of all important aspects of the choice process.

However, the lack of realism and generalization in laboratoryexperiments is hardly criticized[18], meaning a lack of external validity, which can be handled by power sample estimation. Another drawback is the overuse of scholars as investigational subjects, and critics arise because students might have little or, in the extreme, no experience with compliance procedures, including tax reports. Furthermore, university students generally have an advanced education level compared to the average taxpayers or evaders (Weber et

[18] For example, extreme punishments like jailing may not be included inthe laboratory experiments.

al. 2014). However, the real cost of a field experiment is less, which can compensate for the drawbacks. Also, making a mistake in a laboratory experiment is less severe than making so in a field experiment, where even the credibility of thetax administration can be compromised, increasing the lackof confidence in the tax system and, later, reducing tax compliance.

Hence, these two mechanisms, laboratory and fieldexperiments, should be seen as sequential rather than rivals; that is, procedurally, the first thing that should be done is a laboratory experiment before going out into field experiments.

1.3.6. Field Experiments

To overcome the apparent lack of realism[19], the externalvalidity, and the sample power problems from laboratoryexperiments, field studies are carried out; but it is worth saying that it is usually at a high monetary cost. This massive kind of research ensures an extraordinary external validity ofthe outcomes, an almost complete realism, and significant sample power. It is so because they take place in a non- controlled environment where real taxpayers are the subjects of investigation, who often are not necessarily informed about participating. The large sample and their natural habitat of tax evasion are complex to be modelled in laboratory experiments (Weber et al. 2014).

Since the beginning of the current century, economic field experiments have been part of the credibility revolution (Angrist and Pischke 2010; Duflo 2006). Whenimplemented correctly, the control group is built into or as good as randomization. However, policymakers are dubious about allowing tax experiments. The other problem is the scaling up of the results. Moreover, as in laboratory experiments, some institutional changes could not be applied.

A typical example of this is the routine implementation of randomized audits, both small and large, which are very costly (Mascagni 2018). On this side, the most implemented Randomized Controlled Trials [RCTs] were the letter interventions in both physical and electronic formats. In these, the tax administration selects a taxpayer's sample, divides it into two ormore groups, and randomly sends the letters.

Usually, there are four types of letters. First, letters withmessages generally provide information about the enforcement environment, such as the penalties for detectedevasion

[19] The author disagrees with this statement of "lack of realism" in the sensethat only individual taxpayer evolves in a "natural environment", but firms and any organization are artificial by construction, and managers contract highly educated and experienced accountants. However, she uses the expression following the majority of literature.

(*f*). The idea is to convey the increase in an audit's detection probability (p). Second, letters with more direct and more persuasive messages than the firstgroup. It includes notes like: Your return will be closely examined. Here, the behavioral change depends on the taxpayer's perception of the detection probability (p) function. Third, letters that include tailored messages of non-compliance, where the information might come from third-party provided forms. Nevertheless, sadly, if the information is inaccurate or inadequate, as in developing countries used to be, taxpayers are induced to cheat or evade (Chiliquinga and Ramirez 2017). Fourth, letters with factors outside of the deterrence model. Here, other behavioral elements, such as nudges, are cast off, such as civic duty or tax morality. In contrast to the A-S-Y model, the latter type of message must be irrelevant for any amoral taxpayer and entirely rational taxpayers.

1.3.7. Big Data and Artificial Intelligence

A promising recent development is available for analysis of administrative tax data, also called big data, due to the massive amount of information, and goes beyond the institutional tax audits. It compromises internal information returns, administrative tax records, and third-party sources of information, as well. Up to 2010, this information became mainly available in developed countries. However, recently, it has been available for developing countries such as Ecuador, Uruguay, and Costa Rica. The principal advantage is the significant statistical power to extend external validity findings over the effect of interventions and tax management. This data allows for inspecting other aspects, such as heterogeneity, clustering, or even culture-related variables (Seco and Munoz 2018), when different databases could be merged.

In contrast, some issues stand up with this type of strategy. Data must be anonymized to preserve taxpayer privacy, and other technological policies must be implemented to prevent data misuse. These concerns have led to a situation where only a small group of academics access this information, reducing the replicability of studies. With the consolidation of information such as declarations, purchase annexes, credit cards, social security reports, deposits, and exports, the Tax Administration can identify taxpayers who must declare before the expiration of their obligations, allowing more appropriate management of income tax declarations (SRI 2018). Thus, it could be a cost-effective strategy.

Finally, the last advance in tech and information is related to artificial intelligence, which has advantages liketraining algorithms to detect possible frauds practically instantaneously

(Ruan et al. 2019). In China, for instance,those methods were applied to obtain an essential reductionin activities like false or fake tax invoices or accounting manipulations; those strategies go hand in hand with the auto-atomization process. This technological advance will minimize discretion in evasion controls and possible delays.

In summary, section three describes seven methodologies to measure and handle tax non-compliance, following the six most studied in tax literature plus the most currently developed according to new tech and research advances. In the next section, results from the three most used methodologies are presented and restricted to developing countries during the past decade 2010-2019.

1.4 Empirical Applications and Main Results

Previous sections underlined the central behavioral and nudge ideas on a theoretical side. In this section, the three most developed methodologies with microdata have been studied in depth: audits, laboratory, and field experiments. Also, consider applying impact evaluation techniques to find causal relationships.Then, reviews of the most recent empirical literature and their results on the earlier defined properties are presented. For doing so, the eight behavioral and nudge characteristics displayed in section 2.2.1 are considered, given that the experimental studies on tax compliance are extensive and widespread; this document reviews only developing countries' implementations, which are restricted to 2010-2019.

In general, most empirical studies' findings recommend that behavioral aspects like fairness and social norms hypothetically determine better outcomes from the compliance side. After all, filing and paying taxes is not only an individual-choosing process, even for individuals, but also a social predicament for individuals and firms. Here, private and public interests contradict each other, depending on the previous values. Also, paying taxesis considered on a personal level but at a social level beneficial to the general public.

1.4.1. Tax Audits

Most of the studies based on these methods were designed withstratified random audits over new micro-data leaked from extensive tax administrative data. Among the other reviewed methodologies, this approach is the most reliable and costliest and has legal implications for both the tax administration and taxpayers. Unlike in developed countries, where audits are applied as a deterrent tool in developing countries, greater audit enforcement is required where detection and sanctions are mandatory.

Studies steadily found that significant rates of tax evasion arefor self-employment and small business income and are linked to fraud on social security, too. Also, most studies were conducted in developed countries, where tax compliance is generally high (Alstadsæter et al. 2019; Slemrod 2010). In a meta-analysis frame, results show that over 478 outcomes between 1978 and 2018, the only tax rate significantly impacts reducing tax evasion. The impact of theaudit is heterogeneous, and two significative factors are the national culture and the income level of countries.

For middle and low-income countries, audits for individuals and firms are carried out periodically here. The problem is that less than 1% of taxpayers could be audited. In Indonesia, for example, there were around 640,000 self-employed who lodged their 2014 annual tax return, and roughly 4,600 tax auditors were 0.7% in proportion (Rosid etal. 2019), share similar to Latin America countries, such as Argentina, Brasil (Naritomi 2019), Colombia, Ecuador, Mexico or Peru. Audit plans are also used to select sub-sectors. One subsector could increase the probability of an audit by reducing the probability of other sectors; this phenomenon is named probability neglect. In practice and budgetary terms, accurate audits have a very low probability of occurrence, and sequentially, so do the detection and sanctions. However, from behavioral studies, it is derived that instead of taking into account the actual rate of audits, the perception of audit that taxpayers self-estimate (mental accounting)may be a better predictor (Bobek and Hatfield 2003).

In recent years, with data availability, third-party information has been used to estimate risk indices and characterize taxpayers so that a few audits can be implemented cost-effectively. Thus, a better strategy is carried out by combining several methodologies plus audits, detection, and sanctions.

1.4.2. Microsimulation Models - ECUAMOD

The first documented use of microsimulation techniques in economic analysis dates back to the 50s of the past century (Orcutt, 1957; Sutherland and Figari 2013). However, it was not until the 70s and 80s that the use became widespread with the development of both more powerful computers and more advanced programs. In developing regions like Latin America, its applications became popular towards the end of the 90s and the beginning of the 21st century (Sutherland 2014).

Those models use household survey data as the primary input. Then, there are different levels of parametrization or translation of regulations and policies in a system of internally

consistent arithmetic equations. Many of those models combine survey information with administrative data, not only as input information but also as a validation process. The output of these models might be a single simulated variable, a whole simulated dataset, or different comparative scenarios (Sutherland and Figari 2013).

Many models are used for ex-ante policy reform evaluations, which are handy tools for designing tax-benefits policies or so-called anti-poverty interventions at reasonable institutional costs. Among other microsimulation models, this study considered the ECUAMOD tax-benefit microsimulation model (Jara et al. 2021-22). It is part of the SOUTHMOD project, which has been working in Ecuador since 2016 under the coordination of UNU-WIDER. This project aims to develop microsimulation models for countries in the Global South with limited resources. Also, it uses the same platform as EUROMOD for UE-27, and specifically, the ENEMDU plus ENIGHUR household survey data was parameterized for Ecuador.

Microsimulation models applied in economic analysis focus on the budgetary and distributional effects of individual taxes (VAT and income tax), cash transfer policies to and from households, and their previous, present, or -possible- future reforms. Apart from harmonizing data, concepts, and language programs, international projects have advantages in the comparability and interchangeability of tax-benefit policies. Currently, 12 free access models cover all developing regions: Latin America, Africa, and Asia (Jara et al. 2021-22).

1.4.3. Laboratory Experiments

Despite the sample power problem, some lab experiments also contributed to finding the most significant variables that explain and contribute to reducing tax evasion. Alm et al. (1992) developed one of the most known studies. They tested four different options of positive rewards as incentives for compliance: (1) a lottery, which had the most considerable effect on compliance; (2) a fixed compensation for compliant subjects; (3) an audit reduction; and (4) a public goods intervention. Later, there is evidence of no significant differences between students and non-student samples. Also, they find less compliance among students (Alm and Malézieux 2019).

In recent studies, more elaborate strategies were implemented. For example, in 2008, Herrmann *et al.* reported an application of some laboratory experiments on public goods replication, including the second step of pricy fines in 16 different countries. They discovered different patterns across the countries, finding that social norms or cultural

environments are significant. These experiments were designed to recreate the *social predicament* connected with public goods in the laboratory. Then, two characteristicsare necessary to classify products as public: the non-excludability and the non-rivalry in consumption. The resultsof these conditions lead to underinvestment in the private provision of public goods (called the crowding-out effect). Similar lab experiments were carried out in Latin America by Blumenthal et al. (2001) and Castro and Scartascini (2015).

In the public good experiment, the first participants are randomly allocated to groups where each participant receives a monetary endowment and makes an investment decision: keeping the whole or parts of the funding or contributing itto a public good. Second, all contributions to the public goodare doubled by the experimenter and equally split among all group members. Here, standard economic theory would predict the free-riding of all group members and, therefore, no contributions to the public good. However, as in the ultimatum game, lab experiments find substantial heterogeneity in levels of participation and *voluntary cooperation*. Moreover, only stable shares of individuals tend to free-ride or cooperate conditionally on the behavior of other participants, while others contribute at least tentatively (Weber 2014).

Recent lab experiments try to measure and explain the contribution of behavioral factors, such as social norms or culture, equity, sense of justice, reciprocity, and moral appeals (Luttmer and Singhal 2014). They highlight two main results: the cross-cultural perspective, meaning that there were differences across different countries, and group identity like *patriotism* is an essential predictor of compliance, in conflict times and together with fiscal propaganda or governmentcommunication. Also, lab studies report that individual characteristics matter marginally (Alm and Malézieux 2019). Upto now, there are no lab studies using nudges for Latin America, and literature for other developing countries is scarce.

1.4.4. Field Experiments

Opposite to lab experiments in the region, interventions through field experiments have been on the rise during the past decade in the applied economy, and it is so because of the technological improvements and the combination with big data analysis. Also, as was mentioned earlier, field experiments promise a high external validity of the results. Thus, one of the first field implementations was investigated by Slemrod et al. (2001) with a

sample of 22.368 tax returns in the USA. The tax administration sent taxpayers a letter in 1994, which varies the taxpayers' perception of the probability of an audit. The main result was that compliance increased by 12% in two dimensions: income and opportunity to evade. After that, Kleven et al. (2011) confirmed the importance of deterrence with 42.800 randomly selected taxpayers in 2007 and 2008 in Denmark[20].

Recently, in Argentina, for instance, Castro and Scartascini (2015) studied the implementation of a field experiment about compliance and enforcement with 23.000 individuals randomly selected taxpayers. They found a positive relationship between both elements. In 2017, Hallsworth et al. (2017) used the ideas of Herrmann et al. (2014) to implement two natural field experiments to enhance tax compliance. In 2015, a massive field experiment was also implemented in Ecuador called Declaraciones sugeridas (Chiliquinga and Ramirez 2017), where mixed results were found. It is worth mentioning again that most of the models and experiments performed only focused on the taxpayers as individuals. Relatively fewer studies haveanalyzed the dynamics and behaviors thatoccur in firms or organizations in taxes. In Ecuador, Carrillo,Pomeranz, and Singhal (2017) analyzed the effectiveness of information from third-party sources as a deterrent to compliance with corporate income tax, for which they designed afield experiment for about 8,000 taxpayers in which a notification was sent.

Among the few attempts to research firms' compliance is the study carried out by Doerrenberg and Schmitz (2015) in Solvenia for accounting small firms and the recent survey of Brockmeyer et al. (2019). In Chile, Pomeranz (2015) analyses compliance with the VTA through two field experiments on a universe of about 400,000 companies. In Costa Rica, a randomized experiment shows that credible emails increase tax filing and payment (Brockmeyer et al. 2019). The effect persisted over two years, and treated firms became more likely to report transactions with other firms, facilitating future tax enforcement. An email experiment with dissuasive messages in Ecuador was implemented to comply with the corporate income tax with heterogeneous results (Ramirez 2019).

1.5 Discussion and Evaluation

Compelling the three components reviews, so far, at least four gaps could be identified; first, the optimization tax evasion model A-S-Y still underestimates tax compliance; second, it not

[20] The literature on developed countries is bigger than this, but it has not developed due to the central attention of this analysis is in developing countries.

clear and uniform the significance and impact that behavioral components have on the probability of compliance, whether it depends on other components like income country level; third is the time-related or dynamic results of interventions like nudges, where the lack of persistence and the fourth gap is associated with the aggregation problem.

Although each methodology has advantages and disadvantages, the current state of economic research and analysis implies that models might be not only in analytical schemes with general and unrealistic assumptions. The ideal model should also be studied in applied fields, where empirical approaches complement the analytical results. Beyond this, itis also desirable that analytical and practical studies converge with economic policy objectives such as increased revenue for the government or reduced tax non-compliance.

Table 1.2. points out the previously reviewed methodologies with their advantages, disadvantages, and explanatory variables about tax compliance. Where it can be seen, the most reliable methods are based on Tax Audits, but it is costly not only because of budget restrictions but also time-consuming. The other increasingly used method is the field experiments. However, most of them are too costly in terms of administration and have a high opportunity cost in terms of lost confidence and later revenues. Then, to solve those drawbacks, laboratory experiments are highly recommended to evaluate ex-ante any possible interventions at a reasonablecost and credibility.

Table 1.2. Summary of methodologies that measure tax non-compliance

Methodology	Advantages	Disadvantages	Explanatory Variables
		Macro-Level	
1. Currency Demand Approximation	• Low-cost estimations for the Tax Administration • Harmonized for international comparability. • Data available	• Most of the general assumptions are at the cost of accuracy. • There are no specific and administrative strategies to reduce evasion	• Monetary Base • Number of transactions • GDP • Aggregate consumption
2. Consumption-Based Estimations	• Administrative or survey data is available. • Some strategies could be implemented at an Institutional level	• It is still too macro for control strategies to be implemented. • Required another verification method to correct any deviation identified.	• Consumption loans • Credit card expenditures. • Income reported to the tax administration
		Intermediate level	
3. Tax Moral Perception Surveys	• Harmonized for international comparability.	• Based on perception and self-reported metrics • The strategies could be implemented at an institutional level only	• Individual perceptions, components, and characteristics • Collective perceptions, social norms, and cultural factors • Attitudes about evasion
		Microdata level	
4. Tax Audits	• Legal implications. • Real and accurate measures.	• High-cost estimations in personnel, time, and budget.	• Real market income (Y) • Real reported income (D)

	• Be able to manage the perceived probability of audit.	• Usually, it is beyond Tax Administration capacity. • Low number of audits performed	• Real costs and expenses (C) • Real individual characteristics • Risk indices and models • Real institutional characteristics
5. Microsimulation models	• Not only harmonized questions and variables for international comparability but also harmonized concepts and functions. • Combine perception and self-reported metrics with administrative data. • Produce better outcomes than descriptive statistics based on simple surveys due to the external validation process. • In an upper level could be connected with general equilibrium models • Being able to program behavioral components.	• Because it is costly, those tools are possible mainly under international research projects and funding. • Needs a high level of institutional coordination and bureaucracy. • In basic and intermediate levels, it generates only partial equilibrium results.	• Simulated market income (Ys) • Simulated reported income (Ds) • Simulated costs and expenses (Cs) • Real individual characteristics or imputated ones. • Simulated institutional characteristics
6. Laboratory Experiments	• Fewer costs of estimations and no opportunity cost of losing tax revenues. • Internal validity • Theoretical assumptions can be tested.	• Possibly a low sampling power. • Possibly no external validity.	• Simulated Market Income (Y_s) • Reported income simulated (D_s) • Treated and control groups. • Individual and collective characteristics • Behavioral attitudes
7. Field Experiments	• High external and internal validity • Accuracy and reliability.	• High-cost estimations in budget and administrative resources. • Opportunity cost from the loss of tax revenues.	• Estimated market income (Y_e) • Real reported income (D) • Estimated costs and expenses (C_e) • Treated and control groups. • Real individual characteristics • Real institutional characteristics
8. Big Data and Artificial Intelligence	• Available for Tax Administration • External and internal validity for declared incomes. • Interconnected information available for suppliers and customers. • Big Statistical sampling power	• Limited availability for researchers • Biased due to non-declared incomes • Personal information laws allow identifying neither individual taxpayers nor enterprises; it is only allowed to add values. • Allows correcting the underestimation of noncompliance for self-employment income.	• Food and other Consumption expenses through electronic bills • Assets and liability metrics • Other types of income and expenses • Banking transactions

Elaboration: Author.

1.6 Conclusions of the Chapter

Analysing tax compliance or non-compliance in developing countries is far different from doing so in developed countries. This document presents a framework that explains mostof the results of nudge interventions, and then a three-component review is proposed.

The first component is the theoretical review, where income Tax compliance or non-compliance could be defined, considering different aspects like the declaration of the actual income and posterior tax payment, the time when the tax is paid, and the level of enforcement. The most remarkable and referential tax compliance or non-compliance model is the A-S-Y optimal model proposed by Allingham and Sandmo (1972) and extended by Yitzhaki (1974). In this risky choice formulation, the probability of audit, the rate of tax, and risk aversion explain non-compliance. This model analyses only market income, letting outside costs and expenses under the net income approach.

The main challenge of the A-S-Y model is the underestimation of compliance under empirical contrasts. Then, behavioral models arrived by the end of the past century. Behavioral components applied in taxes challenge the idea of complete rationality and show more prediction power. In this sense, behavioral models could be considered a more general frame to explain compliance or non-compliance. In this document, eight behavioral components were exposed and described. Moreover, behavioral components challenge the idea of pure monetary utility, introducing other components like social normsor culture.

Another assumption under the optimization model is the ideaof individualism. To overcome the limitation, a pyramidal scheme was analyzed. It has six levels, and the A-S-Y model and its behavioral components only fit for one of the six levels. Under the individualistic models are other levels of informality and truly illegal activities. Above the individual taxpayer level are firms and organizations that need more active interactions before declaring incomes, costs, and taxes and paying them. The review of corporative tax evasion models shows that multilevel strategies areneeded.

The second component is the methodological review. Here, the objective is to identify and measure tax evasion through six classical methodologies mentioned in classical literature, from the macro-level to the intermediate up to the microdata level. Here, one new methodology was added with thetechnological and research advances.

The third component is the empirical review; the results of the three principal methodologies under microdata information are presented here. For audit studies, the main result is that the

actual probability of audits is very low and interchanges between subsectors. From lab experiments, many behavioral components are tested for individual taxes only. In the last decade, studies based on field experiments have increased in developed and developing countries, of which randomized control trials RCT are the most used. This methodology has been used for individual and firm' taxes; furthermore, tangible effects on tax revenue have been observed. On the contrary, potential errors in field applications can be more severe and undermine confidence in the tax system; this added to the higher implementation cost compared to lab experiments.

The elements of the three reviews, as well as the advantages, disadvantages, and principal explanatory variables, are summarized and evaluated. This exercise reinforcesthe idea that a unique methodological approach is almost impossible, so a combination of methodologies and tools is needed. Finally, from a microdata point of view, lab and field experiments could be complementary and the most usedin recent studies due to the impact evaluation technique, which leads to inferring causal relations.

Chapter 2. An Administrative Panel Data Impact Evaluation About Reactive Nudges on Personal Income Tax Compliance with Real Taxpayers

2.1. Introduction of the Chapter

As was already pointed out in the first chapter, tax evasion presents a far challenge in developing nations compared to developed counterparts, with evasion rates more than doubling those of regions like the European Union (ECLAC 2018; Rosid et al. 2019; WIDER 2023). In perspective, tax revenues in developing countries average 14 percentage points less of the GDP than in OCDE countries (Rasteletti and Saravia 2023). For instance, in Ecuador, studies by ECLAC (2018) revealed significant evasion levels not only in VAT but also which are as high levels of evasion in personal income taxes among autonomous workers and producers operating in the informal economy, impacting personal income tax declaration and tax payments ultimately, creating what is termed tax evasion opportunities (Alm 2012). This disparity is not solely attributable to a lack of legal enforcement or a pervasive informal economic culture where informal economic activities are socially tolerated. It is also rooted in Tax Administrations' limited resources and authority, perpetuating a vicious cycle of informality-evasion, crime impunity, and lack of control (Becker 1974).

To reduce tax evasion levels or, in other words, increase tax collection, several strategies have been implemented from the side of national governments and tax administrations. In this sense, there is a dearth of literature on cost-effective interventions for Tax Administrations, mostly in developed countries and in the minority in the global south, particularly concerning administrative data and behavioral strategies like *nudges* (Alves and Afonso 2019). One of these strategies has been reactive nudges, which the tax administration has singled out among the tools to bolster tax compliance. Compared to simple informative nudges, these interventions are heaviest as they entail the coordinated involvement of not only tax auditors and legal experts but also IT engineering, statisticians, judges, and even prosecutors within the Tax Administrative framework (SRI 2019). From an organizational standpoint, they represent the most impactful avenue for intervention, with legal implications for both sides, taxpayers and tax authorities.

From the institutional point of view, there is a pessimistic sight that if these heavy interventions fail to yield increases in tax revenue, no other intervention will suffice. Nonetheless, a secondary impact could be the heightened perception of audits among those directly audited and surrounding stakeholders such as accountants and CEOs (Ramirez-

Alvarez 2023). The specialized nature of professionals involved in tax audits renders such interventions highly costly for tax administrations. However, taxpayers in developing countries are not randomly selected but targeted based on risk models, considering factors like market income, specific activities, tax payment amounts, and other personal and societary characteristics (Oliva and Aparicio 2010). Consequently, while a zero-sum outcome may be possible, governments seek to increase revenues in a governmental revenue strategy alone.

Regarding the methodology, most applied studies utilize the simple semi-logarithmic linear models to calculate the impacts of Tax Administrative interventions over income declared and tax paid for the government revenues and tax-income elasticities (Bermúdez and Castillo 2017)[21]. However, more reliable approaches use the traditional approach to estimate impacts through a propensity score match (PSM). This method usually focuses on one of the two aspects: balancing the covariates or estimating the scores. To solve this drawback limitation, Imai and Ratkovic (2014) proposed the Covariate Balancing Propensity Score (CBPS) to reach both objectives simultaneously; here, the CBPS approach is used combined with Fix Effects estimators to determine the impact of SRI intervention.

The remainder of this chapter is structured as follows. The second section provides a theoretical framework for a behavioral approach to tax evasion models, focusing on reactive nudges. The third segment summarizes the state of the art about applied studies using CBPS. The fourth section shows a summary of the personal income tax in Ecuador from 2000 to 2020. It delineates the specific application of the reactive nudges within the Ecuadorian context and a subset from 2010 to 2018 with the available data. The fifth part outlines the data utilized in the current evaluation and elucidates the identification strategy employed. Subsequently, the sixth section engages in a discussion and evaluation of the results. Finally, in the seventh section, conclusions are drawn based on the findings of the previous section.

2.2. The Behavioral Framework

From the first chapter, it was pointed out that while the ASY evasion model is well-suited for analytical and mathematical purposes, its primary weakness lies in its low predictive power for empirical and econometrical studies. This limitation underscores the potential of

[21] In Ecuador, like any other developing country, at least 75% of taxpayers declare zero in tax (SRI 2010-18), despite taxpayers' having nonzero market incomes and other relevant characteristics. In econometric terms, the personal income tax variable exhibits zero-inflated properties. Therefore, a more suitable econometric specification for the estimation of tax-income elasticities might be a Tobit model (Cameron y Trivedi, 2005).

incorporating behavioral insights and tools to enhance tax compliance without the drawbacks of detection and sanctions-based methods. Incorporating behavioral components in optimization models might improve the analytical framework and enhance predictive power. This is so because analytical approaches mitigate previously identified biases (Leicester *et al. 2012*; James 2017).

2.2.1. Income Tax Evasion Models under Behavioral Approaches

Behavioral tactics have been integral to economic analysis since its beginning as a science in the late 18th century. Then, the behavioral approach gained prominence in the late 70s of the twentieth century with two pivotal moments that marked the development of this field: the late seventies with the work of Kahneman and Tversky (1979) and in 2017 with another winner of the Nobel Prize in economics, Richard Thaler (2008) together with Sunstein. Both stages provided general explanations for deviations from the neoclassical idea of **complete rationality**. In challenging this idea, Kahneman et al. (1982) introduced key concepts in what is studied as behavioral economics today. Among others, key concepts include but are not limited to *anomalies, excess optimism, overconfidence, overreaction, anchoring,* and *extrapolation*. They likewise explore how *cognitive biases* and judgments (*beliefs*) are characterized in prospect theory and the two systems of thinking: automatic and reflexive (Kahneman 2011). Meanwhile, R. Thaler (2008) further analyzed behavioral tools like nudges. Using terms such as anomalies, bias, irrationality, or puzzling to describe economic phenomena deviating to an incomplete rationality or predictable bias. Thaler, along with Sunstein (2008), distinguished between two types of economic agents: Econs, who are close to supercomputers or robots, and the second one, Humans, who are more realistic and limited in math abilities and decisions.

Unlike optimization models, like the ASY evasion model, which focuses on complete rational agents, behavioral models (Hashimzade et al. 2013) offer two schemes. First, strategies such as the carrot approach or incentives (Weber et al. 2014) can be used. Second, money maximization can be extended to include other valuable outcomes like social recognition and public regard (or punishments) (Ajzen 1985). Starting in the 21st century, several applied studies on taxation using behavioral tools were widespread, most for developed countries (OCDE 2021). In other words, nowadays, there are limited studies conducted on the behavioral aspects, not only in taxation but also in other fields of economics in developing countries such as Ecuador.

In addition to the principal authors mentioned above, the seminal studies that used behavioral components in tax models originated with Benjamini and Maital (1985). Those authors explored the impact of tax evasion by considering three behavioral factors: one is the subjective probability bias, and the second is the environmental, behavioral perception, and social stigma. Similarly, Samuelson and Zeckhauser (1988) introduce the idea of *status quo bias*, now known as *inertia*. Later, Levi and Suddle (1989) focused on *reciprocal altruism* in tax compliance, where the actions of some evaders are influenced by the reactions, motivations, and intentions of other taxpayers around them. From those studies, an alternative approach to addressing the solely monetary assumption of the ASY model was incorporating the individual reputation as a valuable and desirable outcome, a behavioral component.

A key feature of behavioral strategies is that they do not impose high monetary costs but are marginal from the institutional side. At the same time, they are easy to deal with for the economic agents as taxpayers in the *human* definition. To avoid without altering their freedom and preferences and ultimately without breaking the libertarian paternalism principle of Thaler. With this latter idea in mind, nudges and taxes are inherently contradictory. Subsequently, the nudge approach challenges the currently most used and traditional punishment tax policy tools.

According to Hashimzade et al. (2013), prospect theory and social interactions characterize the primary behavioral components in tax evasion models. For econometric purposes, the ladder group of components is preferred because social interactions challenge the idea of a purely individualistic attitude of *econs* in neoclassical tax models. Later, some psycho-social concepts were deeply explored, such as social justice, fairness, and ethics—or tax morals—*(Alm 2018; Weber et al.* 2014).

In addition to the structural and behavioral factors already noted, other important control variables for the econometric estimation were stated by Fischer et al. (1992) in four groups that influence tax evasion. One is constituted by demographic factors (such as age, sex, place of living, ethnicity, etc.). Two is the nature of taxes (mainly referred to the source and level of income). The third aspect joins other behavioral elements like attitudes and perceptions (e.g., preference for justice and avoiding unfairness). The fourth group comprises institutional characteristics of tax administration (such as minimalism, a service-oriented approach, clear information about the probability of audits, or at least a perception of it).

Nevertheless, recent survey-based and econometrical studies showed that common individual socio-demographic attributes have *little to no impact* on tax avoidance. Despite this, a meta-analysis study has shown that demographic factors should be involved as control variables to enhance estimation effects (Hoffman et al. 2017). Moreover, in the case of non-removable natural resource abundance such as Ecuador, empirical evidence has shown that natural resource wealth is linked to less information transparency and, consequently, less tax collection or more tax evasion and avoidance (Mohtadi et al. 2019).

Even in developed countries like England, adverse results are still observed based on survey data and behavioral approaches (James 2019). Most people prefer to pay in cash for services to avoid taxes. Other acts included avoiding public transportation fares, cheating if possible, purchasing stolen goods, claiming devolutions or benefits without the proper documentation, and, with the least amount of justification, accepting a bribe. Also, the cited study found a gap between age groups and gender. Older people and women tend to follow the law more than younger people and men, and the first groups evade the less.

2.2.2. Reactive Nudges and Taxation

Given that the application of behavioral tools is a relatively recent advance in econometrics in general, and for developing countries in particular, there is a most innovative concept called reactive nudge. This concept emerges because many empirical studies suggest that behavioral factors, such as fairness and social norms, lead to better compliance predictions and outcomes. Filing and paying taxes is not only an individual decision-making process but also involves social considerations for individuals and corporations' staff. In this context, private and public interests may conflict with each other, depending on the previous set of values, beliefs, and morals. On a personal level, paying taxes can be perceived as costly and a psychological loss of income and time. However, on a social level, it might be perceived as beneficial as it funds public goods and services (WIDER 2023a) and the social protection system.

For this research, a reactive nudge is defined as every persuasion method carried out by the Tax Administration before legal sanctions or monetary fines but keeping the threat of it, given the force of law and the authority of the tax administration. This helpful tool does not contradict traditional forms of tax auditing but instead reinforces them by increasing the taxpayers' perception of auditing. A notable methodological feature of audits is that they often rely on administrative data methods and are designed using stratified random sampling

from extensive micro-data. Among the various methodologies reviewed, this approach is the most reliable and expensive but has legal implications for tax administration and taxpayers. In contrast to developed countries, where audits serve as a deterrent, the same audit tools in developing countries require stricter audit enforcement, where detection and sanctions are legally mandated (Mascagni et al. 2016).

On the other hand, studies on administrative data and random audits steadily found a significant difference between rates of tax evasion for self-employment and small business income compared with those employees in a labor dependency relationship only (Alves and Alfonso 2019; Weber et al. 2014; Pissarides and Weber 1989). Also, these kinds of evaders may have the same fraudulent attitude toward social security contributions. While taxes are not directly associated with public goods and services, social security contributions could be directly linked to direct health, retirement pensions, and unemployment insurance services.

As already pointed out, most studies on tax interventions were conducted in developed countries, where tax compliance is generally high as a starting point of analysis (Alstadsæter et al. 2019; Slemrod 2019). A meta-analysis of 478 outcomes from 1978 to 2018 found that only changes in tax rate significantly reduced tax evasion. However, the impact of audit is heterogeneous, influenced by factors such as national culture and the country's average income levels.

In middle- and low-income countries, audits for individuals and firms are typically conducted periodically. However, less than 1% of total taxpayers are audited. For instance, in Indonesia, around 640,000 self-employed individuals filed their 2014 tax returns, but only about 4,600 were audited, this represented just 0.7%, meaning less than 1% (Rosid et al. 2019). This share is quite like that of Latin American countries, such as Argentina, Brazil, Colombia, Ecuador, Mexico, and Peru (Naritomi 2019). Besides, audit plans often target specific sub-sectors, increasing the likelihood of audits in one area at the expense of others, a phenomenon known as probability neglect. In practice, the probability of an actual audit, and consequently detection and sanctions, is very low. However, behavioral studies show that rather than the actual audit rate, the perception of audit or how taxpayers mentally estimate their likelihood of being audited, may be a more effective predictor of tax compliance (Bobek and Hatfield 2003).

In recent years, increased I&D, transparency, and data availability[22] have enabled third-party information to analyze and estimate risk indices and build profile taxpayers, allowing audits to be conducted more cost-effectively. As a result, a more effective strategy combines various methodologies with tailored controls, interventions, audits, and sanctions.

2.2.3. Tax Amnesties Change the Behavior of Taxpayers

Although the research proposal did not consider this topic, this dynamic partly explains the results. Within the structure of tax policies, some interventions change taxpayers' behavior for the better, increasing tax collection, but others change taxpayers' behavior for the worse. Sometimes, tax amnesty could fall into the first group and other times in the second group of policies, to the point of being considered harmful to tax collection, as Mamesah and Kristanto (2021) showed in their meta-analysis study. The results of 22 earlier studies assessing the advantages of tax amnesty policies are non-consistent in a unique direction. Some studies confirm that tax amnesty programs improve private citizens' tax compliance, mainly during the first implementation or after a long period. The expected result is that the more taxpayers take advantage of the tax amnesty policy, the more they report and pay their taxes as required. However, this initial positive result may decrease the impact of tax collection as this policy becomes more and more recurrent. Then, for subsequent implementations, tax administrations need to examine current regulations to convey the appearance that it is too easy for taxpayers to acquire this tax amnesty facility, which motivates worse taxpayers' behavior waiting for the subsequent amnesty implementation.

On the other hand, according to Purwanti et al. (2020), taxpayers willing to apply for tax amnesty programs have a specific profile. For example, they studied the business taxpayers who applied that policy in Indonesia from 2016 to 2017. They argue that knowing those characteristics may help map the motivational sorts of taxpayers contributing to higher tax compliance. The authors used logistic regressions to tax audits, tax evasion, and corporate risks, influencing taxpayers' decision to participate in amnesty programs and other incentives.

Another study by Gita and Hidayatulloh (2019) reveals that taxpayers' compliance is not impacted by taxation knowledge; it is possible that taxpayers might have a limited comprehension of the payment and reporting processes. Perhaps because taxpayers believe

[22] Unfortunately, Ecuador's tax data availability has shown the opposite since the COVID-19 emergency, and this situation particularly affected the culmination of this thesis.

that the penalties imposed for breaking the law are relatively low, taxpayers might also believe that there is now little support for tax sanctions on taxpayer compliance. Consequently, taxpayers are encouraged to act in a disobedient manner.

2.3 Empirical Studies About Nudges on Taxes

Regarding Andreoni et al. (1998), a good model might comply with at least two properties: high predictive power and helpful for policymakers. In a timeline, before the 80s, there were scarce studies about tax evasion worldwide. The earliest robust and consistent studies were made during the eighties of the past century. One of the most remarkable first authors, Clotfelter (1983), explored the factors that influence tax evasion not only in a sum amount but also as a percentage of the total tax revenue for the central government of the USA. He showed the relation between marginal tax rate and tax evasion and found significant effects of three levels of tax rates over underreporting incomes and consequently tax paid. From a methodological point of view, the author used linear logarithmic specification models. For his part, Feinstein (1991) employed an econometric analysis with pooled USA data from 1982 to 1985 of income returns and explored the factors that increase the tax evasion problem. He proposed a variety of model specifications, such as the Tobit model, which is under the concept of a latent variable for extended evasion or the propensity to evade, and the Fractional Detection Model. One of the remarkable results is that there was no significant relation between income and evasion, but a negative relation was estimated with the marginal tax rate and evasion. Those results were consistent with Yitzhaki`s previous analysis. According to Slemrod (1985), tax evaders tend to report at the top of a tax range instead of within its interior, opposite to truthful taxpayers with no incentives to modify or manipulate their tax form.

Along with Andreoni et al. (1998), the determinants of non-compliance, among other factors, are the opportunity to evade, the marginal tax rate, the level of market income, and the set of individuals and demographic characteristics. Other studies with experimental or simulation approaches found that crucial features linked to evasion are the perceived audit probability, the monetary number of fines, the actual frequency of audits, age, and sex. For instance, there is consistent evidence that age is negatively related to evasion, while females evade less than males (James 2019; Baldry 1987; Friedland et al. 1978). Nevertheless, all those studies were focused on developed countries - specifically the USA or England- while in middle- and low-income countries, there were few or no studies even by the end of the 20th century. In the 21st century, and especially during the late 2010s and 2020s, numerous studies have been

implemented using experimental field data, survey data micro-simulations, and administrative big data approaches in both developed nations and developing countries. The application of AI models in tax evasion studies suggests that while significant progress has been made, much work remains.

Some of the most remarkable authors in Latin America studies about tax compliance transferences and income inequalities are Alvaredo, Bourguignon, Ferreira and Lusting (2024); Jara et al. (2024); Duran (2023); Flachaire et al. (2022); Clifton et al. (2020); Cano (2017); Espinoza Medina (2015). Some remarkable studies on tax evasion using experiments and behavioral tools in Latin America are Lopez-Luziriaga and Scartascini (2023), Carrillo et al. (2021), Londoño-Velez and Àvila-Mahecha (2021), Ortega (2020) and Scartascini, C. (2019) where the authors used behavioral tools to explain the differences in income declaration and taxes paid, in sum tax evasion. Also, fewer studies use administrative data, including Kotsogiannis et al. (2024), Alm (2021), and Beer et al. (2020). The latter study showed that audits might have significant deterrent or counter-deterrent impacts. One year following an operational audit, taxable income is predicted to rise by 15% overall, but it is heterogeneous among demographic variations. However, it is also anticipated that the year after the audit, the declared income will be reduced by 15% and up to 21% by the third year without subsequent audits. According to these findings, continuous audits and better-targeting audits for non-compliant taxpayers would increase auditable income and positively impact future tax revenues.

Recent studies have provided sufficient evidence that inadequate taxpayer information is one of the biggest obstacles to tax compliance, especially in developing countries (Schächtele et al. 2022). Nevertheless, there is a dearth of field experimental evidence regarding low-cost interventions to enhance taxpayer registration as a starting point, and this contrasts with the literature on nudging taxes. In Brazil, for instance, the tax administration sent emails to 160k Brazilians to promote online registration. Compared to a control group, a straightforward invitation dramatically increases taxpayer registration, but including a lottery prize message decreases the registration. In the Dominican Republic, the tax administration conducted a natural experiment to investigate the effects of deterrence messages on tax compliance. They sent letters to 56,310 businesses that collectively paid $700 million in tax yearly before the experiment. After the experiment, tax revenue increased by $184 million (Holz et al. 2023). None of the studies cited used panel data from the same country within three or more periods.

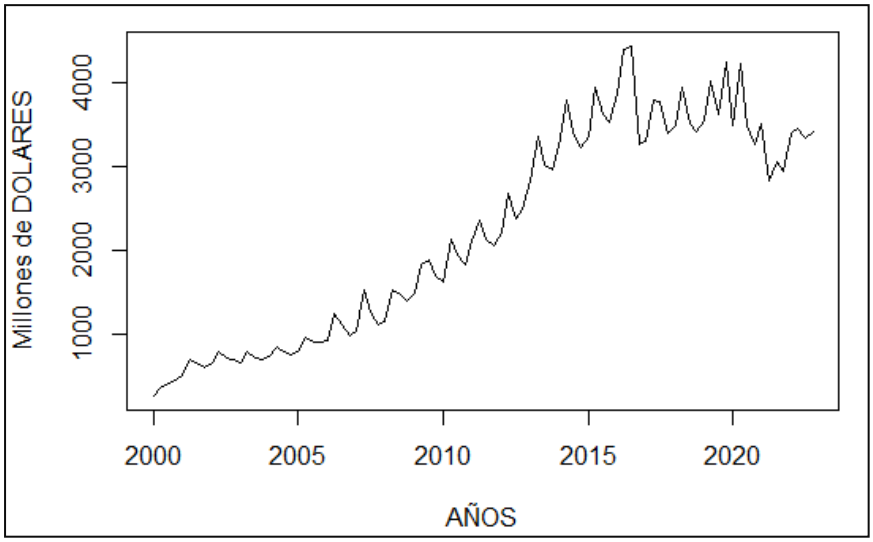
Another study, with more than 10k taxpayers in a randomized controlled trial in Indonesia, used informative letters, deterrents, and an administrative simplification option. It showed that simplicity, implemented using billing codes, has the highest chance of a prompt settlement and increases compliance by 32% compared to the control group. However, deterrence increased tax collection by 27%, and the informative letters were the least effective, with a low significative effect (10% confidence) and a 12% impact (Yogama et al., 2024). At the end of the day, various behavioral and informational barriers could also prejudice taxpayers, and a nudge approach may help them to get beyond those obstacles (Antinyan and Asatryan 2019). As a preliminary conclusion from the literature review, nudges have had varying degrees of success in increasing tax collection. This indicates that apart from previous structural social and economics, the efficacy of nudging interventions also depends on the design issues and managerial implementation. Furthermore, beyond nudging, other behavioral tools have not yet received attention, like boots, which are programs that focus on taxpayers' competencies for making decisions, and sludge, which are institutional characteristics that obstacle tax compliance (Alm et al. 2023).

2.4 Personal Income Tax in Ecuador

In Ecuador, there are two tax systems. The national system is under the administration of the Internal Rents Service (SRI 2012), and the subnational system is under different rules, with different levels of local governments (Ramirez-Alvarez et al., 2024). The Internal Tax Regime Law regulates National taxes -LRTI- (Congreso Nacional del Ecuador 2004). From 2000 to 2017, the tax revenue showed a positive tendency, as seen in Graph 2.1; this series shows a notable seasonality in April each year, where societal tax income is previously declared and paid. However, since the beginning of 2018, there has been evidence of stagnation in tax collection, mainly because of the stagnation in economic growth. This situation also can be related to business or commodity cycles (ECLAC 2018).

Four tax remissions and amnesties have occurred since the SRI's creation in Ecuador. The first was in 1997 with a low impact, and this regulation also blocked new remissions for the next ten years. The second one was in 2008 for interest and fines amnesty, which considerably impacted on tax collection. The third was in May 2015 with minor impact again, and the last was in 2018 (SRI 2019). This last tax remission in 2018 consisted of forgiving interest and fines if the taxpayer paid the tax, and it was more generously than the two previous ones from the taxpayers' view (SRI 2018). At that moment, tax amnesty negatively influenced even citizens who had previously been scrupulous about paying their taxes.

Graph 2.1. Monthly Nominal Taxes Revenue Evolution from Jan 2000 to Dec 2022

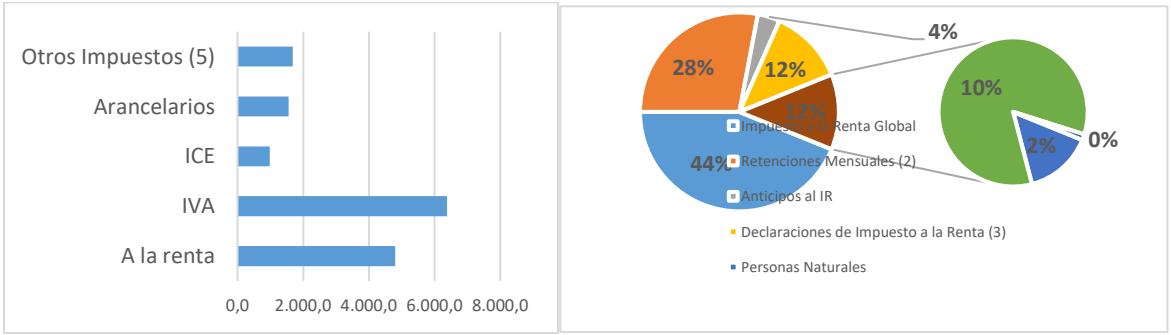


Elaboration: Author *Source*: SRI (2022)

After that, the COVID-19 tragedy affected the world, significantly reducing the 2019 and 2020 tax revenues and production levels and increasing poverty and inequality (Jara et al. 2021). Scartascini (2019) and Guerrero (2020) pointed out the negative side of this strategy in their studies.

Under the law's force, the tax income of Ecuador is paid at the individual level. This means there will be no couple conciliation or per-capita taxable income until 2022, as in other countries like the USA. Also, according to the national accounts (BCE 2022) and the SRI revenue statistics, 2018 income tax was the second national revenue after VAT. However, this tax must be divided into personal and societal income tax, representing around 12% of the national taxable income, as shown in Graph 2.2.

Graph 2.2. Income Taxes in the National Account for Ecuador



Elaboration: Author *Sources*: BCE (2022) and SRI (2022)

According to the LRTI, taxable income is calculated as the summation of earnings from dependent and independent labor, extra pay even in species, income from capital, and income

from rent, private transfers, and/or gifts. Methodologically, there are certain exemptions for income aggregation, such as the 13th and 14th monthly salaries, the unemployment reserve funds, and the two-time deductions for disability and old age. Deductions from taxable income include social security and personal and patronal contributions. Until 2021, deductions were allowed for five categories of personal expenditures: housing, education, food, clothing, and health, apart from costs and investment of autonomous and professional workers. Up to 2019, the maximum deductible amount was US$14,703, which could be allocated across the categories of housing, education, food, and clothing, with each capped at US$3,675.75. The entire US$14,703 could be applied for health expenses alone or distributed with the other four categories already mentioned. However, another limitation is that no one could be that the total deductible amount cannot exceed 50 percent of the taxable income (Jara et al. 2021). Making the declaration and payment of this tax is very difficult for taxpayers as they are normal humans nor, accountants, neither artificial intelligence.

Ecuadorian legislation defines taxable income as market income minus social security contributions, exemptions, and deductions. For more incredible difficulty in calculation, a tax table is updated each year with eight bands and marginal rates between 5 and 35 percent (up to 2022) as marginal tax rates. Since January 2020, personal expenditures may be deducted only for individuals below US$100,000 (SRI 2020). Nevertheless, the data used in this study section was from 2010 to 2018.

Table 2.1. Income Tax Rates Compilation from 2010 to 2018

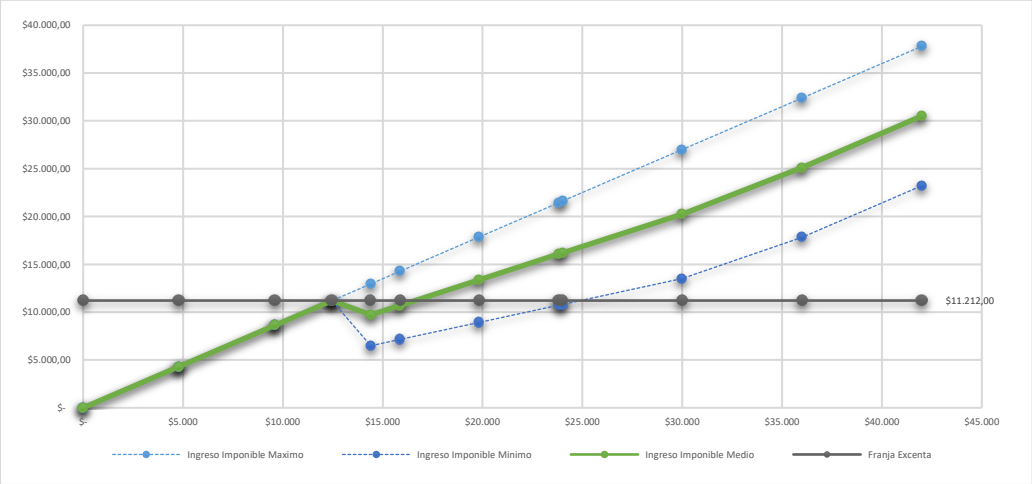
Marginal tax %	2010	2011	2012	2013	2014	2015	2016	2017	2018
0	0 – 8,570	0 –9,210	0 –9,720	0–10,180	0–10,410	0–10,800	0–11,170	0–11,290	0–11,270
5	8,570–10,910	9,210–11,730	9,720–12,380	10,180–12,970	10,410–13,270	10,800–13,770	11,170–14,240	11,290–14,390	11,270–14,360
10	10,910–13,640	11,730–14,670	12,380–15,480	12,970–16,220	13,270–16,590	13,770–17,210	14,240–17,800	14,390–17,990	14,360–17,950
12	13,640–16,370	14,670–17,610	15,480–18,580	16,220–19,920	16,590–19,470	17,210–20,670	17,800–21,370	17,990–21,600	17,950–21,550
15	16,370–32,740	17,610–35,210	18,580–37,160	19,920–38,830	19,470–39,830	20,670–41,330	21,370–42,740	21,600–43,190	21,550–43,100
20	32,740–49,110	35,210–52,810	37,160–55,730	38,830–58,390	39,830–59,730	41,330–61,980	42,740–64,090	43,190–64,770	43,100–64,630
25	49,110–65,480	52,810–70,420	55,730–74,320	58,390–77,870	59,730–79,660	61,980–82,660	64,090–85,470	64,770–86,370	64,630–86,180
30	65,480–87,300	70,420–93,890	74,320–99,080	77,870–103,810	79,660–106,220	82,660–110,190	85,470–113,940	86,370–115,140	86,180–114,890
35	87,300	93,890–	99,080–	103,810–	106,200–	110,190–	113,940–	115,140 -	114,890–

Sources: Author compilation based on SRI (2009, 2010, 2011, 2012, 2013, 2014, 2015b, 2016, 2017a, 2017b).

Since the reform to the internal regime law of 2008, citizens, mainly public servants and those who work in a dependency relationship, could deduct personal expenses, as already mentioned above. In this sense, graph 2.3 shows a simulation of what the taxable income

would be like without expenses, which is the light blue line, how they are now if the maximum deductions are used -blue line- and how it usually is with the total deductible amount.

Graph 2.3. Simulation of Taxable Income after the 2008 Tax Reform



Source: Author's estimations based on SRI (2008 and 2019)

The break in the income corresponding to the exempt fraction is striking, where what is called bunching in the literature is evident. In other words, the same rules applied since 2008 allowed many taxpayers to manage their taxable income in a way that could be as low as possible, creating an area of uncertainty and legal elusion. This partially explains the negative income-tax elasticity for those taxpayers who always pay taxes (Bermúdez and Castillo 2017). Nevertheless, we must not forget that, in the aggregate, the collection of practically all national taxes increased from 2008 to 2018 (Graph 2.1). In practice, to be subject to income tax, any person could have a market income of up to USD 24,000, meaning more than double the exempt band for all taxpayers, creating a possible discretional elusion zone. This is important because it could also introduce an evasion mechanism through the expense deduction for workers under contract.

2.4.1. Intervention: Reactive Nudges in Ecuador 2014-2018

For administrative reasons, Ecuador's national government, central tax administration, and other institutions are divided into nine planning zones. In terms of tax collection, excluding the biggest taxpayers[23], who are responsible for 51% of the total tax revenue, zone 8 (13.8%) and zone 9 (22.9%) are the top two zonal contributors nationwide (SRI 2023). This study was

[23] From 2005 to 2008, the northern region identified certain taxpayers as "Special" using four criteria: (1) Income level (2) total purchases and imports (3) peripherical connection with other taxpayers, and (4) previous taxes paid (SRI 2020).

implemented with data from zone 9, which includes D.M. Quito, the country's capital, and where the head administration is located.

Overall, reactive nudges are defined as the efforts made by the Tax Administration to deter taxpayers from behaviors that facilitate tax evasion. Legally and in planning terms, these actions are known as deterrent policies; they mean longer and stronger email messages than a simple informative letter, plus successive actions to let the taxpayers know they are under permanent tax administration vigilance. However, suppose this approach fails to achieve the desired compliance. In that case, the next step is to send the list of non-respondents to the legal department, which may involve administrative, legal, and financial penalties and fines—in theory-. The interventions evaluated in this paper remain in the previous legal involvements. Because of that, those are defined as reactive nudges, for the reason that many taxpayers were aware of the following legal treatment in case they decide to ignore the tax administrative advertence.

Operationally, for the current paper's aim, interventions were defined based on the integration of two databases of non-complaint taxpayers: those identified and recorded in the Extensive Control System (ECS) and those registered in the Difference Control System (SADIF). Both datasets had information from 2014 to 2018, with a cutoff of data information in March 2020, which implies that only the last declaration is shown for each taxpayer in each of the nine years (SRI 2021). More detailed characteristics are as follows:

1. The ECS cases are classified as Omisses due to non-compliance with tax obligations after the issuance of persuasive notices, sending of emails, and notification of penalties are reviewed.
2. The ECS cases reported in the dataset correspond to several processes, including:
    - Omisses due to closure prevention
    - Omisses due to initiation of legal actions
3. The dataset has two periods: PERIOD refers to the analyzed fiscal year, and DATE refers to the notification date of the document initiating the control process. This is the same for the SADIF database.
4. The selected cases result from a transactional strategy in which, prior to issuing the corresponding penalties, the National Direction sends in sequences 1st. Persuasive notices, 2nd. Follow-up emails, 3rd. Communicating the penalties to the legal

department, and 4th. Sending the cases to the law court. As shown in Table 4, in 87% of the cases, taxpayers respond to the first communication, around 12% go to the second stage, and less than 1% go to the third or fourth legal phase. This process applies to the SADIF cases, too.

Table 2.2.Types of Communications and Actions – Intervention

Acciones	Individuos	%	Frec Acum
1a. COMUNICACION DE DIFERENCIAS	625	53.74	53.74
1b. COMUNICACION DE DIFERENCIAS DE RENTA	389	33.45	87.19
2a. OFICIO DE REQUERIMIENTO DE INFORMACION	99	8.51	95.70
2b. OFICIO DE EXHIBICION CONTABLE	24	2.06	97.76
2c. PAPEL DE TRABAJO DE DETERMINACION	15	1.29	99.05
3. INFORME DE ANALISIS PRELIMINAR	8	0.69	99.74
4. OFICIO DE COMPARECENCIA	3	0.26	100.00
Total:	**1,163**	**100**	

Sources: Author compilation based on SRI (2010-2018)

On the other hand, the Difference Control System (SADIF) is typically used to identify discrepancies between reported amounts to the Tax Administration and expected or normative values. The main objective of DCS is to detect potential underreporting or overreporting of income, deductions, or any other tax filing components. In the case of SRI, they use information from third sources, benchmarks, historical data, or industry standards. Data comparison, anomaly detection, risk assessment, automated alerts, and data integration and audit selection are typically used to get reliable information. These mechanisms might lead to the detection of even fiscal fraud, which is defined as a penal crime in our legislation, including prison time (COIP 2014). In both cases, email messages were sent to the taxpayers. For the current study, the additional characteristics for SADIF are as follows:

1. It includes executive cases considered potential for increasing tax collection. Therefore, the dataset contains values for interest and penalties calculated by the Tax Aministration.
2. The reported cases correspond to an extensive process with the following documents:
    - Communication of Differences
    - Information Request notice
    - Preliminary Analysis report
    - Summons Notice
    - Accounting Exhibit Notice

- Work paper and other

2.5 Data and Identification Strategy

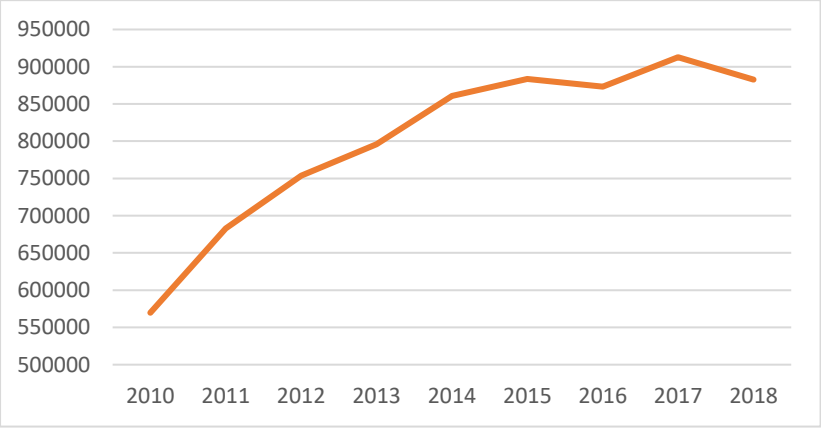
Given the increasing availability of information from administrative bases today, some studies, especially in developed countries, are carried out with administrative bases. Although they may have certain biases, they are also more credible from the point of view of the information declared by people than the information contained in household perception surveys. According to Esteller A. (2024), all data is essential, even the values from survey data. The author informed us about the modular determinants of tax morality, if any. In any case, a citizen can use that information to know their level of morality and decide the scale of our tax administration. The most striking thing is that he found a positive relationship between tax morale and VAT tax fraud in the EU, and, the perception of my good behavior differs from how we judge others. Because of that, perception surveys can modify the taxpayer's responses, while administrative data do not.

2.5.1. Descriptive and Distributional Statistics

This part of the study used three administrative databases of Zonal 9 of SRI. First, the base of Form 102 from 2010 to 2018 with an information cutoff to March 2021 with more than three hundred validated[24] variables or fields per year and around 750 thousand unique taxpayers on average. Second, the base of omitted taxpayers was identified from 2014 to 2018 and registered in the Extensive Control System (ECS). The second database is 4501 taxpayers with nine variables. Third, the base of omitted taxpayers was identified from 2014 to 2018 and registered in the Differences Control System (SADIF). With a total of 229 cases with 19 variables. The unbalanced data panel had over 7 million records in 9 periods and more than 300 variables. Along with the nominal increase in the total tax revenue, Graph 4 shows evidence of increases in the number of taxpayers registered at least during the analysis period, starting with 560 thousand in 2010 and increasing to 900 thousand taxpayers in 2018. The increase was also evident in the average income tax payment.

[24] The original data set has more than 700 variables, but most of them have the same information or minimal differences, for instance, the subtotals.

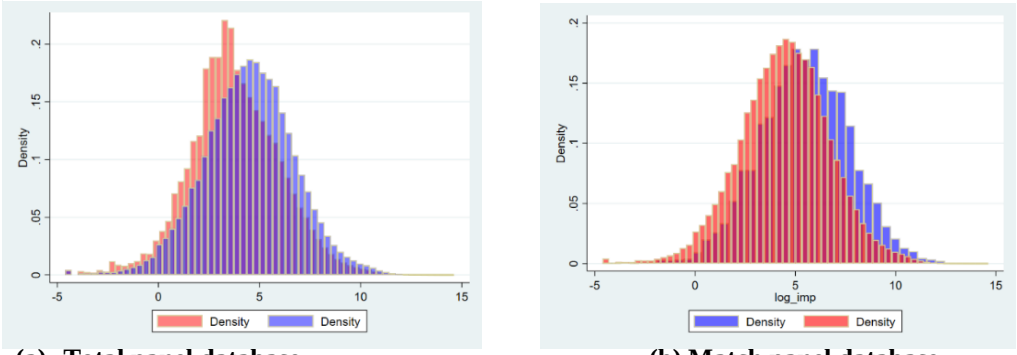
Graph 2.4. Number of Unique Taxpayers from 2010 to 2018 in Zona 9



Source: Author based on SRI (2010-2018) data panel

After the data inspection, the three administrative databases were combined and filtered in an unbalanced panel as the first stage. For the current study, taxpayers were kept updated with information for at least three periods from 2010 to 2018. A total of 859,728 taxpayers and two separate groups were identified (Annex 1).

Graph 2.5. Initial Distribution of Treatment and Comparative Groups



(a) Total panel database **(b) Match panel database**

Source: Author based on SRI (2010-2018)

- The first group is the Intervention or treatment group (T=1), corresponding to individuals from the SCE and SADIF systems. In other words, taxpayers who received at least one deterrent email from SRI from 2014 to 2018 should be included.
- The second group is the comparative group (T=0), which consists of taxpayers who did not receive an email or letter from the Ecuadorian tax administration during the entire analysis period (2010-2018).

From a distributional point of view, the following two tables show how declared income (D) and monetary income tax value (π*D) are split on deciles. For valid values, it was filtered with at least one cent of income or income tax; anything else was classified as zeros. Table 3

shows that the average annual income declared was over USD 400 thousand, with a maximum of USD 55 million. Also, only 59% of people declared an income of at least one cent, meaning that zero percentages matter since the declared income is previous to the tax. Compared those results with the labor surveys where the aggregate income is calculated not only for formal workers and patrons but also for informal activities, it can be said that since the 6th decile could be out of household surveys and because of those people who pay income taxes are primarily from ninth decile of administrative data, which is the tenth decile of surveys, and tenth deciles of administrative data (the missing decile of surveys). This is important for the subjective distribution of taxpayers and their families or the self-perception of their place in society.

Table 2.3. Deciles of Declared Income

Deciles	media	min	max	N
d01	$ 15,617.02	$ 0.01	$ 35,193.04	41,542
d02	$ 55,507.52	$ 35,194.49	$ 74,853.00	41,542
d03	$ 92,279.23	$ 74,853.45	$ 109,157.29	41,542
d04	$ 126,557.08	$109,157.65	$ 144,863.28	41,541
d05	$ 165,640.41	$144,864.28	$ 188,528.38	41,542
d06	$ 216,772.93	$188,529.17	$ 248,413.79	41,542
d07	$ 289,903.57	$248,414.82	$ 338,386.85	41,541
d08	$ 409,656.19	$338,388.93	$ 497,588.11	41,542
d09	$ 653,121.33	$497,589.17	$ 876,364.99	41,542
d10	$2,000,150.50	$876,368.16	$55,337,045.00	41,541
valid v	$ 402,517.67	$ 0.01	$55,337,045.00	415,417
ceros	0	0	0	596,470
missing v	.	.	.	0

Source: Author based on SRI (2010-2018) panel data

Lastly, in this subsection, the distribution of declared income tax is shown in Table 4, where two things could be highlighted. First, fewer people pay an income tax of at least one cent; in other words, only 20% declare a favorable tax; on the contrary, 80% declare USD 0 for income tax. Second, the average income tax paid was USD 1,129, which represents less than 0.3% of the tax rate, and only the last decile is significant.

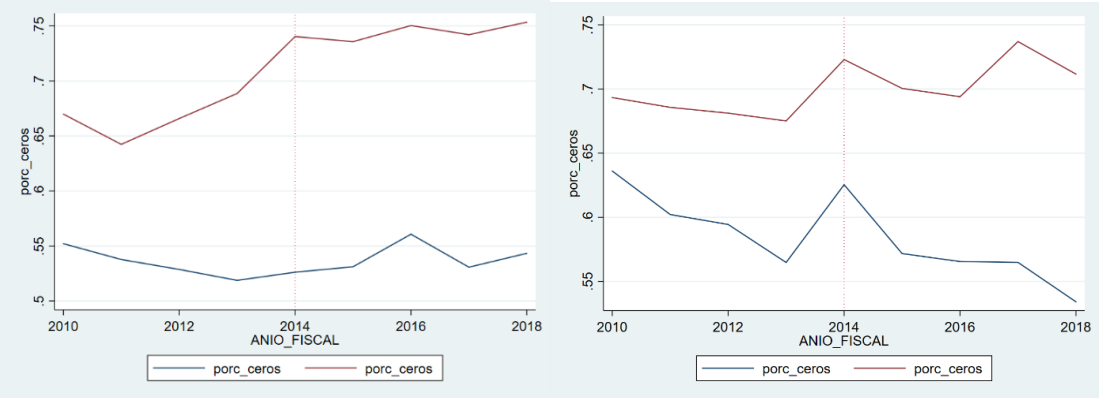
Table 2.4. Deciles of Income Tax

Deciles	media	min	max	N	average tax rate
d01	$ 2.27	$ 0.01	$ 5.10	10,708	0.0%
d02	$ 9.41	$ 5.11	$ 14.30	10,700	0.0%
d03	$ 21.17	$ 14.31	$ 29.08	10,705	0.0%
d04	$ 40.07	$ 29.09	$ 52.89	10,700	0.0%
d05	$ 70.61	$ 52.90	$ 91.60	10,703	0.0%
d06	$ 121.38	$ 91.61	$ 157.39	10,703	0.1%
d07	$ 213.40	$ 157.40	$ 281.84	10,703	0.1%
d08	$ 392.92	$ 281.85	$ 544.91	10,703	0.1%
d09	$ 880.92	$ 544.92	$ 1,432.94	10,703	0.1%
d10	$9,546.89	$1,432.96	$2,216,541.50	10,703	0.5%
valid v	$1,129.89	$ 0.01	$2,216,541.50	107,034	0.3%
ceros	0	0	0	452,960	
missing v	.	.	.	0	

Source: Author based on SRI (2010-2018) panel data

This fact is essential to identifying the strategy for the impact evaluation. In general, previous studies stated that if the data source was on an individual level, such as the audit records, investigators usually utilize a form of the Tobit model with the tax paid as the result variable and total income as an explanatory variable (Andreoni et al. 1998). In practice, when we estimate elasticities through log-linear model specifications, we are missing 80% of data about the taxes paid, which is essential. Nevertheless, this weakness can also be potential in defining the most appropriate specification model, which might be a Tobit model (Amemiya 1984).

Graph 2.6. Percentage of zero statements by groups



(a) Total Panel Data (b) Match Panel Data

Source: Author based on SRI (2010-2018) panel data

In Annex 4, an estimation of elasticities under fixed effects for income tax and total income is shown as a complement; there is a positive and significant relation between those two

variables, and the elasticity tax-income beta$_1$ is a significant relation between those two variables and the elasticity tax-income β_1 is 0.55.

$$\ln\_tax\_paid_{i,t} = a_0 + \beta_1 ln\_inc_{i,t} + \beta_2 \ln\_costs\_Xp_{i,t} + \sum_{j=2011}^{2018} a_j year_j + \sum_{i=3}^{k} \beta_i Ind\_charact_i + e_{i,t} \quad [14]$$

On the other hand, when income is the result variable, most of the empirical studies estimate log-linear regression models. Even though there are many ways to measure tax evasion today, both econometric methodologies and those based on administrative data are increasingly used. This will depend a lot on the level of development and use of information technologies for each country and the stage of its development. Therefore, in middle-income countries such as Ecuador, indirect measurement methodologies are still necessary, and following the majority of tax evasion literature, total declared income is used as the dependent variable, and a sort of evasion is measured under the non-declared income idea. This is because a taxpayer who declares his total market income is not incentivized to change or correct his declaration in the future.

Table 2.5. Evasion Measurement Approaches

Indirect Approach	Direct Approach	Econometrical Approach
• National Accounts	• Special Audits	• Perception Surveys • Controlled Experiments (field and labs)
• Households Surveys	• Ordinary Audits Data Sets	
• Money Demand	• Amnesty Data Sets	• Instrumental Variables
• Monetary Transacctions	• Collection and fraction campaigns	• Tobit models
• Product-Input Tables		
• Microsimulation models		

Elaboration: Author based on ECLAC (2018)

The Identification Strategy: Weighting Propensity Score Matching and Fixed Effects

Given the massive discrepancy between the number of individuals belonging to the treatment group and the control group, those individuals with the closest characteristics to the individuals in the treatment group were selected from the control group by estimating a

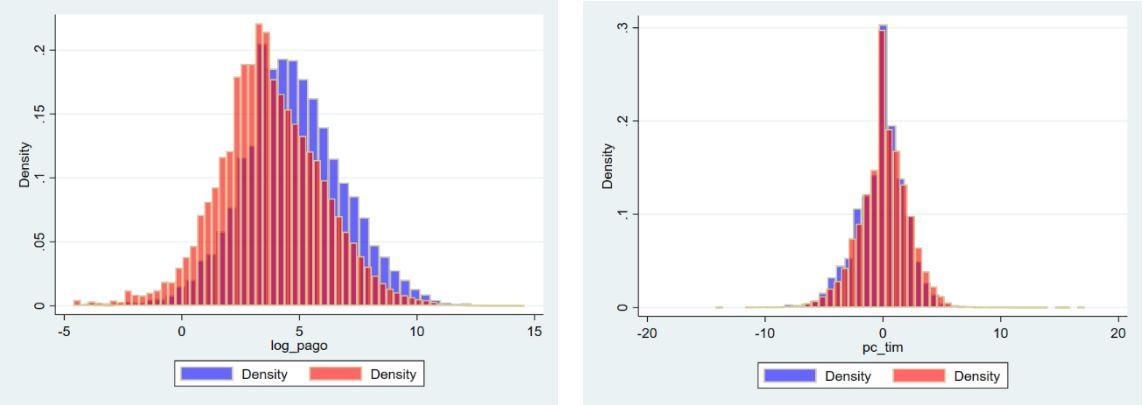
weighting propensity match score estimated before the intervention, it means from 2010 to 2013.

The traditional Propensity Score Matching (PSM) and evaluation strategy emerged as a non-parametric technique from statistical literature and is closely linked to the experimental framework and the search for causal evidence (Rubin 1974; Rosenbaum and Rubin 1983; 1985; Lechner 2002; Abadie and Imbens 2012). The basic idea of a PSM is to identify similar individuals in a large group of non-participants in terms of pre-treatment characteristics (X). By comparing the outcomes of this well-matched control group with those of the participants, the differences can be attributed to the treatment effect. Rosenbaum and Rubin (1983), on their part, recommend using balancing scores, denoted as b(X), which are functions of the observed covariates X. These scores ensure that the conditional distribution of X given b(X) is independent of the treatment random assignment. With good standard support, the impact is defined as follows:

$$\tau_i = Y(1)_i - Y(2)_i \quad [15]$$

With this strategy, estimating the individual treatment effect τi is impossible, so we must concentrate on (population) average treatment effects, meaning the 'average treatment effect on the treated' (ATT). The following graphs show distributions for the total panel group (left) and the matched group (right).

Graph 2.7. Distributions Matched Treatment (red) and Comparative (blue)



(a) Total Panel Data (b) Match Panel Data

Source: Author based on SRI (2010-2018) panel data

As King and Nielsen (2019) noted, PSM frequently does the opposite of what it was designed to do, leading to increased bias, imbalance, inefficiency, and model dependence. PSM

shortcomings stem from its attempts to simulate a fully randomized trial rather than the more effective entirely blocked randomized experiment that is the goal of other matching techniques. As a result, PSM is particularly blind to the frequently significant imbalance that can be removed. And after the PS significative calculation, the following condition of this strategy is the required balance prior to the treatment from 2010 to 2013. Variables with ratios up to 1.08555 meet the condition, while others do not.

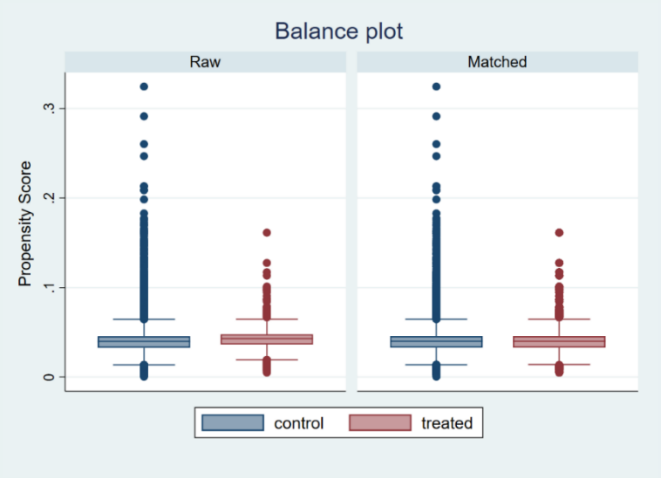
Table 2.6. First balance CBPS

Variable	mean_T	mean_C	diff	std_diff	sd_pool	var_ratio
log_activo	11.73932	11.82326	-0.0839377	-0.0669252	1.254201	1.053807
log_pasivo	10.90026	10.70795	0.1923052	0.1139196	1.688079	0.9404238
log_st_saldo_favor	7.650741	7.200897	0.4498441	0.2332637	1.928479	0.8208715
log_gto_pers	8.677391	8.600539	0.0768519	0.0934185	0.8226623	0.9802828
log_sueldos	10.43649	10.19847	0.2380188	0.2064514	1.152904	0.950296
jubilado	0.0050307	0.0121204	-0.0070896	-0.065357	0.1084754	0.4182703
autonomo	0.0223589	0.0263067	-0.0039479	-0.0247209	0.1596977	0.853838
multado	2.167132	0.801305	1.365827	1.085546	1.258194	2.235081

Mean standardized diff. = 0.19695
Mean absolute standardized diff. = 0.23620
Maximum absolute standardized diff. = 1.08555

Source: Author based on SRI (2010-2018) panel data estimations

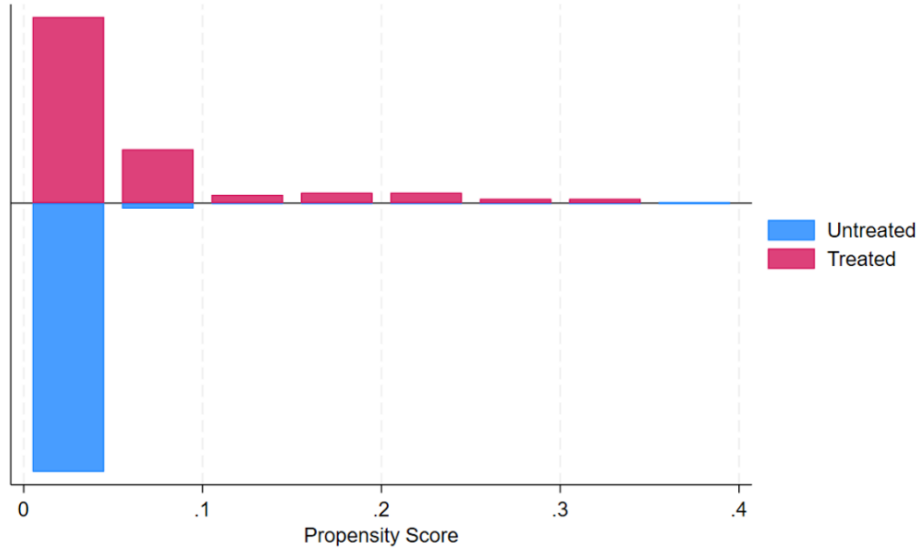
Graph 2.8. Balance Plot



Source: Author based on SRI (2010-2018) panel data

On the one hand, we need the treatment to be conditionally independent of both potential outcomes to identify ATE. However, we only need the treatment to be conditionally independent of Y0 to identify the ATT and the fact that there are some units in the control group for each treatment stratum. The nearest neighbor selection method was used to select the control group, which is the most straightforward distance measure, the Euclidean distance (normalized) obtaining similar distributions.

Graph 2.9. Common Support



Source: Author based on SRI (2010-2018) panel data

However, PSM as an identification strategy is not enough to reduce any identified or perceived selection bias with observational data, specifically administrative data. According to Guo et al. (2020), the optimal results depend on the fit between the assumptions embedded in the analytic model and the data generation process. Finally, the same PS is used to balance and calculate a weighted estimation using the following statistics.

Table 2.7. Covariates Balance Results

Variables	mean_T	mean_C	diff	std_diff	sd_pool	var_ratio
log_activo	11.79196	11.82046	-0.0284982	-0.0226599	1.257651	1.044149
log_pasivo	10.56626	10.71363	-0.1473703	-0.086954	1.694807	1.342867
log_st_saldo_favor	7.215509	7.214407	0.001102	0.0005696	1.934649	1.275511
log_gto_pers	8.627186	8.602882	0.0243035	0.0296145	0.8206623	0.9622581
log_sueldos	10.10981	10.2056	-0.0957937	-0.0828657	1.156011	1.206663
jubilado	0.0067069	0.0118837	-0.0051767	-0.0480821	0.1076643	0.5676468
autonomo	0.0222845	0.0261711	-0.0038866	-0.0243982	0.1593002	0.8553529
multado	1.091772	0.8462132	0.2455587	0.1914017	1.282949	0.9262935

Mean standardized diff.	-0.00542
Mean absolute standardized diff.	0.06082
Maximum absolute standardized diff.	0.1914
C.V. of matching weights:	0.18967
S.D. of matching weights:	0.18967
Skewness of matching weights:	0.16579
Kurtosis of matching weights:	0.06954
Maximum matching weight:	24.4336

Source: Author based on SRI (2010-2018) panel data

Once the balance problem was solved, fix effects models were applied with the logarithmic income as the result variable and under the three considerations to analyze consistency and the interest parameter is φ:

$$\log\_inc_{i,t} = \alpha_i + \lambda_t + \varphi Trat_i + e_{i,t} \quad [16a]$$

$$\log\_inc_{i,t} = \alpha_i + \lambda_t + \varphi Trat_i + \sum_{j=1}^{k} \beta_j FControls_i + e_{i,t} \quad [16b]$$

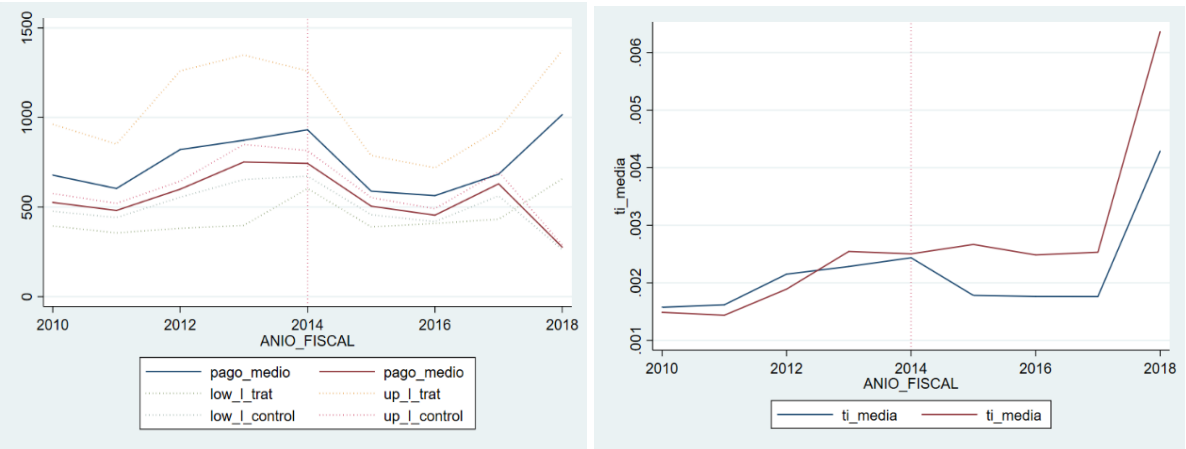
$$\log\_inc_{i,t} = \alpha_i + \lambda_t + \varphi Trat_i + \sum_{j=1}^{k} \beta_j FControls_i + \sum_{j=1}^{k} \gamma_j Year_t + e_{i,t} \quad [16c]$$

2.6 Analysis of the Results and Discussion

The panel data statistics show almost the same story using any alternatives as a result variable: income tax, final payment, or tax rate. There was a significant difference between the treatment and control groups in the number of taxpayers and the average amount of tax paid. The gap was parallel from 2010 to 2017, meaning no statistically significant differences. However, it was in 2018 that things changed in a bifurcation form. Income tax, payment, or tax rate increases for treatment taxpayers while reducing for the control group. Also, the percentage of people declaring zero income tax reduces for the treated group (Graph 2.10 lines in blue).

Another exciting result of this analysis is that at the first stage (from 2014 to 2107), there were no statistical differences between those two groups. However, there was the last period where a significant difference was shown, during 2018. This difference was explained because of the taxable amnesty, and this was big enough, with around 30% for that single year. This shows an entire impact compared to the pre-treatment period and during the treatment period. These results highlight that pre-controlled taxpayers behave better than pre-non-controlled taxpayers only when significant policies are designed and implemented, even if the policy is a general rule of universal application. Another exciting thing is that the 2018 amnesty was not unique; there was another in 2015, but there were no effects in that year and ahead.

Graph 2.10. Average Tax Payment and Effective Tax Rate over Income



Source: Author based on SRI (2010-2018) panel data

Time variation is vital in analyzing the relationship between tax payments and other variables. From the macro revenue tax statistics, it was logical that taking 2010 as the base year, most subsequent years increase the tax payment, excluding 2014 and 2016. However, given that those are the same individuals, this means that every year, each taxpayer declared more income and paid more income tax. The other significant relation is the estimated relationship between total income and expenses or costs. A positive relation was expected and confirmed for the first explicative variable, but it is low and not statistically significant.

Evaluating the changes in tax payment using a linear/logarithmic model, the results obtained are negative but non-significative effects of the intervention, which counterintuitively does not make much sense due to the very nature of the data and the interventions by themselves. However, following the descriptive statistics already shown, when the effect is estimated only for 2018, the effect is positive and significative at least at 90%. Finally, the following table summarizes all estimations under CBPS and fixes effects for the entire period of intervention 2014-2018, with no effect, and only for 2018. Finally, a shocking result is that the difference in 2018 is more than double the difference in income declaration and tax payment.

Table 2.8. Estimation Results for PSM and CBPS

	Full 2014-2018						Only 2018					
	Normal PSM			CBPS			Normal PSM			CBPS		
VARIABLES	Mt	Mcf	Mcv	MtPS	McfPS	McvPS	Mt2	Mcf2	Mcv2	MtPS_18	McfPS_18	McvPS_18
	log_base_imp	log_base_imp	log_base_imp	log_base_imp	log_base_imp	log_base_imp	log_base_imp	log_base_imp	log_base_imp	log_base_imp	log_base_imp	log_base_imp
tratamiento	-0.0745	-0.0478	-0.0302	-0.0396	0.612	0.672	0.216	1.031**	1.016**	0.150	2.039	2.062*
	(0.0967)	(0.157)	(0.163)	(0.226)	(0.535)	(0.517)	(0.188)	(0.405)	(0.418)	(0.303)	-1.344	-1.250
log_activo		0.227***	0.227***		0.171***	0.179***		0.300***	0.301***		0.296***	0.325***
		(0.0328)	(0.0329)		(0.0448)	(0.0473)		(0.0584)	(0.0585)		(0.0776)	(0.0830)
log_pasivo		-0.000646	0.000169		0.0417	0.0343		-0.0673**	-0.0676**		-0.0259	-0.0370
		(0.0186)	(0.0186)		(0.0267)	(0.0264)		(0.0317)	(0.0318)		(0.0410)	(0.0462)
log_saldo_favor		-0.0757***	-0.0766***		-0.0929***	-0.0823***		-0.0774***	-0.0764***		-0.0937***	-0.0770**
		(0.0121)	(0.0122)		(0.0152)	(0.0153)		(0.0221)	(0.0222)		(0.0313)	(0.0353)
log_gto_pers		0.144***	0.144***		0.0754**	0.0865**		0.222***	0.224***		-0.0304	-0.0235
		(0.0255)	(0.0256)		(0.0379)	(0.0373)		(0.0456)	(0.0458)		(0.0620)	(0.0582)
log_sueldos		0.160***	0.160***		0.123***	0.123***		0.190***	0.194***		0.136*	0.174**
		(0.0269)	(0.0269)		(0.0428)	(0.0429)		(0.0474)	(0.0476)		(0.0770)	(0.0719)
autonomo		0.0797	0.0788		0.296**	0.256*		0.261	0.258		-0.0425	0.0311
		(0.0949)	(0.0951)		(0.144)	(0.153)		(0.166)	(0.167)		(0.104)	(0.126)
2011.anio_fiscal#c.multado			0.0904			0.0318			0.116			-0.00980
			(0.154)			(0.0387)			(0.170)			(0.0416)
2012.anio_fiscal#c.multado			-0.0226			0.0302			-0.0329			-0.0158
			(0.133)			(0.0701)			(0.152)			(0.0659)
2013.anio_fiscal#c.multado			-0.0294			-0.0242			-0.0512			-0.0950
			(0.134)			(0.0700)			(0.153)			(0.0668)
2014.anio_fiscal#c.multado			-0.0147			-0.00338			-0.0378			-0.0803
			(0.135)			(0.0738)			(0.158)			(0.0745)
Constant	9.693***	4.695***	4.717***	9.740***	6.043***	5.862***	9.699***	3.594***	3.550***	9.736***	6.081***	5.397***
	(0.00625)	(0.406)	(0.419)	(0.00769)	(0.674)	(0.684)	(0.00803)	(0.688)	(0.705)	(0.00306)	-1.191	-1.120
Observations	25,947	12,512	12,512	21,767	12,582	12,582	14,47	7,701	7,701	12,501	7,718	7,718
R-squared	0.000	0.040	0.041	0.000	0.047	0.060	0.000	0.069	0.071	0.000	0.092	0.110
Number of id_pers	11,34	7,615	7,615	8,038	7,633	7,633	8,597	6,191	6,191	6,823	6,175	6,175

Note: Standard errors in parentheses: *** p<0.01, ** p<0.05, *p<0.1 *Source*: Author's estimations

2.7 Conclusions of the Chapter

A challenge analysis with administrative panel data was conducted to evaluate the effects of reactive nudges implemented by SRI from 2014 to 2018. To do so, non-canonical or traditional approaches and estimations were needed. From the theoretical point of view, the interventions were non-traditional as well and could be explained under behavioral elements and the 2018 tax amnesty.

First, a weighted propensity score matching was built and combined with fixed effects estimators for the empirical estimation. Basically, from 2010 to 2017, there were no differences between the intervention and control groups, and there was one year of massive difference in 2018. Where the pre-intervented group behaves better than the control group, doubles the income declared and the tax paid.

Under CBPS and fixed effects estimations, there was a positive effect for tax interventions only for 2018, but it is low in significance. In principle, the treatment effect increases the declared income when another big intervention is combined, such as the tax amnesty policy for fines and interest, but not for the non-declared and unpaid tax. Then, tax interventions had no effects for the short to medium term, but they already have for the long term.

A tax policy recommendation for tax administration derived from this study is that it is better to intervene than not because the effects are significant in the case of other tax policies combined; also, from the literature review, the perception of audits is a good predictor of taxpayer behavior.

PART TWO. Decomposing the Effects of Tax Income and Monetary Transfers versus other Factors on Poverty and Inequality with the ECUAMOD Microsimulation Model

This part of the research presents two other papers focused on applied research and analyses of tax policy in Ecuador plus cash transfer policy and social security contributions using the microsimulation model: ECUAMOD. This second part tries to answer why we must pay taxes as a society in collective. A partial answer is to fund the social protection system specifically to create cash transfer mechanisms, which is the most extensive social policy in Ecuador, Latin America, and worldwide with the aim to combat poverty, and because of that, it is called the antipoverty policy par excellence. Maybe the rest of the answer relies on a philosophical discussion about tax morality and social welfare (Ponce 2023) which goes beyond the objectives of this thesis.

In the third paper, a historical compilation of the tax-benefit policies during the last four decades (1980-2021) is made, and an analysis is carried out on the aggregate effect of the interventions versus other market factors such as market income or population changes. In the fourth study, the effects of COVID-19 during 2020 were analyzed, and how stabilizing mechanisms such as income tax and social security contributions allowed citizens to partially mitigate the adverse results of the health crisis in contrast to the ad-hoc crisis policies, which had minimal impact.

The Tax-Benefit Microsimulation Model: ECUAMOD

As was exposed in the first chapter, the tax-benefit microsimulation model ECUAMOD is part of the SOUTHMOD project, which, up to date, compromises a total of 12 models from Latin America, Africa, and Asia countries (Jara et al. 2021). Also, all these microsimulation models are built on the EUROMOD platform (EUROMOD 2022). ECUAMOD relies on household survey data ENEMDU and ENIGHUR as its primary input data. Then, laws, reforms, regulations, and other tax-benefit policies are parametrized and harmonized in an arithmetic, internal, consistent system of equations. Also, this model combines survey data with administrative data, both as input data and as a validation procedure. As outputs, the model can produce a single simulated variable, a complete simulated dataset, or many comparative bases and simulated scenarios. Those types of models are very helpful for designing tax policies because it let evaluate ex-ante reforms. The same applies to cash transfers and social security policies. Once the tool has been developed and implemented its use is relatively low in monetary cost, but it has an important learning cost at the beginning.

Since 2020, FLACSO has been the headquarters of the country model and has to coordinate institutional information and validation each year.

Microsimulation models used in economic analysis examine the budgetary and distributional consequences of individual taxes like VAT and income tax, cash transfer programs to and from families, and prior, current, or potential future reforms or scenarios. Aside from synchronizing data, income concepts, variables, and programming languages, worldwide initiatives like the SOUTHMOD project allow international comparisons and the interchangeability of policies and scenarios.

Chapter 3. The Effect of Direct Taxes and Monetary Transfer on Poverty and Inequality in Ecuador[25]

3.1 Introduction of the chapter

Introducción del capítulo

América Latina es conocida como una de las regiones más desiguales del planeta (Chancel et al. 2022). A pesar de una importante disminución de la desigualdad y la pobreza durante los años 2000, altos niveles de desigualdad persisten en la región y han aumentado en algunos países durante los últimos años. Tal es el caso del Ecuador, donde los niveles de pobreza y desigualdad disminuyeron entre el 2000 y el 2014 para luego estabilizarse y aumentar como resultado de la pandemia de la COVID-19 (Jara et al. 2022).

Históricamente, la disminución de la desigualdad y la erradicación de la pobreza han sido objetivos que en el Ecuador han estado ligados a políticas, programas y proyectos específicos con varios actores tanto en lo público como en lo privado. Si bien hasta finales de los años 70 esas políticas desde lo gubernamental estaban condicionadas a las ayudas para el desarrollo, poco a poco, los diversos gobiernos han ido apropiándose de ellas. Con ello, y para mediados de los años 90 ya se hacía evidente la necesidad de formas de financiamiento estatales endógenas que dependan menos de las ayudas externas y más de la capacidad de generar recursos propios, como lo son los impuestos directos.

Dichas dinámicas observadas en el Ecuador no han sido ajenas al contexto latinoamericano, puesto que para finales de los años 70 primaba en la región la idea del desarrollo como ampliación de la infraestructura, en los años 80 se adoptaron las reformas neoliberales,[26] en los años 90 se puso énfasis en la reducción del tamaño del Estado y, en el nuevo milenio la búsqueda de una mayor autonomía en cuanto a políticas económicas[27] que repercutan también en las políticas sociales. Es así como, a partir del año 2000 se implementaron varios programas focalizados como los de transferencias monetarias condicionadas en países como México, Colombia, Brasil y por supuesto Ecuador, entre otros (Fonseca, 2006). Dichos

[25] Este capítulo fue publicado en el libro "Política social, pobreza y desigualdad en el Ecuador: 1980-2021" en coautoría con Xavier Jara, Lorena Moreno y María Gabriela Colmenarez y corresponde al capítulo 7. Se puede descargar el libro completo de: https://repositorio.puce.edu.ec/items/0fdb6753-c5bf-4890-b2fd-47d77d8bb7f8. Además, sobre la base de este capítulo se ha publicado un artículo en la revista internacional World Development, se puede descargar dicho artículo en el siguiente enlace: https://authors.elsevier.com/sd/article/S0305-750X(25)00061-0.

[26] Las reformas se pueden resumir en liberalización comercial y desregularización con el propósito de alcanzar el crecimiento económico (Sader y Gentili, 1999).

[27] Situación que en buena medida se vio favorecida por el auge de los precios de las materias primas de 2003 hasta finales de 2014 (CEPAL 2018b).

programas estaban dirigidos a las familias más pobres y vulnerables de cada país. Además, a esos programas se anclaron otros programas y proyectos de diversa índole como de becas o créditos. Complementario a ello cabe destacar a nivel global dos hitos durante las últimas cuatro décadas, y en lo referente al debate e implementación de políticas sobre pobreza. En primer lugar, está el establecimiento de la línea internacional de pobreza por el Banco Mundial en 1991 y sus posteriores actualizaciones (Ravallion et al. 1991, Ravallion et al. 2009). En segundo lugar, está el establecimiento de los ODM documento firmado en septiembre de 2000 y los ODS impulsados desde la ONU en 2015 (Gil 2018).

Bajo este contexto, el objetivo de este capítulo es analizar la evolución de la pobreza y la desigualdad de ingresos en el Ecuador desde el momento en que se vuelve permanente el levantamiento de encuestas de hogares, y evaluar la contribución que han tenido las reformas de impuestos directos y transferencias monetarias en reducir la pobreza y la desigualdad en el país. Para esto, se utilizan las Encuestas de Empleo Desempleo y Subempleo (ENEMDU) para el periodo 1988-2021. Además, para años claves en los que se introdujeron reformas importantes al impuesto a la renta y a las transferencias monetarias focalizadas (e.g., bono de desarrollo humano) se utilizan técnicas de microsimulación para cuantificar en qué medida los cambios en política tributaria y social explican los cambios en pobreza y desigualdad en el país.

Nuestro análisis permite destacar cuatro periodos importantes en cuanto a la evolución de la pobreza y la desigualdad en el Ecuador entre 1988 y 2021. El primer periodo va de 1988 al 2001. Durante este periodo, la pobreza y extrema pobreza caen inicialmente hasta 1997 pero luego aumentan de manera importante entre 1998 y 2001 como resultado de la crisis financiera que golpeó al país y que culminó con la dolarización oficial de la economía ecuatoriana. Cabe recalcar que para la mayor parte de este periodo (1988 a 1999) solo se levantaron las encuestas para el área urbana. El segundo periodo corre de 2001 a 2014. En este periodo se evidencia una disminución significativa de la pobreza y la desigualdad que coincide con dos factores importantes: la implementación de programas de transferencias no contributivas como el Bono de Desarrollo Humano,[28] y el boom de los comoddities del periodo 2007-2014. El tercer periodo corresponde a los años entre 2014 y 2019, durante los

[28] El concepto de transferencia no contributiva se usa en contraposición al sistema de seguridad social que en efecto funciona en base a las contribuciones o aportes directos de los afiliados. Estas contribuciones, en contraparte, otorga ciertos seguros como son los de salud, enfermedad y pensiones, entre otros. Cabe recalcar que, a pesar de no ser financiada con aportes directos, la asistencia social es financiada por el Estado en parte a través de impuestos indirectos a los hogares.

cuales se vive un estancamiento en términos de reducción de la pobreza y desigualdad en el país. Finalmente, el último periodo está caracterizado por los años en los que se ha vivido la pandemia de la COVID 19 y que trajo consigo un aumento importante de los niveles de pobreza y desigualdad no solo en el Ecuador, sino también en la región y el mundo entero (Mahler et al. 2022).

Nuestro análisis del efecto de reformas a impuestos y transferencias sobre la pobreza y desigualdad en el Ecuador abarca los dos periodos intermedios descritos anteriormente y se concentra en comparar cambios entre tres subperiodos: 2003-2008, 2008-2014 y 2014-2019. La selección de los subperiodos aspira capturar los efectos de las mayores reformas a los programas de asistencia social (e.g., Bono de Desarrollo Humano) y al impuesto a la renta de personas naturales. Los resultados de la descomposición muestran que las reformas socio-fiscales introducidas en los diferentes subperiodos siempre contribuyen a la reducción de la pobreza y de la desigualdad en el Ecuador.[29] En este sentido, las reformas a impuestos y transferencias reforzaron la reducción de la pobreza y desigualdad explicada por cambios en el ingreso de mercado y otros factores poblacionales en los dos primeros subperiodos (2003-2008 y 2008-2014), y mitigaron el aumento en la pobreza y desigualdad a causa de cambios en el ingreso de mercado y otros factores en el último subperiodo analizado (2014-2019). Sin embargo, el efecto de las políticas socio-fiscales es limitado, contribuyendo en promedio menos del 20% del cambio total en pobreza y desigualdad en los tres subperiodos analizados. En el caso de la desigualdad, el efecto limitado es parcialmente explicado por la falta de reformas para hacer el impuesto a la renta más progresivo.

Lo que resta del capítulo se organiza de la siguiente manera. En la segunda sección se hace un repaso a las principales políticas de erradicación de la pobreza desde 1980 hasta 2021. En la tercera sección se describen los datos y la metodología de descomposición para cuantificar el efecto de cambios en impuestos y transferencias en la evolución de la pobreza y desigualdad de ingresos. En la cuarta sección se expone la evolución histórica de la pobreza y desigualdad desde el año que se hacen permanentes las encuestas de hogares; es decir, desde 1988 hasta 2021 y se evalúa el efecto de reformas a impuestos y transferencias. En la quinta sección se plantean las lecciones aprendidas y posibles recomendaciones de política pública

[29] En este artículo, el término “socio-fiscal" se utiliza para referirse a los impuestos directos y transferencias monetarias en su conjunto.

en materia social y tributaria. Finalmente, en la sexta sección se plantean las conclusiones del capítulo.

3.2 Main regulations, plans and programs related to the erradication of poverty and reducction of inequality in Ecuador: 1980-2021

Principales normativas, planes y programas relacionados a la erradicación de la pobreza y reducción de la desigualdad en el Ecuador: 1980-2021

Dos hechos marcan el inicio de la década de los años 80 en el Ecuador. Primero, la vigencia de una nueva Constitución desde agosto de 1979 y, segundo, el retorno al régimen democrático – representativo o el fin de una dictadura militar. Más tarde, en 1998 y 2008 se volvería a cambiar de constitución y con ello todo el régimen normativo del país. En cuanto a la inversión social, se observa una reducción desde fines de los años 80 y principios de los años 90, coincidiendo con el aumento del endeudamiento externo y las dificultades fiscales. En lo que la CEPAL denomina como las dos décadas perdidas de América Latina. Esta sección resume las principales normativas, planes y programas que tienen como objetivos por un lado erradicar la pobreza o al menos la extrama pobreza y, por otro lado, reducir la desigualdad en el Ecuador.

3.2.1. Constitutions of 1979, 1998 and 2008

Constituciones de 1979, 1998 y 2008

En la constitución de 1979 no se menciona explícitamente el concepto de pobreza, pero se encuentran referencias a la situación de poblaciones vulnerables, tales como: “Se procura la capacitación de la mujer campesina y de los sectores marginados” (Consejo Supremo de Gobierno 1979). Esto deja en evidencia que la idea misma de pobreza no se encontraba institucionalizada todavía. Se encuentran, sin embargo, varias referencias a los conceptos de desarrollo[30] progreso (mencionado 5 veces), y riqueza (mencionada 5 veces). Mostrando el optimismo que primaba en aquella época. Otra aproximación interesante es que en la Sección IV se trata sobre la seguridad social y la promoción popular, como un abordaje indirecto de la pobreza. Por otro lado, ciertos artículos como el 29, hablan de objetivos nacionales como disminuir la mortalidad infantil o, en el apartado 3, se trata sobre la “asistencia social, establecida y regulada por el Estado, de acuerdo con la ley” (ibid.). Adicionalmente, el

[30] En la constitución de 1979, la palabra *desarrollo* está mencionado 23 veces en total y 19 como contrario al concepto de pobreza. Por su parte, en la constitución de 1998 se nombra en 42 veces en total y en 30 ocasiones como lo opuesto a pobreza.

artículo 30, en el que se enuncia el hecho de que se Estimula los programas de vivienda higiénica y barata, luego se busca la provisión "de los medios de subsistencia a quienes carecen de recursos y no estén en condiciones de adquirirlos, ni cuenten con persona o entidad obligada por la ley a suministrárselos" (ibid.).

Por su parte, en la Constitución de 1998 sí se hacen explícitos tanto los conceptos de pobreza – que aparece 5 veces – como sus contrapartes desarrollo y riqueza que se nombran 42 y 5 veces, respectivamente. Así por ejemplo en el Artículo 3, Literal 4, se habla de "Preservar el crecimiento sustentable de la economía, y el desarrollo equilibrado y equitativo en beneficio colectivo", en tanto que, en el mis Artículo, pero en el Literal 5 se señala explícitamente el objetivo nacional de "Erradicar la pobreza y promover el progreso económico, social y cultural de sus habitantes" (Asamblea Nacional Constituyente 1998/2007, 2). Poniendo énfasis en la idea misma de erradicación de pobreza como objetivo nacional.

Por último y a diferencia de las dos constituciones anteriores, la constitución del 2008 vuelve más explicitas por un lado la necesidad de erradicar la pobreza y, por el otro lado, el de desarrollar la sociedad (Asamblea Nacional Constituyente, 2008). Además, se menciona la necesidad de políticas propensas a reducir las desigualdades bajo esquemas tendientes a una mejor redistribución del ingreso y, se enmarca la necesidad de Políticas de Desarrollo Social e Investigaciones Sociales. Con ello cada sector social toma relevancia en especial Educación, Salud y Desarrollo Urbano, visto de manera tanto personal como colectiva. La palabra pobreza y relacionados aparece en dicha constitución 6 veces, en tanto que desarrollo se nombra 42 veces y riqueza 5 veces. A la carta política se le deben añadir los demás cuerpos normativos que permiten la aplicación y funcionalidad de las políticas planteadas, mismos que se revisan a continuación.

3.2.2. Other notable regulations

Otras normativas destacadas

El cambio en el pensamiento se evidencia también en otros marcos normativos por debajo de las constituciones vigentes en cada momento. Entre los años 60 y los años 70, por ejemplo, se privilegiaban los intereses de los sectores de la economía familiar y la tenencia de la tierra en el ámbito rural (Primera Reforma Agraria, 1964-1970). Luego, en marzo de 1979, se promulgó la Ley de Fomento y Desarrollo Agropecuario, tratando de darle más dinamismo a las políticas rurales hasta entonces vigentes. Para 1990 se produjo una notable movilización indígena, con lo que, entre 1980 y 1999 se configuran dos momentos. El primer momento es

la polarización entre latifundio-minifundio que continúan con la tradición de la forma de producción de la hacienda, misma que se caracteriza por los bajos niveles tecnológicos y los bajos rendimientos en general. Y, el segundo momento que fue el retiro progresivo de la intervención estatal, de los años 70, deviniendo en estructuras de protección de la tenencia -de la tierra -y que a cambio se crearon medidas de compensación y *subsidios*, mismos que existen hasta el día de hoy[31]. En 1994 con la Ley de Desarrollo Agrario, se limitó considerablemente el papel del Estado y con ello se fomentó la concentración de la tierra, de los ingresos y por ende de la riqueza.

Desde el ámbito institucional se subraya la creación del Ministerio de Bienestar Social en junio de 1980. Dicho ministerio se crea con las atribuciones para formular, dirigir y ejecutar la política estatal en materia de seguridad social, protección de menores, cooperativismo y la promoción popular y bienestar social (Presidencia de la República 1980). Más adelante, en 1999, se fusionaron los Ministerios de Trabajo y Recursos Humanos y de Bienestar Social en una sola entidad que se denominó Ministerio de Trabajo y Acción Social, fusión que en lo posterior sería derogada. Por último, el 18 de septiembre de 1998 se creó el Bono Solidario (BS), mismo que se pensó como una compensación para las familias más pobres del país, ante la eliminación de los subsidios a los combustibles (Presidencia de la República 1998). A partir del año 2000, se establece como función general del Ministerio de Bienestar Social instituir políticas de acción social para procurar, mejorar la calidad de vida de la población, especialmente en las comunidades y grupos humanos en los que se ha intensificado la situación de pobreza (Presidencia de la República 2000). Finalmente, desde el año 2007, se cambia de denominación a Ministerio de Inclusión Económica y Social -MIES-(Presidencia de República, 2007).

3.2.3. Government plans, programs and projects for the erradication of poverty

Planes, programas y proyectos de gobierno para la erradicación de la pobreza

Entre 1980 y 2021 se han propuesto e implementado diez planes de desarrollo en el Ecuador. El primero fue el Plan Nacional de Desarrollo 1980-1984 en el cual se evidencia que los problemas del país no podían resolverse únicamente con la construcción de caminos, escuelas y el mantenimiento del orden público. Además de la infraestructura se puso énfasis en la atención a los espacios sociales del desarrollo a fin de corregir las tendencias concentradoras

[31] Entre los subsidios que aún se mantienen se destacan los subsidios a los combustibles fósiles (gasolina y diésel) y al gas licuado de petróleo para uso doméstico.

de la riqueza. De todas las propuestas, destacan tres políticas socioeconómicas. La primera política para destacar es la de las de remuneraciones tendientes a mejorar el poder adquisitivo de los trabajadores y a evitar su reducción por la inflación. Segundo, de educación y cultura y, tercero respecto de 11 programas sociales en los denominados sectores sociales del desarrollo como: Bienestar Social, Seguridad Social, Salud y Nutrición, Saneamiento Ambiental y Vivienda.

Por su parte en el Plan de Desarrollo 1985-1988 se dio especial importancia a la desocupación, el subempleo, el déficit habitacional, las deficiencias del sistema educativo, preparar académica y técnicamente los recursos humanos para la producción (de ahí el énfasis en la educación técnica); y, la constante migración del campo a la ciudad, la cual se daba en condiciones espontáneas, sin una apropiada política ni programas de equipamiento urbano.

En el Plan de Desarrollo 1989-1992 se enfatiza aún más el modelo empresarial y de privatizaciones, con la aplicación de las medidas de ajuste neoliberal y los estilos de desarrollo prevalecientes. Lo que resultó en una profundización de la pobreza y el agravamiento de los problemas sociales. Así, se estima que para 1988, el desempleo abierto alcanzaba el 14,3% de la población económicamente activa y el subempleo sobrepasaba el 50%. Igualmente, se evidenciaba un notable retroceso en otros indicadores como la distribución de ingresos, los salarios, la nutrición, y el saneamiento ambiental (Paz y Miño 2012). Por lo que, era importante evitar un proceso de regresión social manteniendo el esquema de los denominados sectores sociales (educación, salud, bienestar social), sin embargo, comienza a variar su concepción sobre el universalismo de la aplicación de las políticas sociales; situación que, se sintetizan en el problema del pago de la deuda social. Para finales de los 90s, más del 50% de la población vive en condiciones de extrema pobreza y una parte importante de ella sobrevive entre la indigencia y la pobreza (Secretaría Técnica del Frente Social, 2007).

Inmediatamente después, en el Plan de Acción del Gobierno y Reforma del Estado de 1993 a 1996 se planteó como objetivo la mejora del bienestar social y de los servicios públicos, la modernización del Estado, el aumento de la productividad y la producción, y lograr la estabilidad macroeconómica para dinamizar la economía. En 1998, mediante decreto ejecutivo se crea el Bono de la Pobreza que a partir de 2003 se denominaría Bono de Desarrollo Humano y en adelante sería el eje articulador de varios programas sociales a nivel nacional. De 2000 a 2003, en el Plan de Gobierno se proponen metas de corto plazo con el

propósito de superar las crisis económica, política y social. Como resultado de la crisis sistémica, el gobierno nacional optó por la dolarización oficial de la economía ecuatoriana el 13 de marzo del año 2000 (H. Congreso Nacional 2000).

Por su parte, en el Plan Nacional de Desarrollo 2007-2010 se establece una agenda en la que se incorporan conceptos como el desarrollo sostenible y equitativo. Se realiza una restructuración del Ministerio de Bienestar Social al MIES, Instituto de la Niñez y la Familia -INFA- Público, se crean instituciones como el Instituto de Economía Popular y Solidaria y, la Corporación de Finanzas Populares. El primer objetivo del plan da énfasis en facilitar el acceso a bienes y servicios que fomenten el desarrollo y con ello erradicar la pobreza.

En el Plan Nacional del Buen Vivir[32] 2009-2013 se enfatiza la construcción de un Estado plurinacional e intercultural. Se elaboran agendas sectoriales y zonales, se divide al país por zonas para equilibrar el desarrollo territorial. Se implementan las coordinaciones zonales y las unidades de ejecución por la menor unidad de planificación (distritos, circuitos), en sectores territoriales donde antes no se daba atención ciudadana. Se priorizan ciertos programas específicos como el Programa de provisión de alimentos o de Uniformes Escolares.

El Plan Nacional de Desarrollo 2013-2017 establece hojas de rutas para cada uno de sus objetivo y políticas que permitan el monitoreo del avance de metas trazadas para caminar hacia el denominado Buen Vivir. Aquí se establece un modelo de Articulación del Sistema Nacional de Planificación Participativa en el que se determina a la Estrategia para la Erradicación de la Pobreza como una de las dos estrategias nacionales. Los montos del bono de desarrollo humano se unifican para adultos mayores y personas con discapacidad. Se crea el Viceministerio de Movilidad Humana, se cambia el modelo de gestión de los ministerios de educación y de salud.

Finalmente, en el Plan Nacional de Desarrollo 2017-2021 se establecen los objetivos y las disposiciones del régimen de desarrollo (a través de la implementación de políticas públicas) Resalta el objetivo 1.1 que busca “Promover la inclusión económica y social; combatir la pobreza en todas sus dimensiones, a fin de garantizar la equidad económica, social, cultural y territorial”, pero en la práctica se emitió la contradictoria Ley Humanitaria ante la crisis del

[32] El Buen Vivir es un concepto en construcción en el Ecuador y se asemeja al concepto de Bienestar occidental. Pero, este nuevo concepto incorpora además de la visión económico-material, los saberes ancestrales, la armonía con la naturaleza y el equilibrio intergeneracional. Para su conceptualización inicial se tomó como referente la acepción quechua del Sumak Kawsay.

COVID 19 (Asamblea Nacional 2020). En dicha ley, por ejemplo, se redujeron las condicionales para el despido intempestivo de trabajadores y servidores públicos, así como también se redujeron los sueldos y salarios en varios sectores de la economía.

3.3 Data and methodology for the analysis of poverty and income inequality

Datos y metodología para el análisis de pobreza y desigualdad de ingresos

Después de haber hecho una revisión de las principales normativas y programas enfocados en combatir la pobreza y reducir la desigualdad en el Ecuador, esta sección se concentra en los datos y métodos para analizar la evolución de la pobreza y desigualdad de ingresos en el país. Esta sección de se divide en tres partes. La primera subsección discute el uso de encuestas de hogares como principales fuentes de información para la medición de la pobreza y desigualdad de ingresos, concentrándose en la implementación y cambios metodológicos de la Encuesta Nacional de Empleo, Desempleo y Subempleo (ENEMDU), que representa la principal fuente de información en el Ecuador, referente a estadísticas laborales y sociales comparables a través del tiempo. La segunda subsección presenta los modelos de microsimulación de impuestos y transferencias como herramientas para evaluar la incidencia de políticas socio-fiscales sobre la pobreza y desigualdad. La última subsección describe un método de descomposición para cuantificar la contribución de reformas a impuestos y transferencias en los cambios de pobreza y desigualdad en el tiempo.

3.3.1. Household surveys for measuring poverty and inequality

Encuestas de hogares para la medición de la pobreza y la desigualdad

La recolección de información relacionada a ingresos en el Ecuador en encuestas oficiales tiene registros que datan del año 1975, cuando el entonces Instituto Nacional de Estadística (INE), realizó el levantamiento de la Encuesta de Población y Ocupación en Quito, Guayaquil, 15 ciudades de la costa y 13 de la sierra que conformaban el área urbana nacional. Esta fue la primera vez que se recogió información sobre ingresos laborales y no laborales de los ecuatorianos (INE 1976).[33]

Posteriormente, en 1985 se crea una nueva oficina encargada de las temáticas laborales, el Instituto Nacional de Empleo (INEM),[34] bajo la tutela del Ministerio de Trabajo y Recursos

[33] Mediante Decreto 27 de abril de 1976, se oficializó la creación de la mencionada institución, hoy conocida como INEC. Además, el 7 de mayo del mismo año se expidió la Ley de Estadística, aún vigente hasta 2022.
[34] El INEM se crea mediante Decreto 942, de 12 de julio de 1985.

Humanos. En base a un proyecto que contó con el financiamiento del Banco Central y el Programa de las Nacional Unidas para el Desarrollo (PNUD), y la asistencia técnica de la Organización Internacional de Trabajo, se empezó a levantar la Encuesta Permanente de Hogares: empleo, desempleo y subempleo desde 1987 (INEM 1987).[35]

Hasta el año 1992, el INEM continuó con a la responsabilidad de relevar cifras laborales y de ingresos; sin embargo, desde 1993, dicha competencia regresó al Instituto Nacional de Estadística y Censos, y se materializó a través de la instauración de la Encuesta Nacional de Empleo, Desempleo y Subempleo (ENEMDU), manteniendo la metodología de su predecesora. La encuesta tuvo representatividad estadística únicamente urbana hasta 1999, y desde el 2000 incrementó la muestra de manera que fuese posible realizar estimaciones nacionales, urbanas y rurales. El año 2002 fue un año atípico en donde la muestra fue únicamente urbana, aunque desde 2003 hasta 2006 se volvió a contar con información nacional y por áreas geográficas.

En 2007 el INEC, con acompañamiento técnico nacional e internacional, y en acuerdo con el Banco Central, realizó una revisión integral del marco conceptual de la ENEMDU, teniendo como principal resultado la armonización de cifras laborales y de ingresos presentadas por ambas instituciones. Es así que, en 2008 por primera vez se homologa, en el ámbito de lo que ahora se conoce como comisiones estadísticas, la medición de la pobreza por ingresos (INEC, 2008).

Desde 2007 en adelante la ENEMDU ha presentado variedad de incorporaciones metodológicas. En diciembre 2013 se aplica una migración al marco de muestreo 2010, en base al correspondiente Censo de Población y Vivienda. En marzo 2014 se incrementa el tamaño de la muestra y en septiembre del mismo año se actualiza el marco conceptual de la Población Económicamente Activa. En junio 2015, se actualiza la metodología de la medición del empleo en el sector informal. Desde el 2020, se producen una serie de cambios en el contexto de la pandemia de la COVID 19. En marzo 2020, se suspende el operativo de campo por la declaración de emergencia sanitaria y por la misma razón, en los meses de mayo y junio se levanta la ENEMDU telefónica. En septiembre 2020, se retoma la ENEMDU con modalidad cara a cara. Desde enero 2021, se levanta la ENEMDU continua con publicaciones mensuales, trimestrales y una anual. Finalmente, en junio 2021, se empalman las series de datos septiembre 2020 – mayo 2021.

[35] Se tiene registros de bases de datos desde el año 1988.

De manera paralela, la discusión conceptual sobre la medición de la pobreza en Ecuador, enmarcada en el estado del arte global y regional, se desarrollaba entre los enfoques de insuficiencia de recursos y el de carencias múltiples (CEPAL 2018a). Sin embargo, siguiendo la tradición de organismos internacionales que desarrollaban métodos para la medición en la región basados en el presupuesto de los hogares, en el país se priorizó la producción de instrumentos de recolección de información que permitieran estimar la pobreza por insuficiencia de recursos a través del estudio de los ingresos.

En este contexto, se fue modificando el formulario de la primera encuesta continua con representatividad nacional del INEC, la ENEMDU, incluyendo preguntas sobre ingresos laborales y no laborales enmarcados tanto en las guías conceptuales internacionales, así como en la normativa nacional. Por ejemplo, desde la aparición de las primeras trasferencias monetarias, se adicionaron preguntas sobre la recepción de bonos, los cuales pasaron a formar parte de un agregado de ingreso per cápita familiar. Sin embargo, no fue sino hasta el 2008, que el concepto y la metodología de medición de la pobreza fueron homologados por una Comisión Estadística Interinstitucional. Según dicha Comisión, para el Ecuador la pobreza por ingresos se define como:

"la situación de carencia de recursos económicos, aproximados a través del ingreso per cápita familiar que le impiden al individuo alcanzar un cierto nivel de consumo o línea de pobreza, así aquella población que esté bajo la línea de pobreza es identificada como pobre por ingresos" (Castillo y Puebla 2016, 8).

Es así como, a través del uso de umbrales monetarios, determinados a través del costo de una canasta básica, contra la cual se compara el ingreso de los hogares, se logró por primera vez homologar un método de estimación de la pobreza absoluta. Esto fue además posible gracias a la disponibilidad de fuentes de información secundarias que permitieron justamente la definición de criterios como hogar tipo, canasta alimentaria y no alimentaria, y líneas de pobreza y pobreza extrema. De manera específica: Censo de Población y Vivienda 2001, Encuesta de Condiciones de Vida 2006, e Índice de Precios al Consumidor 2004-2006. Posteriormente, se han realizado esfuerzos por oficializar mediciones que transitaran hacia la multiplicidad de dimensiones de la vida, sea a través de la modificación del cuestionario de la misma ENEMDU o la medición en otras fuentes como los censos.

Por otro lado, un aspecto relevante a considerar en relación al monitoreo de la pobreza y desigualdad en base a la ENEMDU es que, debido a la implementación de innovaciones

metodológicas, la comparabilidad directa no es posible de manera histórica. De manera específica, las estimaciones son comparables en los siguientes periodos: (i) 1988-1999: la encuesta se levantaba en noviembre e indagaba por los ingresos correspondientes a octubre, tenía representatividad estadística únicamente urbana y el agregado del ingreso no incluía ingresos no monetarios; (ii) 2000-2006: la encuesta se levantaba en diciembre e indagaba por los ingresos correspondientes a noviembre, tenía representatividad nacional, urbana, rural, y el agregado del ingreso no incluía desagregaciones del ingreso laboral del empleo independiente; y (iii) 2007-2021: la encuesta se levantaba en diciembre e indagaba por los ingresos correspondientes a noviembre, tenía representatividad al menos nacional, urbano, rural (en algunos años provincial), y el agregado del ingreso así como la estimación de la pobreza fueron homologados por comisión interinstitucional.

3.3.2. Tax and chash transfers microsimulation models
Los modelos de microsimulación de impuestos y transferencias

Para evaluar el efecto de los impuestos directos y transferencias monetarias sobre la pobreza y desigualdad de ingresos en el Ecuador, este capítulo utiliza ECUAMOD, el modelo de microsimulación de impuestos y transferencias del Ecuador (Jara y Varela 2019).[36] En pocas palabras, los modelos de microsimulación son programas en los que se ha traducido la legislación de impuestos y transferencias a una serie de ecuaciones aritméticas con el objetivo de calcular, para cada individuo en los microdatos, el monto a pagar en términos de impuestos y aportes a la seguridad social y el monto a recibir en términos de bonos y transferencias monetarias, partiendo del ingreso de mercado y las características socio-demográficas de los hogares, para llegar al ingreso disponible.

ECUAMOD permite simular los principales componentes de impuestos directos y transferencias monetarias que forman parte del ingreso disponible del hogar en el Ecuador, donde el ingreso disponible del hogar se define como la suma del ingreso de mercado más las transferencias monetarias del gobierno (incluyendo bonos y pensiones) de todos los miembros del hogar, menos aportes a la seguridad social (IESS general, IESS voluntario,

[36] ECUAMOD ha sido desarrollado como parte del proyecto de UNU-WIDER 'SOUTHMOD-simulating tax and benefit policies for development' en el que se han construido modelos de microsimulación de impuestos y transferencias para un conjunto de países en desarrollo (Decoster et al. 2019). ECUAMOD y otros modelos del proyecto SOUTHMOD han sido implementados en el software EUROMOD, que proporciona un entorno armonizado para el análisis comparativo entre países (Sutherland y Figari, 2013).

ISSFA e ISPOL) e impuesto a la renta de personas naturales.[37] ECUAMOD es un modelo estático en el sentido que las simulaciones de impuestos y transferencias no toman en cuenta posibles reacciones de comportamiento de los individuos (e.g., cambios en oferta laboral) y no se realizan ajustes por cambios demográficos en el tiempo. Los resultados de las simulaciones de ECUAMOD han sido validados contra estadísticas externas (Jara et al. 2022).

En este capítulo, utilizamos ECUAMOD para simular aportes a la seguridad social, impuesto a la renta y los principales programas de asistencia social en el Ecuador durante el periodo 2003-2019. Los microdatos utilizados para las simulaciones provienen de la Encuesta Nacional de Empleo, Desempleo y Subempleo, ENEMDU. Como se explica en la siguiente sección, nuestro análisis se concentra en el efecto de reformas a los instrumentos simulados sobre cambios en pobreza y desigualdad entre 2003 y 2019. La elección de este periodo es motivada por varias razones metodológicas. Primero, la ENEMDU de años anteriores al 2000 y en 2002 contienen información solo para el área urbana, mientras que nuestro objetivo es analizar el impacto de cambios en políticas socio-fiscales en todo el país, distinguiendo entre área urbana y rural. Segundo, nuestro análisis tiene el propósito de analizar el efecto de los impuestos directos y las transferencias directas en conjunto. En este sentido, si bien el primer programa de asistencia social, el Bono Solidario, se instrumentaliza desde el año 1999, no es hasta el 2003 que la asistencia social se establece de manera más estructurada con la creación del Bono de Desarrollo Humano (BDH) y se cuenta con fuentes de información oficial más confiables. Finalmente, nuestro análisis excluye los años afectados por la pandemia de COVID-19 debido a que, durante este periodo, los cambios en ingresos de mercado explican la mayor parte de los cambios en ingreso disponible (Jara et al. 2022, Avellaneda et al. 2021). Además, en la sección 4.3 se discuten los cambios en pobreza y desigualdad durante la pandemia.

El modelo de microsimulación ECUAMOD, nos permite cuantificar el efecto de reformas a tres instrumentos de política durante el periodo 2003-2019: (i) aportes a seguridad social; (ii)

[37] La simulación de impuestos y transferencias en ECUAMOD depende de la calidad de la información en los microdatos utilizados. Por ejemplo, pensiones públicas no pueden ser simuladas porque las encuestas de hogares (utilizadas para la simulación) no contienen información del historial de aportes al IESS, ISSFA o ISPOL. En caso de no poder ser simulados, los montos de pensiones u otros instrumentos se toman directamente de los datos y se incluyen como parte del ingreso disponible.

impuesto a la renta de personas naturales; y (iii) Bono de Desarrollo Humano.[38] La Tabla 1 resume las principales reformas consideradas en el modelo entre los tres subperiodos de análisis. Como se puede observar, durante el periodo 2003-2019, han existido varias reformas a los instrumentos simulados. En términos de aportes a seguridad social, el cambio más importante se observa en el segundo subperiodo cuando la tasa de aporte del seguro voluntario aumento de 17,5% a 20,5%. En cuanto al impuesto a la renta de personas naturales, la principal reforma tuvo lugar al final del primer subperiodo con la introducción de la Ley Reformatoria para la Equidad Tributaria de 2007 que entró en vigor en 2008.

Table 3.1. Principales reformas socio-fiscales consideradas en las simulaciones

	2003-2008	2008-2014	2014-2019
Aportes a la seguridad social	- No hubo cambios	- Aumento de las tasas de aporte del seguro general: de 9,35% a 9,45%; y de 11,35% a 11,45% - Aumento de las tasas de aporte del seguro voluntario: de 17,5% a 20,5%	- Aumento de las tasas de aporte del seguro voluntario: de 20,5% a 20,6%
Impuesto a la renta de personas naturales	- Aumento de la progresividad del impuesto a la renta: cambio de las bandas de impuesto de 6 a 9 y, tasa superior pasa de 25% a 35% - Introducción de deducciones por gastos personales	- Disminución de exenciones por discapacidad y tercera edad.	- No hubo cambios más allá de las actualizaciones por inflación.
Bono de Desarrollo Humano	- Aumento del bono de US$15 a US$30 para las madres y de $11,5 a US$ 30 para tercera edad y personas con discapacidad.	- Introducción del Índice del Registro Social RS2013-2014, que remplaza al RS2008-2009, para la identificación de beneficiarios - Aumento del monto de US$30 a $35 en 2009 y en 2013 a 50 US$ por mes	- Introducción de pagos adicionales por hijos: BDH variable - Aumento de montos de bonos para adultos mayores (Pensión Mis Mejores Años) y personas con discapacidad (Pensión Toda una Vida)

Fuentes y elaboración: propia en base a Registro Social, SRI, IESS, ECUAMOD

Dos componentes de esta reforma se pueden resaltar. El primero es la modificación de los tramos impositivos, incrementándose de seis a nueve tramos, con la introducción de dos tasas adicionales de 30% y 35% en la parte superior y una banda intermedia de 12%. El segundo es la introducción de generosas deducciones por gastos personales en alimentación, vestimenta, educación, salud y vivienda. Finalmente, en todos los subperiodos se tuvieron lugar aumentos de los montos del Bono de Desarrollo Humano. Adicionalmente, el sistema de focalización para identificar beneficiarios también ha tenido reformas. El segundo subperiodo captura la

[38] En el análisis, consideramos dentro del concepto de Bono de Desarrollo Humano, los diferentes programas que se han derivado de él en el transcurso del tiempo como, por ejemplo, los programas de pensión para adultos mayores y personas con discapacidad. El modelo toma en cuenta, igualmente, la introducción del Bono Joaquín Gallegos Lara.

introducción del Índice del Registro Social RS 2013-2014 para la identificación de beneficiarios del bono y el cambió del punto de corte. Lo cual resultó en una disminución de la cobertura del programa (Palacio et al. 2023). El último periodo toma en cuenta la introducción del Índice del Registro Social RS2018-2019 y el aumento del umbral de identificación de beneficiarios, que se traduce en un aumento de la cobertura del programa (ibid).

3.3.3. Decomposition of changes in poverty and inequality over time
Descomposición de cambios en pobreza y desigualdad en el tiempo

Los niveles de pobreza y desigualdad de un país en un punto específico del tiempo son el resultado de la combinación de las características poblacionales (incluyendo la composición demográfica y la distribución del ingreso de mercado) y de las políticas socio-fiscales (i.e., el impacto de los impuestos directos, aportes a seguridad social y transferencias monetarias). Nuestro objetivo es cuantificar en qué medida las principales reformas a políticas socio-fiscales en el Ecuador han contribuido a los cambios en ingreso disponible de los hogares en el tiempo. Los modelos de microsimulación de impuestos y transferencias son particularmente útiles para este tipo de ejercicio pues, por medio de simulaciones contrafactuales, permiten aislar el efecto de un factor manteniendo el resto de los factores fijos. Nuestro análisis se basa en la descomposición propuesta por Bargain y Callan (2010) que combina el uso de encuestas de hogares con técnicas de microsimulación para separar el efecto directo de reformas a políticas socio-fiscales de otros efectos.

Siguiendo a Bargain y Callan (2010), comenzamos por definir 'ingreso de mercado' del hogar como la suma de ingreso laboral, ingreso de capital, ingreso por arriendos, pensiones privadas y transferencias privadas, antes de que se apliquen impuestos directos y transferencias públicas directas. Definimos, por otro lado, el 'ingreso disponible' del hogar como el ingreso después del pago de impuestos/aportes a la seguridad social y del recibo de todas las transferencias monetarias.

La matriz y_t contiene información de la población del país en el periodo t, en particular, el ingreso de mercado y las características sociodemográficas de cada hogar. El ingreso disponible del hogar en el periodo t está dado por $d_t(p_t, y_t)$ donde d_t denota la 'función de impuesto y transferencias' que transforma, para cada hogar, los ingresos de mercado y las características del hogar (y_t) en un cierto nivel de ingreso disponible. La 'función de impuesto y transferencias' depende también de un conjunto de parámetros monetarios p_t, por

ejemplo, los montos de las transferencias monetarias, el nivel de las bandas de impuesto a la renta, etc. Consideremos finalmente $I[d_t(p_t, y_t)]$, un indicador de pobreza o desigualdad calculado en base a la distribución de ingreso disponible del hogar en el periodo t. El cambio en el indicador I de pobreza o desigualdad entre dos periodos (t=0, 1) está dado por:

$$\Delta = I[d_1(p_1, y_1)] - I[d_0(p_0, y_0)] \qquad [18]$$

Este cambio en el indicador I calculado en base al ingreso disponible puede descomponerse en la contribución del cambio en la política de impuestos y transferencias ('efecto de política'), la contribución de otros factores como cambios demográficos o cambios en la distribución del ingreso de mercado ('otro efecto') y la contribución de cambios en niveles nominales ('efecto nominal'). El cambio en el indicador I de pobreza o desigualdad entre dos periodos (t=0, 1) puede rescribirse como:

$$\Delta = \{I[d_1(p_1, y_1)] - I[d_0(\alpha p_0, y_1)]\} \quad \text{('efecto de política')}$$

$$+ \{I[d_0(\alpha p_0, y_1)] - I[d_0(\alpha p_0, \alpha y_0)]\} \quad \text{('otro efecto')}$$

$$+ \{I[d_0(\alpha p_0, \alpha y_0)] - I[d_0(p_0, y_0)]\} \quad \text{('efecto nominal')} \qquad [19]$$

Los términos $I[d_0(p_0, y_0)]$ y $I[d_1(p_1, y_1)]$ denotan el valor del indicador de pobreza o desigualdad basados en la distribución de ingreso disponible del principio y del final del periodo, respectivamente. El término $I[d_0(\alpha p_0, y_1)]$ representa el nivel de pobreza o desigualdad de una distribución de ingreso disponible contrafactual en obtenida al aplicar las políticas de impuestos y transferencias del principio del periodo (t=0) a la población del final del periodo (t=1). Para obtener esta distribución contrafactual se requiere hacer los montos nominales de los dos periodos comparables. Por esta razón, los parámetros monetarios de política del principio del periodo p_0, ha sido ajustado con un factor α, que captura los cambios en niveles nominales (por ejemplo, precios o salarios). En nuestro análisis utilizaremos el Índice de Precios al Consumidor (IPC) como factor de ajuste para llevar los parámetros monetarios de principios del periodo a niveles de fin del periodo. Finalmente, el término $I[d_0(\alpha p_0, \alpha y_0)]$ también representa el nivel de pobreza o desigualdad de una distribución de ingreso disponible contrafactual. Está se obtiene al ajustar nominalmente tanto los parámetros de política del año inicial como los ingresos de mercado del año inicial a niveles del fin de periodo. El último término de la ecuación (2) es cero en caso de que ajustes nominales simúlatenos a la base de datos y a los parámetros monetarios de los impuestos y

transferencias no afecten la ubicación relativa de los hogares en la distribución de ingreso disponible (Bargain y Callan 2010).[39] Esta característica del sistema de impuestos y transferencias ha sido verificada para el caso del Ecuador (Bargain et al. 2017).[40]

3.4 Results analysis

Análisis de los resultados

En esta sección presentamos los resultados de nuestro análisis. En primer lugar, presentamos la evolución de la pobreza y desigualdad de ingresos en Ecuador de 1988 a 2021. Como parte de este ejercicio, comparamos los indicadores tradicionales de pobreza y desigualdad con indicadores que excluyen bonos de la definición de ingreso para tener una primera impresión de la incidencia de estos instrumentos. Finalmente, presentamos los resultados de nuestra descomposición para evaluar el efecto de reformas a impuestos directos y transferencias monetarias sobre los cambios en pobreza y desigualdad en momentos específicos del periodo de análisis.

3.4.1. Historical evolution of poverty and income inequality in Ecuador 1988-2021

Evolución histórica de la pobreza y la desigualdad de ingresos en Ecuador 1988-2021

Entre 1988 y 2021 no existe una medición nacional que permita analizar una evolución generalizada de la pobreza y de la desigualdad de ingresos en el Ecuador, puesto que los primeros 12 años la recolección de datos en la ENEMDU se concentró en el área urbana. Por esta razón, nuestro análisis presenta resultados a nivel nacional y distinguiendo entre el área urbana y rural. Adicionalmente, por cuestiones de comparabilidad, el análisis pone énfasis en los periodos durante los cuales existieron cambios en la metodología de recolección de datos. Para todos los años de análisis, se presentan los resultados en base a las encuestas de final de año.

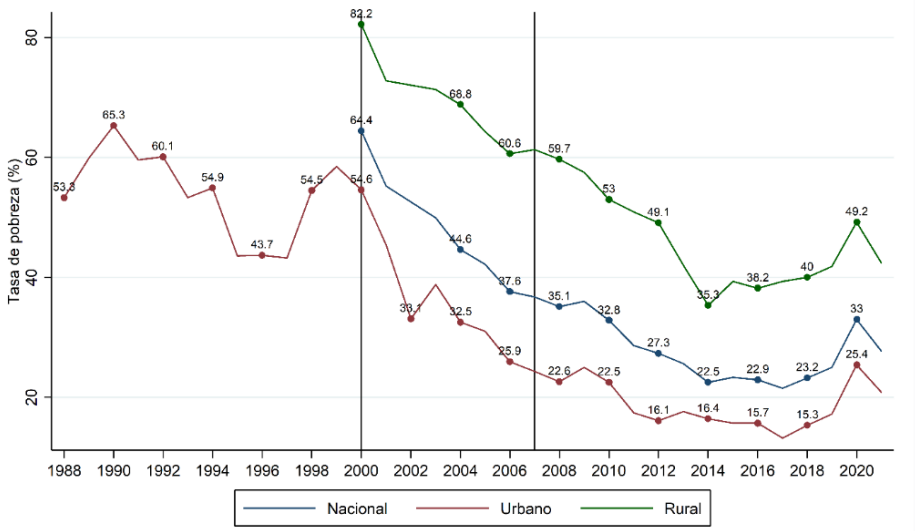
El gráfico 3.1 presenta la evolución de la tasa de incidencia de pobreza por ingresos entre 1988 y 2021. La línea roja representa la evolución de la tasa de pobreza urbana, la línea verde presenta los resultados para el área rural, mientras que la línea azul representa la evolución de

[39] Esta propiedad de los sistemas de impuestos y transferencias se conoce como homogeneidad (Bargain y Callan 2010).

[40] Cabe recalcar que una descomposición alternativa se puede definir, en la que el 'efecto de política' se obtiene manteniendo fijos los datos del año de inicio en vez del año de final de periodo. Adicionalmente, si se cumple la propiedad de homogeneidad, se puede aplicar la descomposición de Shorrocks-Shapley tomando el promedio de las contribuciones de los dos tipos de descomposiciones descritas anteriormente (Bargain y Callan 2010).

la tasa de pobreza a nivel nacional. Las líneas negras verticales representan los años en los que hubo cambios metodológicos en la ENEMDU.

Graph 3.11. Income poverty rate 1988-2021



Nota: Las líneas verticales denotan años en los que hubo cambios metodológicos en las encuestas.
Fuente: Elaboración propia en base a la ENEMDU

En el área urbana, la tasa de incidencia de pobreza pasó de 53,3% a 43,2% entre 1988 y 1997. La mayor tasa durante este periodo se observó en el año 1990 (65,3%), año después del cual la tasa de pobreza disminuyó hasta 1997. La tasa de pobreza urbana aumenta de manera importante en 1998 y 1999 como resultado de la crisis bancaria que golpeó al país durante estos años. Desde el año 2000 hasta el 2017, la tasa de incidencia de pobreza urbana fue mayoritariamente descendiente. Desde el 2018 se observa un aumento en la tasa de pobreza urbana que llega a su pico en el 2020, año de inicio de la pandemia de la COVID 19, alcanzando niveles de 25,4% (8,2 p.p. más que el año previo).

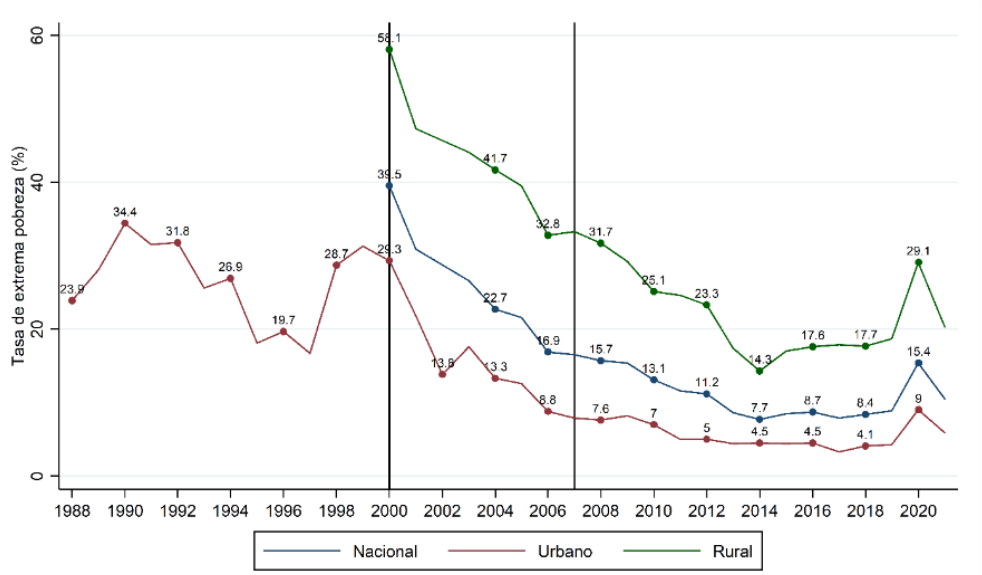
Desde el año 2000 se cuenta con una primera línea base de la medición de la pobreza a nivel nacional.[41] La tasa de incidencia de la pobreza nacional fue descendiente hasta el 2014, año desde el cual la cifra se estancó hasta 2019, incluso mostrando ligeros incrementos. Cabe notar que este estancamiento se debe a la tendencia opuesta en la evolución de la pobreza en el área rural y urbana. Entre 2014 y 2019, se observa una ligera tendencia a la baja en pobreza a nivel urbano, mientras que durante el mismo periodo la tasa de pobreza rural aumenta. Finalmente, el efecto de la pandemia impacta de manera drástica tanto a la zona urbana como

[41] Como se mencionó anteriormente, existen cambios metodológicos en las encuestas en el año 2000 y 2007. Por esta razón, el análisis se concentra en las tendencias teniendo en cuenta diferentes subperiodos.

rural. En la última, la tasa de pobreza aumenta de 41,8% a 49,2% de 2019 a 2020. A nivel nacional, el aumento es de 8p.p. (de 22,9% a 33%).

El gráfico 3.2 presenta la evolución de la tasa de extrema pobreza durante nuestro periodo de análisis. El concepto de extrema pobreza captura el incumplimiento mínimo de requerimientos alimenticios. Al igual que en el caso de pobreza, el gráfico presenta resultados para el área urbana, rural y a nivel nacional. La evolución de la tasa de extrema pobreza sigue un patrón similar al de pobreza, pero con niveles más bajos. En particular, se observa un aumento de la tasa de extrema pobreza urbana de 23,9% a 34.4% entre 1988 y 1990, seguido de una disminución hasta el año 1997. La tasa de extrema pobreza aumenta durante la crisis bancaria, llegando a niveles de 31,3% en el 1999.

Graph 3.12. Extreme Income Poverty rate 1988-2021

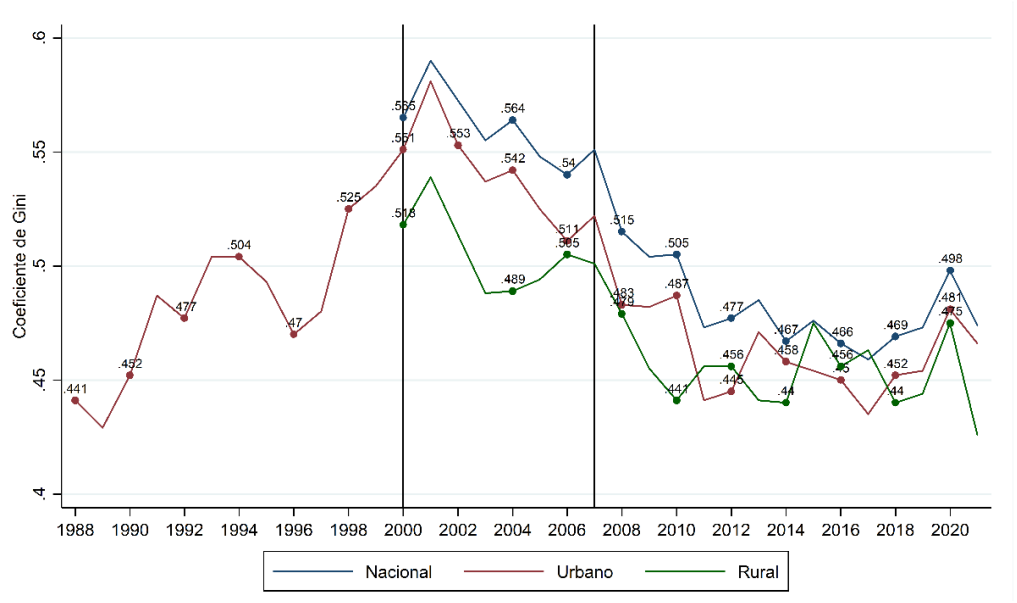


Nota: Las líneas verticales denotan años en los que hubo cambios metodológicos en las encuestas.
Fuente: Elaboración propia en base a la ENEMDU

Del 2000 al 2014, la tasa de extrema pobreza cae a nivel nacional, urbano y rural. A excepción del 2015, donde se observa un aumento en el área rural con respecto al año anterior, la tasa de extrema pobreza permanece relativamente estable durante el periodo 2014-2019. La pandemia de la COVID 19 tiene un impacto importante en extrema pobreza. Entre 2019 y 2020, la tasa de extrema pobreza aumenta de 6,6 p.p. (de 8,9% a 15,4%) a nivel nacional, 4,8 p.p. (de 4,2% a 9%) a nivel urbano y 10,4 p.p. (18,7% a 29,1%) a nivel rural. Los niveles de extrema pobreza disminuyen en el 2021 pero no regresan a los niveles de prepandemia.

Finalmente, el gráfico 3.3 presenta la evolución de la desigualdad de ingresos medida por medio del coeficiente de Gini. El gráfico muestra que el coeficiente de Gini del área urbana incrementó de 0,441 a 0,581 desde 1988 hasta 2001, lo que equivale a una tasa de variación (TV) de 31,7%, superior a la tasa de variación de la pobreza en el mismo periodo. El pico en el 2001, año posterior a la dolarización, se observa también a nivel nacional y en el área rural. Entre el 2001 y el 2014, la desigualdad de ingresos fue mayoritariamente descendiente. Durante este periodo, el coeficiente de Gini a nivel nacional cayó substancialmente de 0,59 a 0,467 (TV: 20,8%). Como en el caso de la pobreza y extreme pobreza, la desigualdad se estanca entre 2014 y 2019 para luego aumentar drásticamente en el 2020 a causa de la pandemia de la COVID 19. Entre 2019 y 2020, el coeficiente de Gini crece de 0,473 a 0,498 (TV: 5,3%) a nivel nacional. Para finales del 2021, el coeficiente de Gini disminuye, pero aún no se regresa a los niveles de la prepandemia. La evolución de la desigualdad en el área urbana y rural es relativamente consistente con la tendencia a nivel nacional, excepto durante el periodo 2014-2019. Durante este periodo, el coeficiente de Gini en el área urbana cae constantemente hasta en 2017 para luego aumentar en el 2018 y 2019. Al contrario, el coeficiente de Gini en el área rural es más alto entre 2015 y 2017.

Graph 3.13. Gini coeficient 1988-2021

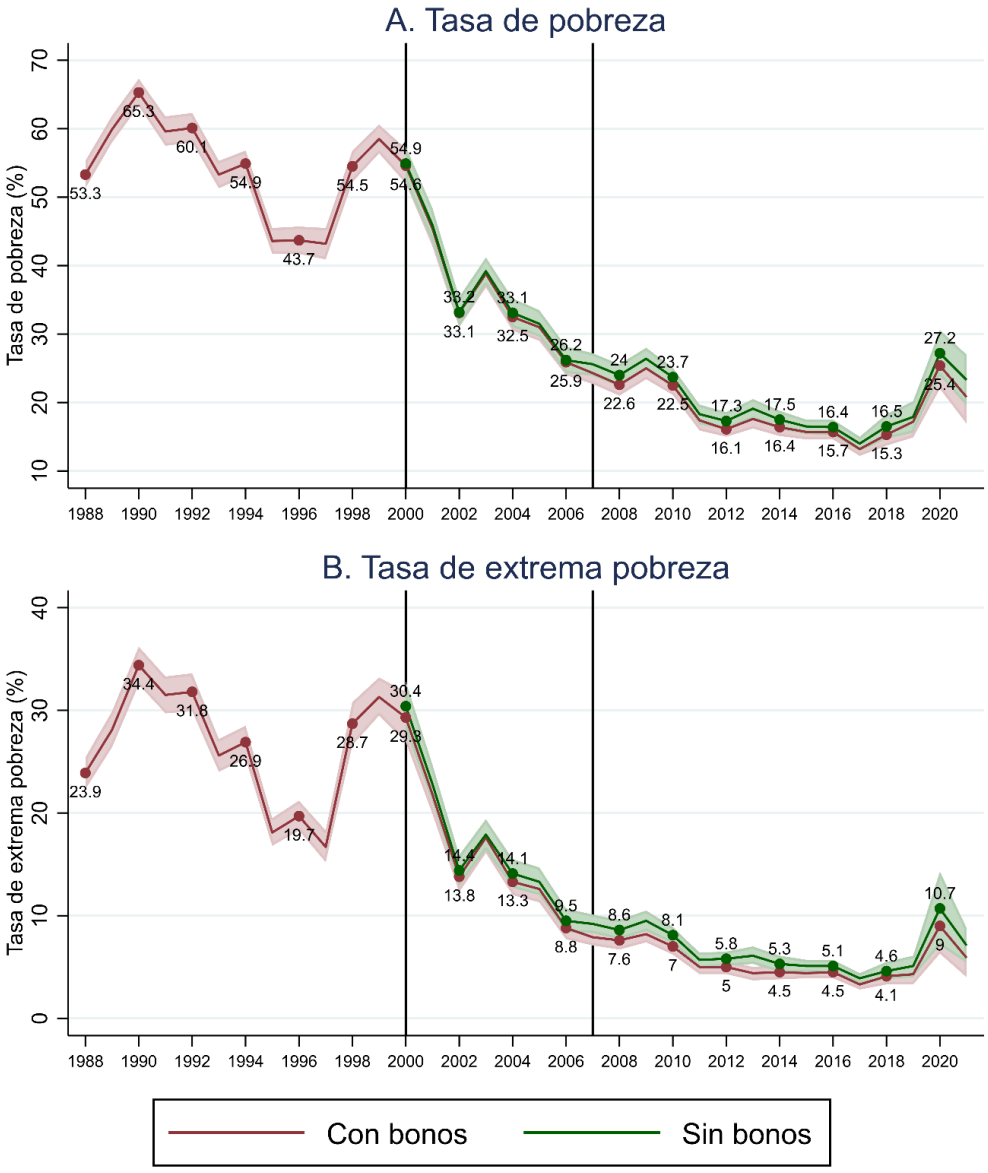


Nota: Las líneas verticales denotan años en los que hubo cambios metodológicos en las encuestas.
Fuente: Elaboración propia en base a la ENEMDU

Para complementar los hallazgos en base al coeficiente de Gini, evoluciona de la relación entre el promedio del ingreso per cápita del hogar del decil 10 sobre el decil 1. Los resultados son consistentes con la evolución de la desigualdad medida por el Gini. En particular, la ratio

del ingreso del decil 10 al decil 1 aumenta de 18,4 en 1988 a 55 en 2001. Esto quiere decir que el ingreso per cápita del hogar del decil 10 era 18,4 veces mayor al del decil 1 en 1988 y pasó a ser 55 veces mayor en el 2001.

Graph 3.14. Poverty and extreme poverty in urban areas – total income vs income without bonuses from 1988 to 2021



Nota: Las líneas verticales denotan años en los que hubo cambios metodológicos en las encuestas.
Fuente: Elaboración propia en base a la ENEMDU

Entre el 2001 y el 2014, la relación del decil 10 al decil 1 a nivel nacional disminuye y luego se mantiene estable entre el 2014 y 2019. En este último periodo, las diferencias entre el área urbana y rural son consistentes con las diferencias observadas con el coeficiente de Gini.

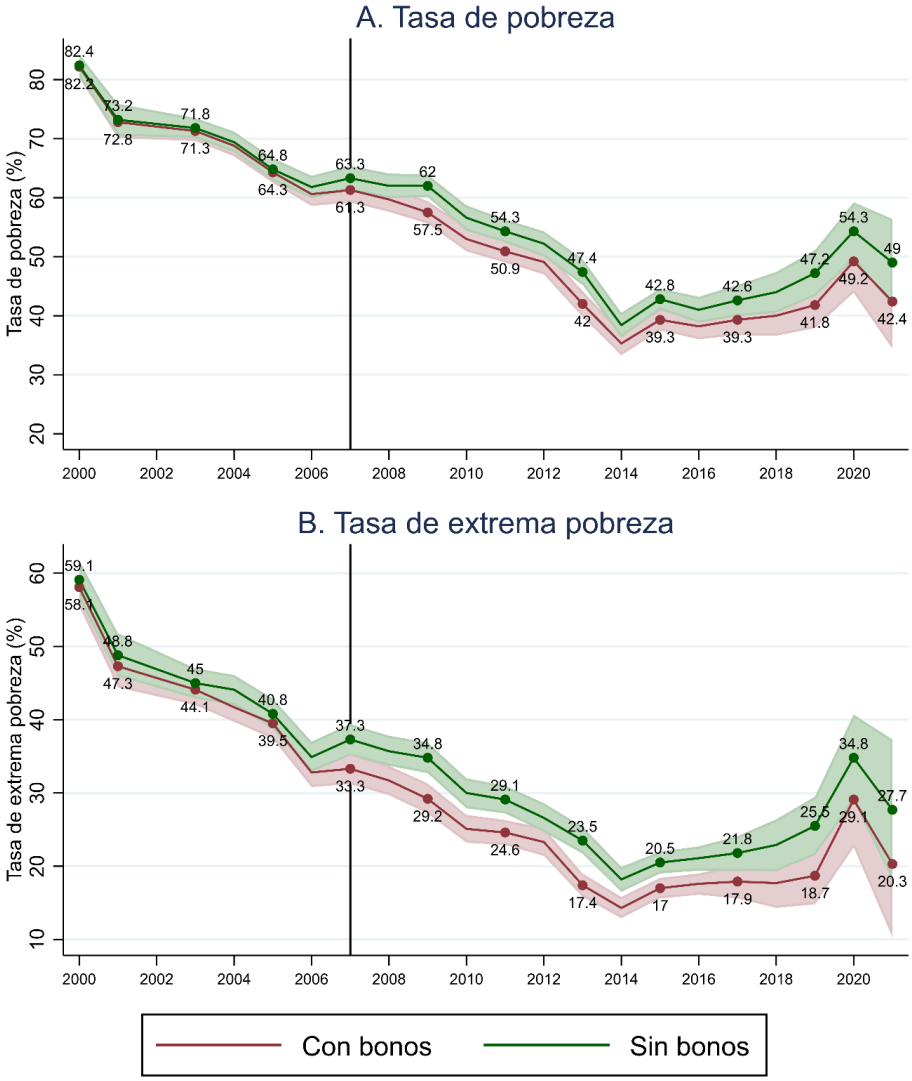
Finalmente, del 2019 al 2020, la relación del decil 10 al decil 1 aumenta drásticamente a causa de la pandemia de la COVID 19, pasado de 24 a 34,1 a nivel nacional.

Para introducir el análisis de la descomposición de cambios en pobreza y desigualdad presentado en la siguiente sección, los gráficos 3.4 y 3.5 comparan tasas de pobreza y extrema pobreza calculadas en base a ingreso total per cápita del hogar con y sin transferencias no contributivas (Bono de Desarrollo Humano y Bono Joaquín Gallegos Lara) reportadas en la ENEMDU. El objetivo es tener una primera impresión de la incidencia de las transferencias no contributivas en la pobreza y desigualdad de ingresos. Cabe resaltar que entre el año 1988 y 1997 no existían transferencias monetarias no contributivas en el Ecuador. El Bono de la Pobreza se introduce en 1998 para mitigar el efecto de la eliminación de los subsidios a los combustibles, pero no es hasta el 2000 que este tipo de transferencias se comienza a capturar en la ENEMDU.

El gráfico 3.4 presenta resultados para pobreza y extrema pobreza urbana. Los gráficos muestran que, si bien las transferencias no contributivas reducen la pobreza y extrema pobreza urbana, su efecto es modesto y no significativo. En cuanto a pobreza y extrema pobreza rural, el gráfio 3.5 muestra una incidencia más pronunciada de las transferencias no contributivas. En particular, se observa que entre el 2008 y el 2017 las transferencias no contributivas reducen la extrema pobreza rural de manera significativa.

El análisis de incidencia presentado en esta sección muestra que las transferencias no contributivas tienden a reducir la pobreza en el Ecuador. Sin embargo, este análisis nos permite evaluar el efecto de las políticas socio-fiscales solo de manera parcial por dos razones. Primero, al evaluar la incidencia de las transferencias no contributivas en un solo año, el efecto obtenido es el resultado de la interacción entre las características de la población y el diseño de las políticas. Por ejemplo, si en un año en particular había una mayor proporción de familias económicamente vulnerables (de acuerdo al Selben o al índice del registro social) con niños menores, la cobertura del Bono de Desarrollo Humano podría ser más elevada que en otros años. Segundo, la ENEMDU no captura el monto de aportes a la seguridad social o impuesto a la renta de personas naturales. Por ende, la incidencia de estos instrumentos no puede ser analizada de forma directa. Si bien, este segundo problema puede afectar solo de manera limitada a pobreza y extrema pobreza, su efecto puede ser importante en términos de desigualdad.

Graph 3.15. Poverty and extreme poverty in rural areas – total income vs. Income without bonuses from 1988 to 2021



Nota: Las líneas verticales denotan años en los que hubo cambios metodológicos en las encuestas.
Fuente: Elaboración propia en base a la ENEMDU

3.4.2. Decomposition of changes in poverty and inequality in Ecuador

Descomposición de los cambios en pobreza y desigualdad en Ecuador

En la sección anterior se evidenció que las transferencias no contributivas han tenido un efecto significativo en la reducción de la extrema pobreza rural en el Ecuador. En esta sección profundizamos la discusión de los efectos de políticas socio-fiscales sobre la pobreza y la desigualdad en el Ecuador. Para esto utilizamos ECUAMOD, el modelo de microsimulación del Ecuador, que permite simular aportes a la seguridad social, impuesto a la renta y las principales transferencias monetarias en el país. ECUAMOD simula estas

políticas para todas las personas y hogares en la ENEMDU. Existen dos principales ventajas en el uso de modelos de ECUAMOD.

Primero, el modelo permite simular de manera detallada aportes a la seguridad social de asalariados e independientes y el impuesto a la renta de personas naturales. Estos instrumentos no son capturados en la ENEMDU y, por ende, ECUAMOD nos permite analizar su impacto redistributivo. Segundo, ECUAMOD nos permite simular distribuciones de ingreso disponible contractuales en las que las políticas de impuestos y transferencias de un año se aplican a la población de otro año. Por ejemplo, el modelo nos permite simular cuál habría sido el nivel de pobreza y desigualdad en el Ecuador en el año 2019 si se hubieran conservado las políticas de impuestos y transferencias con las características del año 2014. Esta posibilidad brindada por el modelo nos permite descomponer cambios en pobreza y desigualdad en el tiempo en la contribución de (i) reformas a impuestos y transferencias y (ii) cambios en la población e ingreso de mercado.

Para la descomposición, nos concentramos en tres subperiodos donde se observaron diferencias en la evolución de pobreza y desigualdad y en los cuales existieron reformas importantes del Bono de Desarrollo Humano y del impuesto a la renta de personas naturales: (i) 2003 y 2008; (ii) 2008 y 2014; y (iii) 2014 y 2019. Más precisamente, calculamos el cambio en pobreza y desigualdad entre los años de cada periodo y cuantificamos la contribución de reformas socio-fiscales en explicar los cambios observados. La decisión de tomar el 2003 como año de inicio para el análisis es motivada por dos razones. Primero, las diferencias en el diseño de la ENEMDU se vuelven más importantes si consideramos años anteriores al 2003. Segundo, el 2003 marca un punto importante pues es el año en el que se institucionaliza el Bono de Desarrollo Humano como principal programa de asistencia social en el Ecuador. La decisión de tomar el 2019 como año final de análisis es para evitar tener en cuenta los efectos de la pandemia de la COVID-19. Sin embargo, los efectos de la pandemia en pobreza y desigualdad y el rol de las políticas socio-fiscales durante este periodo se discuten en la siguiente sección. A continuación, se presentan los resultados de la descomposición de Shorrocks-Shapley en base a los dos tipos de descomposición descritos en la sección 3.3.

El gráfico 3.6 presenta los resultados de la descomposición para los tres periodos considerados. El Panel A presenta la descomposición de cambios en pobreza de ingresos. El Panel B muestra los resultados en términos de extrema pobreza. Finalmente, el Panel C se concentra en la descomposición de cambios en desigualdad de ingresos medida por el

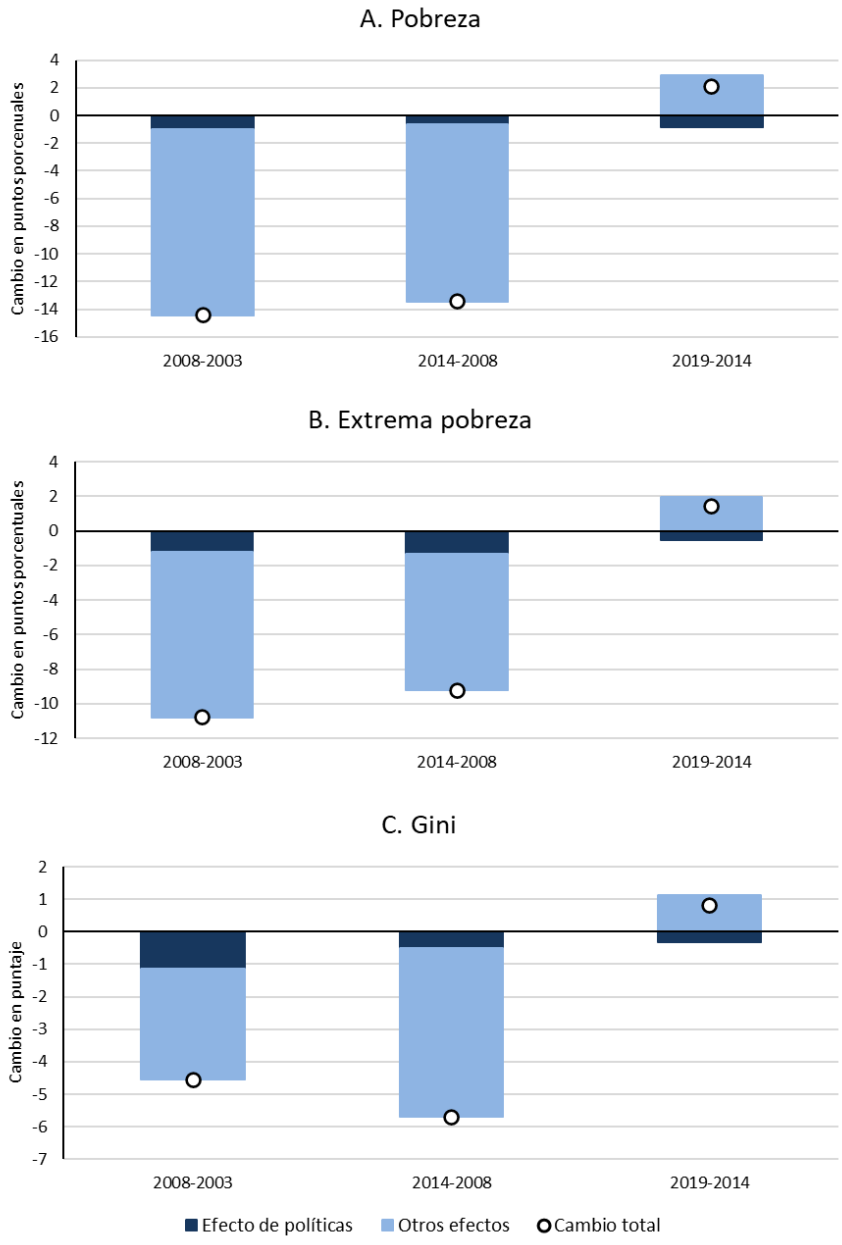
coeficiente de Gini. En los tres paneles, el círculo blanco represente el cambio total en pobreza, extrema pobreza o desigualdad entre los dos años de cada periodo. Las barras azul oscuras representan la contribución de reformas socio-fiscales (efecto de políticas) en los cambios totales. Las barras azul claras representan la contribución de otros factores (otros efectos) en los cambios totales observados.

En términos de pobreza (Panel A), los resultados muestran que la tasa de pobreza se redujo de 14,4 puntos porcentuales (p.p.) entre 2003 y 2008, de 13, p.p. entre 2008 y 2014 y aumentó de 2,1 p.p. entre 2014 y 2019. En los tres periodos analizados, observamos que la mayor parte del cambio en pobreza se explica por el componente de otros efectos. Más precisamente, la disminución de pobreza entre 2003-2008 y 2008-2014 se explica por una mejora en ingresos de mercado que tiene un efecto reductor de la pobreza. Al contrario, el aumento de pobreza entre 2014-2019 se explica por un empeoramiento de ingresos de mercado.

Por otro lado, las reformas socio-fiscales, en particular las reformas al Bono de Desarrollo Humano, contribuyen a una reducción de la pobreza en los tres periodos de análisis. Para el periodo 2003-2008, el aumento del monto del BDH contribuye a una reducción de la pobreza de 1 p.p. Para el periodo 2008-2014, la contribución del BDH disminuye – aunque aún reduce la pobreza – y contribuye a una reducción de 0,6 p.p. de la pobreza. El efecto más modesto para este periodo se explica por el tipo de reforma al BDH que se observa entre el 2008 y el 2014. Por un lado, entre estos dos años el monto del bono aumenta, lo que contribuye a reducir la pobreza. Por otro lado, la cobertura del bono se reduce, lo que contribuye a un aumentar la pobreza. El efecto que prima es el aumento del monto del bono.

Sin embargo, el efecto reducido del BDH por la reducción de la cobertura del programa alerta de los procesos cuasi arbitrarios de graduación exógena que ocurren cuando se levanta un nuevo índice del Registro Social y se determina un nuevo punto de corte para identificar a los beneficiarios. Finalmente, para el periodo 2014-2019, cambios en el BDH mitigan de un 0,8 p.p. el impacto de otros efectos en aumentar la pobreza. El aumento del efecto del BDH con respecto al subperiodo anterior (2008-2014) se explica por un aumento en la cobertura del bono y la introducción del BDH variable con montos adicionales por hijos de diferentes edades.

Graph 3.16. Decomposition in changes in poverty, extreme poverty, and income inequality



Fuente: Elaboración propia en base a ECUAMOD.

Los resultados en términos de extrema pobreza (Panel B) siguen un patrón similar al de pobreza. La tasa de extrema pobreza se redujo de 10,8 p.p. en el periodo 2003-2008, de 9,2 p.p. entre 2008 y 2014 y aumentó de 1,4 p.p. en el periodo 2014-2019. Al igual que para pobreza, la mayor parte del cambio en extrema pobreza se explica por el componente de otros efectos – cambios en ingreso de mercado. Las reformas al BDH contribuyen a reducir la tasa de extrema pobreza en todos los periodos. Contrariamente al caso de cambios en pobreza, reformas al BDH en el periodo 2008-2019 tienen un mayor efecto en la reducción de extrema

pobreza que en el periodo anterior. Esto se debe al hecho que, para extrema pobreza, la reducción en la cobertura en el BDH tiene menor impacto que el aumento del monto del bono. Al igual que en el caso de pobreza, cambios en el BDH mitigan el aumento de extrema pobreza debido a otros efectos.

Con el objetivo de dar una indicación de los factores asociados a los cambios en pobreza y extrema pobreza dentro del componente de otros efectos, las Tablas A1 y A2 en el anexo presentan una desagregación de la tasa de pobreza y extrema pobreza de ingreso de mercado (antes de impuestos y transferencias) por variables demográficas. Para los periodos 2003-2008 y 2008-2014, se evidencia una disminución de la pobreza, con ingreso de mercado, a nivel nacional de -13,5 p.p. y -12 p.p., de manera correspondiente. En el primer subperiodo, dicha disminución se asocia principalmente a reducciones en la tasa correspondiente al área urbana (-9,8 p.p.), mientras que para el segundo se evidencia que el área rural es la que contribuye más (-8,2 p.p.). No existen diferencias al desagregar por sexo en ambos subperiodos. Al analizar por niveles de instrucción, se identifica que las personas con educación básica son las que más aportan a la disminución (-9,5 p.p. y 9 p.p.). Por otro lado, al incremento de 4,1 p.p. de la tasa de pobreza con ingreso de mercado, entre 2014 y 2019, contribuyen mayoritariamente personas en áreas rurales, con educación básica y de autoidentificación indígena. Para el caso de las variaciones de la tasa de pobreza extrema, con ingreso de mercado, las contribuciones por características sociodemográficas muestran un ordenamiento similar al análisis previamente realizado sobre la tasa de pobreza moderada.

Finalmente, el Panel C muestra los resultados de la descomposición de los cambios en el coeficiente de Gini en los tres periodos de análisis. Los resultados muestran que el coeficiente de Gini cayó de 0,046 puntos en el periodo 2003-2008, de 0,057 puntos en el periodo 2008-2014 y aumentó de 0,008 puntos en el periodo 2014-2019. Al igual que en el caso de pobreza y extrema pobreza, las reformas a impuestos y transferencias contribuyeron a reducir la desigualdad en todos los periodos. La contribución de cambios en impuestos y transferencias en explicar los cambios en desigualdad en el primer periodo de análisis representa 25% del cambio en el Gini. En el caso de desigualdad, la contribución de las políticas viene no solamente de la reforma al BDH sino también de la reforma al impuesto a la renta de personas naturales. En el segundo periodo de análisis, la contribución de reformas a políticas socio-fiscales es más baja, representando un 9% del cambio en el Gini entre 2008 y 2019. El efecto más modesto en este periodo se explica por la menor cobertura del BDH, pero también porque entre estos dos años no hubo ninguna reforma mayor al impuesto a la renta.

Finalmente, entre el 2014 y el 2019, el coeficiente de Gini aumenta debido a cambios en el ingreso de mercado, capturados en el componente de 'otros efectos'. En la ausencia de reformas socio-fiscales entre los dos años, el coeficiente de Gini habría aumentado de 0,451 a 0,462. Sin embargo, las reformas de políticas socio-fiscales permiten mitigar este aumento y el Gini en el 2019 se ubica en 45,9.

3.4.3. The rol of taxes and transfers during the COVID-19 pandemic in Ecuador
El rol de impuestos y transferencias durante la pandemia de la COVID 19 en Ecuador

Después de la alarma mundial sobre el coronavirus a finales de 2019, misma que tuvo como epicentro China, los casos confirmados en las Américas se comenzaron a reportar a inicios del año 2020. Concretamente en el caso de Ecuador, el Ministerio de Salud da a conocer el primer caso el 29 de febrero de 2020. Para el 11 de marzo de 2020 se declara el Estado de Emergencia Sanitaria en el Sistema Nacional de Salud y el 13 de marzo se activó el Comité de Operaciones de Emergencia -COE- a nivel Nacional (MSP 2022). Lo siguiente fue restringir la movilidad o establecer el confinamiento de las personas en ciudades como Quito y para el 15 de marzo se decreta el Estado de Emergencia a nivel Nacional, restringiendo casi todas las actividades públicas y privadas, excepto las denominadas actividades esenciales como sanidad y alimentación. El confinamiento estricto se mantuvo hasta junio de 2020 y a partir de julio del mismo año se comenzaron a flexibilizar dichas medidas buscando normalizar el funcionamiento de los negocios y las instituciones, para lo cual se implementaron acciones como el teletrabajo.

De acuerdo con las cifras oficiales se han contabilizado 35.818 personas fallecidas y confirmadas con COVID-19. Sin embargo, el exceso de muertes entre el 20 de marzo de 2020 y diciembre de 2021 se contabiliza por sobre los 89.165 (OSE 2022). Además de los efectos sanitarios en el deceso de personas y las afectaciones en la salud, se tuvieron efectos tanto en lo económico[42] como en lo social y lo político. Por lo cual, desde el gobierno central se tomaron ciertas medidas de política pública con el propósito de mitigar los efectos adversos de la pandemia sobre la economía de los hogares.

Luego de los efectos sanitarios, los efectos más visibles se dieron en el mercado laboral puesto que, con el cierre de muchos negocios aumentó el desempleo y se redujo considerablemente el número de trabajadores en el sector formal de la economía y bajo

[42] De acuerdo con los datos del Banco Central del Ecuador, el PIB para 2020 se redujo en 14% respecto del año 2019.

condiciones laborales formales. Así también se vieron reducidos los ingresos de las personas en actividades informales como el comercio y de todas maneras las personas que aún mantenían sus trabajos vieron reducidos sus ingresos. Bajo este panorama, aumentó tanto la pobreza por ingresos, pasando de 25% en 2019 a 33% en 2020; como la extrema pobreza, al pasar de 8,9% en 2019 a 15,4% en 2020. Asimismo, aumentó la desigualdad, pasando de 0,473 puntos en 2019 a 0,498 en 2020.

Utilizando técnicas de microsimulación combinadas con métodos de descomposición, estudios recientes han demostrado que las políticas de impuestos y transferencias tuvieron un impacto muy limitado en mitigar el aumento de la pobreza y desigualdad durante la pandemia (Jara et al. 2021, Avellaneda et al. 2022). El modesto impacto del sistema de impuestos y transferencias se explica por dos razones. Primero, el Bono de Protección Familiar en sus 4 fases y el Bono Nutricional tuvieron baja cobertura y duración. Segundo, el bono de desarrollo humano no pudo brindar protección a hogares que sufrieron pérdidas de ingresos ya que la recepción de este bono no depende del ingreso de los hogares sino del índice de registro social. En este sentido, las únicas políticas que actuaron como estabilizadores automáticos fueron los aportes a seguridad social y el impuesto a la renta, absorbiendo parte del choque económico en la parte alta de la distribución de ingresos (Jara et al. 2021, Avellaneda et al. 2022).

3.5 Lessons and recommendations

Lecciones y recomendaciones

En base al análisis presentado a lo largo de este capítulo, en esta sección se discuten las principales lecciones acerca de rol que han tenido los impuestos directos y transferencias monetarias en reducir la pobreza y desigualdad de ingresos en el Ecuador. Adicionalmente, se resaltan los objetivos que se debería tener en cuenta para considerar hacia donde deberían direccionarse las políticas de impuestos y transferencias en vista a reducir la pobreza y desigualdad de ingresos en el Ecuador. Debido a la importancia en el acceso y uso de datos para evaluar el progreso de la situación de los hogares en el país, está sección define recomendaciones de carácter técnico, por un lado, y de política pública, por otro lado.

Desde el punto de vista técnico, tres recomendaciones pueden ser resaltadas. Primero, para el presente análisis ha sido importante realizar una especie de arqueología de la información respecto de las encuestas de empleo de los hogares, con el propósito de recolectar los datos de fuente primaria y a nivel micro o desagregado (hogares y personas). Este tipo de trabajo es

fundamental para poder hacer un recuento de la evolución de la pobreza y desigualdad de ingresos en el Ecuador y debería ser fomentado dentro de instituciones públicas. En este sentido, para este trabajo, se ha priorizado el uso de la ENEMDU desde el momento en que su levantamiento se vuelve permanente con el objetivo de tener información comparable. Este esfuerzo inicial de crear una serie histórica comparable debe ser profundizado revisando que exista un mayor grado de consistencia entre los periodos dónde hubo cambios metodológicos en la encuesta.

Segundo, la calidad de la información de ingresos levantada en la ENEMDU debería ser contrastada con información de registros administrativos. Un cruce directo entre las encuestas y datos administrativos de ingresos provenientes del Servicio de Rentas Internas y/o del Instituto Ecuatoriano de Seguridad Social podrían permitir analizar en qué medida problemas de sub-reporte de ingresos o de subrepresentación de altos ingresos en la ENEMDU sesgan los indicadores de desigualdad. De igual manera, un cruce directo entre las encuestas y los datos del Registro Social permitirían identificar posibles problemas en el reporte de la recepción de bonos en la ENEMDU, dado que la segunda tiene un enfoque específico de monitoreo del mercado laboral.

Tercero, la posibilidad de vincular de forma directa las encuestas de hogares a modelos de microsimulación de impuestos y transferencias debería ser explorada con mayor detenimiento. Esto permitiría tener una serie continua de datos que contengan información acerca de pagos a la seguridad social e impuesto a la renta y recepción de transferencias monetarias para la población del Ecuador. De esta manera, sería posible evaluar el efecto de reformas socio-fiscales de manera regular y para cualquier periodo de interés.

Desde el punto de vista de política pública, se pueden resaltar tres recomendaciones importantes. Primero, la discusión y formulación de políticas o programas para la erradicación de la pobreza y la reducción de la desigualdad debería estar directamente vinculada al diseño de reformas socio-fiscales. En particular, las normativas deberían identificar la medida en la cual reformas a transferencias monetarias e impuestos directos prevén reducir la pobreza y desigualdad de ingresos en el país. En este sentido, las propuestas de políticas o programas deberían ser acompañadas de una evaluación ex ante del efecto que estas tendrían a nivel de pobreza y desigualdad. Este tipo de evaluación es recurrente en países desarrollados por medio de modelos de microsimulación y facilita el seguimiento a los programas introducidos y la rendición de cuentas de gobiernos de turno.

Segundo, si bien los programas de transferencias monetarias se han institucionalizado dentro de la política social del país, es necesario repensar sus objetivos y rediseñarlos con respecto a ellos. Hasta ahora, los programas de transferencias monetarias se mantienen dentro de una visión asistencialista. Es posible que, por esta razón, el efecto de las transferencias monetarias en reducir la pobreza y desigualdad de ingresos en el Ecuador sea limitado. Por un lado, la identificación de beneficiarios sufre de problemas de focalización. Mientras que, por otro, la generosidad de las transferencias no se ve reflejada en cambios en los mecanismos que permiten a los hogares escapar de la pobreza, como, por ejemplo, el acceso adecuado a educación y salud de calidad. En este sentido el objetivo de los programas de transferencias monetarias en el Ecuador debería ser reevaluado desde una perspectiva de derecho – derecho a un nivel de vida digno – vinculándolo directamente con la visión de erradicar la pobreza en el país.

Tercero, al igual que los programas de transferencias monetarias, el diseño del impuesto a la renta de personas naturales no ha sido necesariamente considerado desde su rol redistributivo. La discusión de reformas al impuesto a la renta se concentra en general en objetivos de recaudatorios sin ser estos vinculados a la mejora o expansión de políticas sociales o la disminución de desigualdades. Es posible que, por esta razón, las reformas al impuesto a la renta han sido menos regulares que las reformas a las transferencias monetarias. Estos dos tipos de reformas deberían ser consideradas de manera complementaria y en conjunto. Una expansión importante de los programas de transferencias monetarias requeriría necesariamente una revisión del diseño del impuesto a la renta. Sin embargo, es importante recalcar que el financiamiento de la expansión de políticas sociales debe considerarse dentro de una perspectiva más amplia que incluya no solamente reformas al impuesto a la renta de personas naturales sino también de sociedades, impuestos indirectos y a la riqueza.

Las políticas de impuestos y transferencias monetarias pueden tener un efecto importante en reducir la pobreza y desigualdad de ingresos, como sí lo hacen en los países de la Unión Europea, por ejemplo.[43] Por esta razón, este trabajo se enmarca dentro de visión evaluativa y resalta que es indispensable que el monitoreo y evaluación de las políticas específicas se las

[43] En la Unión Europea, los impuestos directos y transferencias monetarias redujeron el coeficiente de Gini de 0.494 (ingreso de mercado) a 0.289 (ingreso disponible) en el 2019. En el mismo año, la tasa de pobreza se redujo de 35.5% a 16% gracias al efecto de las políticas socio-fiscales (EUROMOD 2022). Adicionalmente, estudios recientes muestran que los sistemas de impuestos y transferencias de varios países de la Unión Europea estuvieron bien equipados para combatir el efecto de la crisis de la COVID 19, lo que resultó en cambios menores en los niveles de pobreza y desigualdad de ingreso disponible, a pesar del impacto negativo en empleo e ingresos de mercado (Christl et al., 2021).

realice de manera regular, técnica y bajo un enfoque de mejora continua (Arévalo y Montesdeoca 2022), dónde deberían incluirse tanto metodologías cuantitativas como metodologías cualitativas. En este sentido, es importante considerar un acercamiento entre la academia y los hacedores de política pública para promover el uso de herramientas para el análisis de políticas pública en base a evidencia.

3.6 Conclusions of the chapter

Conclusiones del capítulo

En las tres últimas décadas el Ecuador ha vivido grandes cambios a nivel político, económico y social que han determinado la evolución de la pobreza y desigualdad de ingresos en el país. De esos cambios, es importante identificar aquellos que están relacionados a las políticas socio-fiscales, de aquellos cambios fruto de otros factores socio-económicos y demográficos. En efecto, pensando a futuro, es esencial considerar que tipo de políticas son las más eficaces en reducir la pobreza y desigualdad en el Ecuador.

De los instrumentos utilizados para erradicar la pobreza y reducir la desigualdad, no sólo en Ecuador sino en la región, se destacan los programas de transferencias monetarias y los impuestos directos como la forma más efectiva de financiar dichos programas y redistribuir los ingresos. En este capítulo nos concentramos en analizar en qué medida las reformas de impuestos directos y transferencias monetarias de las últimas décadas han contribuido a reducir la pobreza y la desigualdad en el Ecuador. Para esto, primero se describió la evolución de la pobreza y desigualdad utilizado las Encuestas de Empleo Desempleo y Subempleo de Hogares (ENEMDU) de finales de año del periodo 1988-2021. Después, para años claves en los que se introdujeron reformas socio-fiscales importantes se utilizaron técnicas de microsimulación para cuantificar la contribución de estas reformas en reducir la pobreza y la desigualdad comparado con otros factores.

Entre 1988 y 2021, se destacan cuatro periodos importantes en cuanto a la evolución de la pobreza y la desigualdad en el Ecuador. En el primer periodo (1988-2001), la pobreza cae inicialmente hasta 1997 pero luego aumenta de manera importante entre 1998 y 2001 debido a la crisis financiera que golpeó la economía ecuatoriana. El segundo periodo (2001-20014) está caracterizado por una disminución significativa de la pobreza y desigualdad y coincide con el commodity boom de los años 2007 a 2014 y la introducción del principal programa de asistencia social en el país, el Bono de Desarrollo Humano. El tercer periodo (2014-2019) es un periodo de estancamiento en la reducción de la pobreza y desigualdad en el país.

Finalmente, el último periodo refleja el aumento de la pobreza y desigualdad como resultado de la pandemia de la COVID 19.

En cuanto al efecto de las políticas socio-fiscales, los resultados del análisis muestran que las reformas a impuestos directos y transferencias monetarias introducidas entre 2003 y 2019 siempre contribuyen a la reducción de la pobreza y de la desigualdad en el Ecuador. Sin embargo, el efecto de las políticas socio-fiscales es limitado, contribuyendo en promedio menos del 20% del cambio total en pobreza y desigualdad en los tres subperiodos analizados. Como resultados, el aumento o la disminución de la pobreza y desigualdad en el Ecuador siguen siendo determinados por cambios en la economía que afectan los ingresos de mercado. Es así que entre 2014 y 2019 se observa un aumento de la pobreza y desigualdad explicados por cambios poblacionales y de ingreso de mercado y las políticas socio-fiscales si bien mitigan en parte este aumento, no logran contrarrestar el deterioro de los ingresos de los hogares. Este mismo efecto se observa durante la pandemia de la COVID 19 pero de manera aún más drástica, con un aumento dramático de la pobreza y desigualdad en el Ecuador y un efecto mínimo de las políticas de emergencia, particularmente si se compara con otros países de la región (Avellaneda et al. 2021).

En este sentido, es fundamental repensar la función y el diseño de las políticas de impuestos y transferencias monetarias. Del lado de las transferencias, si bien los programas de asistencia social se han institucionalizado en el Ecuador, aún persisten problemas de focalización, cobertura y generosidad en el monto de bonos que permitan a los hogares adquirir un nivel de vida adecuado. Adicionalmente, la pandemia de la COVID 19 ha resaltado los problemas de las transferencias monetarias cuya elegibilidad está basada en índices compuestos (proxy-means-testing). Estos programas no actúan como estabilizadores automáticos lo que significa que en caso de una pérdida de empleo o ingresos los hogares quedan desprotegidos. Esto resalta la necesidad de repensar la protección social en el Ecuador. Del lado fiscal, es importante pensar en reformas progresivas al impuesto a la renta de personas naturales que permitan crear recursos para financiar la expansión de políticas sociales. Este tipo de reformas tendría un efecto redistributivo importante. Sin embargo, cabe resaltar que el financiamiento de la expansión de la protección social en el Ecuador debería ser pensada en un contexto más amplio que incluya reformas a impuestos directos e indirectos, impuestos a las sociedades y a la riqueza.

Cabe recalcar que el análisis de este capítulo se ha concentrado en el efecto de los impuestos y transferencias en la pobreza y desigualdad e ingresos, utilizando el concepto de ingreso

disponible como variable principal. Por esta razón, no se han considerado los efectos de impuestos indirectos y subsidios. El análisis del efecto de estos instrumentos requiere encuestas con información de ingresos y gastos que, si bien existen en el Ecuador, se recogen con menos regularidad. Igualmente, la provisión de cuidado, salud y educación pública tiene efectos redistributivos pero su análisis requiere información detallada acerca que la manera en la que estos recursos se distribuyen dentro de la población. Finalmente, en el futuro, el efecto de impuestos y transferencias debería analizarse también desde una perspectiva multidimensional (Jara y Schokkaert 2017). Sin embargo, este tipo de análisis tiene limitantes más importantes a nivel de datos.

Chapter 4. The Role of Automatic Stabilizers and Emergency Tax–Benefit Policies During the Covid-19 Pandemic: evidence from Ecuador[44]

4.1 Introduction of the Chapter

In addition to the devasting public health emergency worldwide, the COVID-19 pandemic has resulted in an international crisis which is likely to affect vulnerable population groups more than others as a result of the effects of lockdown and social distancing policies in the short term and the negative effect on employment and earnings in the long term. The COVID-19 outbreak is therefore reinforcing inequalities, and the depth of this effect is likely to be more severe in already highly unequal societies such as in Latin America.

According to estimates from the Economic Commission for Latin America and the Caribbean (ECLAC) (ECLAC 2020) a contraction of − 9.1% of GDP and an increase of 5.4 percentage points (pp) in unemployment is expected by the end of 2020 in Latin America. The severity of the initial economic shock of the pandemic in Latin America has been documented by Bottan et al. (2020), who use online surveys of 17 countries in the region and show that around 45% of respondents have a household member who lost their job during April 2020. Ecuador is among the countries in the region that has been the most severely affected by the COVID-19 outbreak. As of 17 January 2021, Ecuador has reported 230,808 cases and a total number of 14,316 deaths due to the virus, making it one of the countries with the largest number of deaths per million people in Latin America and one with the largest case-fatality rates in the world (WHO 2020). The economic cost of the crisis is also likely to be large in Ecuador, as oil prices (the country's main source of revenue) were already low prior to the pandemic and plummeted as a result of the crisis. The projected drop in GDP growth is close to the regional average, representing a 9% contraction.

As a response to the crisis, governments in Latin America have implemented a variety of social protection measures such as cash and in-kind transfers, provision of basic services, and tax reliefs. The coverage and generosity of the emergency measures vary widely across countries. The main policy implemented by the Ecuadorian government is the health emergency Family Protection Grant (*Bono de Protección Familiar*), which offers a US$120 transfer to low-income families. The transfer, however, excludes individuals in receipt of other social cash transfers and no additional payments have been offered to beneficiaries of

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the main social assistance scheme, the Human Development Transfer (*Bono de Desarrollo Humano*).

The aim of this paper is to investigate the role of tax–benefit policy interventions in mitigating the socioeconomic effects of COVID-19 in Ecuador. More precisely, we compare the pre-COVID situation based on household survey data from December 2019 with a COVID scenario derived by adjusting the 2019 data to capture the effect of the pandemic on the labour market and earnings based on household survey data collected by the National Statistical Institute in May/June 2020. Our COVID scenario, thus, captures the effect of lockdown measures in place until May 2020, which were progressively relaxed during the month of June 2020. Then, we use ECUAMOD, the tax–benefit microsimulation model for Ecuador, and build on the decomposition approach from Brewer and Tasseva (2021) to quantify the distributional effects of: (i) formal and informal earnings losses due to COVID-19, (ii) pre-crisis tax–benefit policies (i.e. automatic stabilizers), and (iii) COVID-related tax–benefit measures implemented by the government.

Our results show a dramatic increase in poverty and inequality between December 2019 and June 2020 due to the COVID-19 pandemic. The national poverty headcount increased by 32.5 pp (from 25.7 to 58.2%), and the extreme poverty headcount increased by 29.4 pp (from 9.2 to 38.6%).[45] Inequality measured by the Gini coefficient rises by 0.131 (from 0.461 to 0.592). On average, household disposable income drops sharply by 41%. The impact is larger in the middle of the income distribution, which is related to the position of earners in different industries across the income distribution and is consistent with recent findings for other Latin American countries (Lustig et al. 2020). Our decomposition shows that, on average, tax-benefit policies will provide very limited income protection. The effect of automatic stabilizers on household disposable incomes is larger than that of COVID-related benefits, and their effects vary across the income distribution. The contribution of auto-stabilizers, in particular, social insurance contributions (SICs) and personal income tax, increases towards the top of the income distribution, i.e., they mitigate the losses in gross earnings of higher-income families more than of lower-income families. The COVID-related Family Protection Grant provides larger protection to households at the bottom of the distribution but plays a limited role in reducing poverty and inequality.

[45] The 2019 national poverty lines of US$85.03 per month for poverty and US$47.92 per month for extreme poverty are used in the analysis.

Our analysis contributes to the growing literature assessing the role of tax–benefit policies in mitigating the distributional impact of the COVID-19 pandemic. Recent studies making use of microsimulation techniques have accounted for the impact of tax-benefit policies on household incomes in developed countries and have highlighted the important role played by COVID-related emergency measures (Beirne et al. 2020; Brewer and Tasseva 2021; Figari and Fiorio 2020). Evidence on the distributional effect of tax-benefit policies during the pandemic in developing countries remains scarce. Lustig et al. (2020) simulate the annualized impact of the pandemic on household income in Argentina, Brazil, Colombia, and Mexico. Their results show a large increase in poverty and inequality and point to an important effect of expanded social assistance programmes in mitigating the impact of the shock in Brazil and Argentina. Brum and de Rosa (2021) nowcast the impact of the pandemic during the second quarter of 2020 in Uruguay and show that the poverty rate increased by 38% with a very limited effect of the emergency cash transfers introduced by the government. Our analysis is in line with these studies. As Brum and de Rosa (2021), we also focus on the period when the economy was the most affected by the pandemic. However, rather than estimating aggregate income losses based on annual estimates of GDP shocks, our approach of using timely labor market data with a tax-benefit model allows us to capture changes in employment and earnings of formal and informal workers and assess in detail the tax-benefit response to the crisis.

More generally, our work contributes to the limited literature studying the role of tax–benefit systems in protecting incomes during economic recessions in Latin America (Daude et al. 2011; Martorano 2018; Vegh et al. 2019). In particular, the study of taxes and benefits as automatic stabilizers has seldom been analyzed for Latin America, making use of microsimulation techniques. To the best of our knowledge, only Espino and González Rozada (2012) have made use of microsimulation techniques to estimate the size of automatic stabilizers in selected Latin American countries. Their study focuses on Argentina, Brazil, Mexico, Nicaragua, and Peru with data from 2005 and 2006. Our analysis, therefore, complements this study, looking at the role of automatic stabilizers in Ecuador in the context of the COVID-19 crisis.

The remainder of the paper is structured as follows. The section on Social Protection in Ecuador and Policy Measures in Response to COVID-19 discusses the main social protection instruments in Ecuador and the emergency tax–benefit policies implemented by the government to mitigate the impact of COVID-19. The Methodology section presents

the methods and data. The Empirical Results section is dedicated to the analysis of the empirical results. Finally, the last section (Conclusion) concludes.

4.2 Social Protection in Ecuador and Policy Measures in Response to Covid-19

Relative to developed economies, social protection in low- and middle-income countries remains modest due to limited fiscal capacity. Government spending on social protection represents, on average, 4.1% of GDP in Latin America compared to 12% of GDP in OECD countries (ECLAC 2019; OECD 2019)[46]. Spending on social protection in Ecuador is below the regional average, representing 1.44% of GDP. Contributory social security benefits have little coverage in the country and consist mainly of contributory old-age pensions. Coverage of non-contributory programmes has decreased over the last years due to budgetary pressure. In terms of taxes, the average tax-to-GDP ratio in Latin America and the Caribbean (LAC) is 23.1% com- pared to 34.3% in the OECD (2020)[47]. LAC countries are also characterized by a different tax composition relative to developed economies. Indirect taxes on goods and services remain important due to their ease of collection. Personal income tax and SICs represent 9.6% and 17.1% respectively of total tax revenue, on average, in the LAC region compared to 23.9% and 26% respectively in the OECD. Tax revenue in Ecuador is below the regional average, with a tax-to-GDP ratio of 20.6%. The contribution of personal income tax is below the regional average, representing around 6% of total tax revenue, whereas the contribution of SICs accounts for 24.5% of total tax revenue.

Looking closer at social protection, individuals and their families can access two main social transfers in Ecuador: The Human Development Transfer and the Unemployment Insurance schemes. The Human Development Transfer (*Bono de Desarrollo Humano*) is the main non-contributory social protection scheme in Ecuador and aims to improve human capital and avoid the persistence of poverty by means of monetary transfers to poor families. It is a proxy means-tested benefit, targeting three population subgroups: (i) families with children younger than 18 years old, (ii) elderly adults above 65 years old who are not entitled to any pensions, and (iii) individuals with disabilities[48]. The proxy means-test is based on a composite index comprising household characteristics and housing conditions. Families and

[46] For comparability, OECD estimates include only spending in pensions and income support to the working age population.
[47] Data for 2018 are used for LAC and 2017 data for the OECD average as the 2018 data are not available.
[48] Here, we consider all the subprogrammes of the original Human Development Transfer under the same umbrella: Human Development Transfer for families with children, non-contributory pension assistance, and non-contributory disability benefits.

individuals below a specific threshold of the index are eligible for the benefit, and certain conditionalities apply to families with children[49]. It is worth noting that household income is not relevant for the proxy means-test, and so, benefit entitlements are not adjusted to cushion income losses per se. Moreover, benefit eligibility is assessed over long periods of time (more than two years) when new official data are collected to recalculate the composite index. Thus, although providing an important income protection for existing recipients, by design, this benefit does not act as an income stabilizer during the initial shock of the pandemic. As of 2019, the Human Development Transfer counted around 1 million beneficiaries.

The Unemployment Insurance Scheme (Seguro de desempleo), introduced back in March 2016, pays out a benefit to unemployed individuals who were previously affiliated with the general social security regime and paid SICs. The benefit amount consists of a fixed payment from a shared pool of funds and a variable top-up payment with funds from an individual account. The scheme consists of five monthly payments, starting after the third month of unemployment. But in response to the pandemic, from April to July 2020, the government reduced the waiting period to 10 days. The fixed payment equals 70% of the national minimum wage (US$400 in 2020). The variable payment tops up the fixed amount up to a maximum benefit amount of 70% of average earnings in the last 12 months of employment. After the first month, the overall payment is reduced by 5 pp every month until entitlement stops. In December 2019, the number of benefit recipients amounted to 22,900.

To mitigate the impact of the COVID-19 crisis, the Ecuadorian government introduced the Family Protection Grant (*Bono de Protección Familiar*) in March 2020. The transfer targets two population groups under a two-stage process and represents a cash transfer of US$120 paid in two monthly installments (i.e., US$60 each month)[50]. In the first stage, the poorest 400,000 households in the country are targeted. To be eligible, (i) the person must be affiliated to the rural workers or unpaid work social security regimes, (ii) the person must earn less than US$400 per month (equivalent to the legal minimum wage), and (iii) no members of the household should be receiving contributory or non-contributory benefits or

[49] Two types of conditionality apply for mothers with children receiving the Human Development Transfer. First, it is required that children aged 6–18 years old in the household enroll in school and attend at least 90% of school days in a month. Second, it is required that children below 6 years old in the household attend health centers at least twice per year for medical check-ups.
[50] US$60 is equivalent to 70.6% of the national poverty line in 2019.

pensions (Presidencia de la República 2020a). In the second stage, it targets 500,000 additional households, excluding stage one beneficiaries. To be eligible, (i) the household head must earn less than US$501.60 per month (equivalent to the official cost of a survivor basket of food and services) and (ii) no member of the household should be receiving contributory or non-contributory benefits or pensions (Presidencia de la República 2020b). The transfer aims to cover the poorest 21% of households in the country that fulfill the eligibility conditions.

Some other policies have been implemented as a result of the COVID-19 pandemic, but because of their design, it is not possible to take them into account within our simulation analysis in a consistent manner. For instance, the possibility of reducing the working hours and, correspondingly, wages have been introduced in the public and private sector. However, this policy does not apply universally. Sub-national governments have also delivered food baskets on demand and without allocation rules. Finally, there are lines of credit to support small businesses from foreign aid from international organizations.

4.3 Methodology and Data

Our study makes use of ECUAMOD, the tax–benefit microsimulation model for Ecuador, based on representative household microdata, to assess the distributional effects of COVID-19 in Ecuador. This section starts by presenting the data and microsimulation model used in the analysis. Then, it discusses the data adjustment made to capture the labour market situation during the first phase of the COVID-19 pandemic that we analyse. Finally, we describe the method used to assess the distributional impact of the COVID-19 crisis in May/June 2020.

Our analysis is based on representative household survey data from the National Survey of Employment, Unemployment and Underemployment of Urban and Rural Households (ENEMDU). ENEMDU is conducted on a quarterly basis by the National Institute for Statistics and Censuses (Instituto Nacional de Estadísticas y Censos, INEC) and represents the main data source for tracking the evolution of poverty and inequality in the country. The latest data available for distributional analysis prior to the COVID-19 pandemic are for December 2019 (INEC 2019), which we use in our study. The data contains information for 17,001 households and 59,183 individuals. Hereafter, we refer to this data as ENEMDU-2019.

ENEMDU-2019 contains information on labor and non-labor income, public pensions, cash transfers, and private transfers, as well as personal and household characteristics. It also contains information on affiliation to social security, which we use to define formal employment[51]. Informal employment in our analysis is therefore defined as non-affiliation to social security. ENEMDU does not contain expenditure data, needed for the simulation of personal income tax, as deductions for certain personal expenditures apply to the calculation of taxable income. For the purpose of personal income tax simulations, we imputed expenditure in food, clothing, education, health, and housing to ENEMDU-2019 based on information from the National Survey of Income and Expenditures of Urban and Rural Households (ENIGHUR 2011–2012) (ANDA 2012)[52].

To provide information about the labour market situation during the pandemic, INEC conducted phone surveys to collect data from the second quarter of 2020 (hereafter ENEMDU-2020) (INEC 2020a). The focus of the survey was to characterize the recent labor market developments under the COVID-19 pandemic. The number of variables collected was restricted and household identifiers were not released as part of the public data[53]. Therefore, ENEMDU-2020 cannot be used directly in our simulations. Instead, we use the data to generate aggregate information on employment and earnings by industry to adjust ENEMDU-2019 and derive input data capturing the Ecuadorian labor market situation during the second quarter of 2020.

[51] In general, ENEMDU captures well information on affiliation to social security as the data are cross validated with information from the Ecuadorian Institute of Social Security (*Instituto Ecuatoriano de Seguridad Social*, IESS).

[52] Unlike ENEMDU, ENIGHUR contains information on both income and expenditures. However, ENIGHUR data are not collected on a regular basis and the latest data available are for years 2011–2012. Expenditure amounts in ENIGHUR 2011–2012 are updated to 2019 values using the Consumer Price Index when imputed to ENEMDU 2019. A twostep procedure is used for the imputation. First, we estimate a probit model to determine which households are more likely to have each type of expenditure. Then, conditional on having positive expenditures, we estimate a linear regression for the amount of expenditures. Household disposable income, characteristics of the household, and household head are used as regressors.

[53] The ENEMDU-2020 phone survey is representative at the national level. INEC (2020b) describes the weighting strategy in the ENEMDU-2020 phone survey and the different steps and statistical tests undertaken to validate the survey weights. The ENEMDU-2020 phone survey contains information for 37,406 individuals, one third were interviewed in May and two-thirds in June. To avoid a decrease in response rates, the size of the questionnaire was reduced for the phone interviews to contain 81 questions compared to 227 questions included in the traditional ENEMDU (INEC 2020a).

4.3.1. Tax–Benefit Simulations

We use ECUAMOD, the tax–benefit microsimulation model for Ecuador, which combines detailed country-specific coded policy rules with household survey microdata to simulate direct and indirect taxes, SICs, and cash transfers for the household population of Ecuador[54]. ECUAMOD is a static model, i.e., tax–benefit simulations abstract from the behavioral reactions of individuals, and no adjustments are made for changes in the population composition over time. Simulation results for ECUAMOD have been validated against official statistics and the model has been used in recent empirical studies (see Bargain et al. 2017; Jouste and Rattenhuber 2019).

ECUAMOD is used to simulate the main tax and benefit components of household disposable income in Ecuador: (i) SICs and (ii) personal income tax for workers reporting affiliation with social security; (iii) the Human Development Transfer, which represents the main social protection program in the country; (iv) unemployment insurance; and (v) the COVID-related Family Protection Grant. Simulations of the unemployment insurance benefit and the COVID-related Family Protection Grant are calibrated to match the number of benefit recipients according to administrative sources. Non-simulated benefits, such as pensions, are taken directly from the data. Disposable income is defined as the sum of market income plus social cash transfers (including pensions) minus income tax and SICs[55].

ECUAMOD is used to simulate the distribution of household disposable income before and during the COVID-19 pandemic to assess the impact of the outbreak and lockdown measures. The pre-COVID scenario corresponds to the income distribution in December 2019 based on ENEMDU-2019. The income distribution in the COVID scenario is obtained by running ECUAMOD with 2020 tax–benefit policies, including the Family Protection Grant, on the adjusted ENEMDU-2019, which reflects the labour market and earnings situation in May/June 2020. The adjustment is discussed in detail in the next section.

[54] ECUAMOD has been developed and is maintained as part of the SOUTHMOD project (Decoster et al. 2019). For more information see Jara and Montesdeoca (2020) and https://www.wider.unu.edu/project/southmod-simulating-tax-and-benefit-policies-development. The model has been implemented in the EUROMOD platform, which provides a common framework based on a standard set of conventions for tax-benefit simulations (Sutherland and Figari 2013).

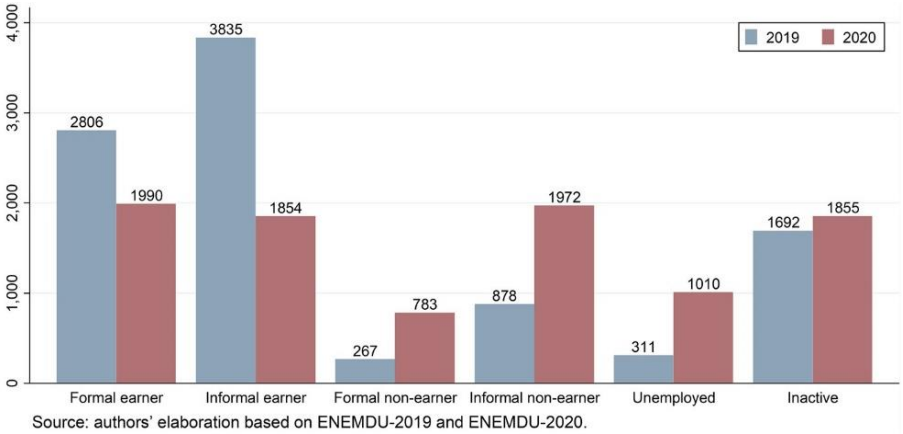
[55] Market income is defined as the sum of employment and self-employment income, bonuses, inkind income, ownconsumption from selfemployment activities, capital and property income, interhousehold payments, and private transfers, minus alimony payments. Imputed rent is not included.

Finally, we note here that the analysis does not account for other mitigation strategies, such as inter-household transfers, that people may be relying on during the crisis. We focus primarily on the protection provided by government policies.

4.3.2. Simulating Changes in Employment and Earnings Due to COVID-19

This section presents the approach taken to derive our COVID scenario. We start by comparing the changes in the labour market and earnings between December 2019 and May/June 2020. Then, we discuss the steps taken to adjust ENEMDU-2019 to reflect the economy's situation in May/June 2020 based on data from ENEMDU-2020.

Graph 4.17. Changes in the labour market between December 2019 and May/June 2020 (in thousands of people)



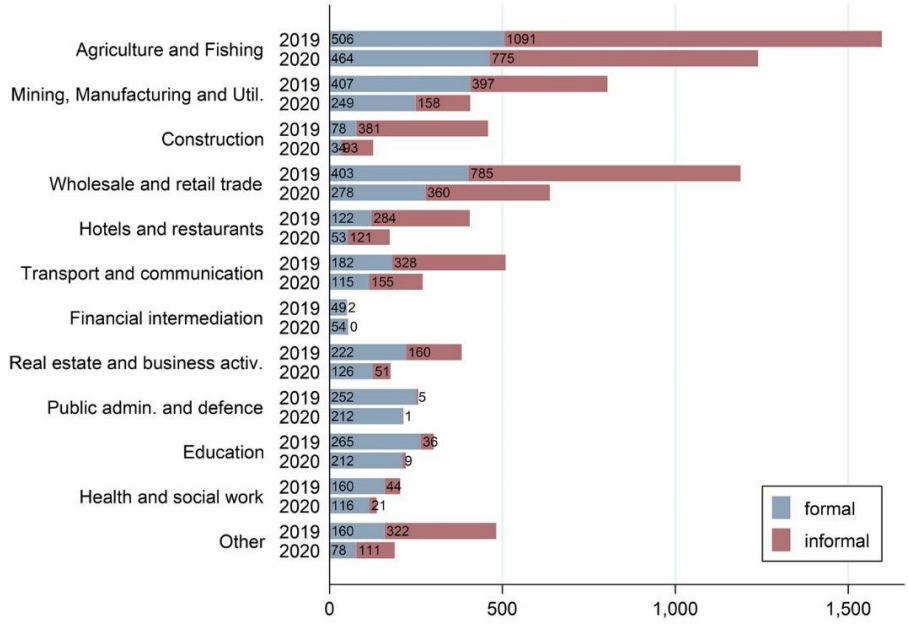
Graph 4.1 presents the changes in the labour market for the working-age population in Ecuador (above 15 years old) between December 2019 and May/June 2020. The figure shows the number of people in work, unemployment, and inactivity (excluding full-time students, pensioners, and individuals with a disability)[56]. For those in work, we distinguish between those in formal and informal employment and those with positive earnings (earner) and zero earnings (non-earner). The results show the striking effect of the COVID-19 pandemic and lockdown measures in the Ecuadorian labour market. The total number of people in (un)paid work decreased by 15% (from 7.8 to 6.5 million), while a large fraction of

[56] Differences in the total number of individuals across categories in Fig. 1 between 2019 and 2020 are explained by the exclusion of fulltime students, pensioners, and individuals with a disability. More precisely, an increase in the number of students and pensioners is observed between December 2019 and June 2020 according to ENEMDU. It is possible that students and pensioners who also received earnings in 2019 were reporting their main activity as being in work in 2019, whereas in 2020 they might have opted for identifying themselves as students or pensioners after losing their earnings due to the pandemic. A rigorous assessment of such effects is not possible due to the lack of panel data.

earners who remained in work lost their earnings[57]. Overall, the number of formal(informal) earners fell by 29% (52%), while the number of formal(informal) non-earners increased 2.9 (2.2) times.

The number of people in unemployment more than tripled from 311,134 to over 1 million individuals. Inactivity also increased, by around 10%. Graph 4.1 illustrates that transitions from paid to unpaid work (i.e. earner to non-earner) or from work to unemployment/ inactivity are the most likely channel of labour market changes during the period when the economy was hit the hardest by the pandemic. The labour market effect of the pandemic by sector of activity is presented in graph 4.2, which shows the total number of earners (top of the bars) per industry in December 2019 and in May/June 2020, distinguishing between formal (blue bars) and informal earners (red bars).

Graph 418 Number of formal and informal earners (in thousands) in December 2019 and May/June 2020



Source: authors' elaboration based on ENEMDU-2019 and ENEMDU-2020.

[57] Unlike in some high-income countries (e.g. the UK), furloughed workers in Ecuador do not receive any government subsidies.

Table 4.1. Mean monthly earnings by industry in December 2019 and May/June 2020 (in USD)

	ENEMDU-2019				ENEMDU-2020			
	Formal		Informal		Formal		Informal	
	Employees	Self-employed	Employees	Self-employed	Employees	Self-employed	Employees	Self-employed
1. Agriculture and fishing	411.2	215.5	226.8	135.7	298.5	70.9	164.8	67.3
2. Mining, manufact. and	702.4	550.0	316.6	255.6	631.2	284.5	214.2	135.1
3. Construction	567.3	870.1	361.5	407.6	483.7	515.1	175.5	153.0
4. Wholesale and retail trade	607.0	568.6	315.4	292.7	529.4	289.2	239.9	137.3
5. Hotels and restaurants	459.6	798.4	254.2	264.8	380.0	130.4	170.7	115.9
6. Transport and	791.1	569.4	414.1	372.9	725.0	221.6	312.4	156.2
7. Financial intermediation, real estate and business	646.5	741.3	302.8	396.8	605.3	354.4	352.6	258.6
8. Public administration and defence; education; health and social work	925.0	749.1	358.6	293.0	916.5	206.5	350.1	219.0
9. Other	425.7	430.4	248.2	201.7	400.2	291.9	220.7	95.1
All	691.5	466.3	288.4	260.4	655.7	158.0	196.0	114.9

Source: Authors' elaboration based on ENEMDU-2019 and ENEMDU-2020

The largest decrease in the number of earners (formal and informal) is observed in the wholesale and retail trade sector, with a drop of 549,000 earners. The mining, manufacturing, and utilities sector follows, with a reduction of 397,000 earners. Other large changes are observed in agriculture and fishing and in the construction sector. The results for agriculture and fishing highlight the importance of data availability to capture accurately the labour market changes under the COVID-19 pandemic. Studies based on indices of at-risk industries usually assume that 'essential' sectors such as agriculture are not affected by the COVID-19 pandemic and lockdown measures (e.g. Lustig et al. 2020). However, informal workers in the agriculture sector are affected by disruptions in the agri-food supply chains and markets due to lockdown measures, facing decreased demand for agricultural products (FAO 2020).

Conditional on being in paid work in December 2019 and May/June 2020, Table 1 reports mean earnings by industries, distinguishing between formal and informal earners and employees versus self-employed.

On average, among all earners, mean monthly earnings decreased by 18% from US$460.5 in December 2019 to US$376.3 in May/June 2020. The decrease was particularly important for formal self-employed workers, amounting to a 66% reduction (from US$466.3 to US$158.0) in mean monthly earnings, compared to a 5% reduction (from US$691.5 to US$655.7) for formal employees[58]. Table 4.1 further shows the heterogeneous effect of the pandemic on earnings across industries. The most significant drop in mean earnings is observed for formal self-employed workers in hotels and restaurants (84% decrease), followed by formal self-employed workers in the category of public administration and defense, education, health, and social work (72% decrease), and informal self-employed workers in the construction sector (62% decrease).

Based on the number of earners (graph 4.2) and mean earnings per industry (Table 4.1), we adjust the data in ENEMDU-2019 to create micro-data reflecting the labor market situation and earnings distribution captured by ENEMDU-2020. More precisely, we modify the labour market status and earnings of individuals in ENEMDU-2019 to match the number of formal and informal earners per industry and mean earnings reflected in ENEMDU-2020.

[58] The changes in monthly earnings capture mostly reductions in earnings per hour worked rather than reductions in working hours. Conditional on being paid in December 2019 and May/June 2020, formal (informal) employees experienced on average a 2% (6%) reduction in weekly hours of work, whereas formal (informal) selfemployed workers experienced on average a 7% (10%) reduction in weekly hours of work.

For this purpose, we estimate a probit model of the probability of being unemployed on a sample of individuals in work or unemployment using ENEMDU-2020. The dependent variable is one if the person is unemployed, and zero otherwise. As regressors, we include sex, age, education dummies, a dummy for being married, a dummy for living in a rural area, and interactions between a female dummy and all other variables. Results from the probit estimation are presented in Table A1 in the Online Appendix.

The estimated coefficients are then used to predict the probability of being unemployed in ENEMDU-2019. The predictions are based on each person's characteristics, multiplied by the coefficients plus a random component that accounts for unobserved factors that may tip people into unemployment. Adding the random term means that we do not completely exclude the lowest-risk groups from unemployment (Li and Donoghue 2014). Based on these predicted probabilities, we move individuals from being formal/informal earners to having zero earnings to match the number of formal/informal earners in Graph 4.2. For this, we first rank formal and informal earners according to their probability of being unemployed and select by industry those with the lowest probability of being unemployed to remain in the status of formal and informal earners. Then, we set to zero all earnings of those individuals who are not selected to remain as earners. Table A2 in the Online Appendix shows the descriptive statistics from the original and adjusted microdata. Finally, for those individuals who remain as formal/informal earners, we adjust their earnings so that the mean earnings per industry and employment status (employee versus self-employed) in the adjusted microdata reflects the information of mean earnings per industry and employment status in ENEMDU-2020 (Table 4.1)[59]. Note that in reality, some workers within these categories might not have experienced changes to their earnings; however, the data do not allow us to identify these workers, and a further disaggregation by individual characteristics (e.g., gender, education) reduces the number of observations in each category.

4.4 Decomposing Changes in the Distribution of Household Disposable Income

In addition to comparing the distribution of household disposable income before and after COVID-19, we follow the decomposition approach proposed by Bargain and Callan (2010), extended by Paulus and Tasseva (2020), and recently applied to the context of the COVID-19 crisis in the UK by Brewer and Tasseva (2021). The method consists of simulating a series of counterfactual scenarios with the aim of isolating the distributional effects of: (i) earnings

[59] The adjustment is made for those categories where mean earnings changed by more than 5% between December 2019 and May/June 2020.

losses due to COVID-19, (ii) pre-crisis tax–benefit policies (i.e. automatic stabilizers), and (iii) COVID-related emergency measures implemented by the government. This section follows closely the description of the decomposition by Brewer and Tasseva (2021).

Let y represent pre-crisis gross market income, $t(y)$ income tax and SICs, and $b\,(t, y)$ government cash transfers. Then, household disposable income in the pre-cri- sis baseline scenario is given by:

$$B = y - t(y) + b\,(t, y) \qquad [20]$$

Now, let y' represent gross market income under the crisis reflecting a scenario with higher unemployment and lower earnings, $t\ y$ denotes income tax and SICs after the drop- i n earnings, and $b\ t, y$ represents government cash transfers after the earnings drop and benefit changes, e.g. newly introduced cash transfers. Then, the household disposable income under the crisis is given by:

$$D = \mathrm{y}' - t(y')\ + b''(\ t, y') \qquad [21]$$

A welfare index I, such as mean income or a measure of inequality or poverty, can be calculated based on the distribution of disposable income under the pre-crisis and crisis scenarios. The total difference Δ in the welfare indicator I between the pre-crisis and crisis scenarios can be represented by:

$$\Delta = I\left[y' - t(y') + b''(t, y')\right] - I\left[y - t(y) + b(t, y)\right] \qquad [22]$$

The difference in the distribution of disposable income, as summarized by index I, can be decomposed into the contribution of the change in the tax–benefit rules ('policy changes effect') and the contribution of 'other effects' not directly linked to policy changes, such as the changes in the underlying gross market income distribution due to the economic shock. Formally, this can be represented as:

$$\begin{aligned}\Delta = &\left\{I\left[y' - t(y') + b''(t, y')\right] - I\left[y' - t(y') + b(t, y')\right]\right\} \text{ (policy changes)} \\ &+ \left\{I\left[y' - t(y') + b(t, y')\right] - I\left[y - t(y) + b(t, y)\right] \text{ (other effects)}\right.\end{aligned} \qquad [23]$$

Following Paulus and Tasseva (2020), for additively decomposable measures only, such as mean incomes, we further decompose the 'other effects' into the effect of earnings changes and the effect of automatic stabilizers. Equation (4) can be rewritten as:

$$
\begin{aligned}
&\{I[y' - t(y') + b''(t,y')] - I[y' - t(y') + b(t,y')]\} && \text{(policy changes)}\\
&+\{I[y'] - I[y]\} && \text{(earnings changes)}\\
&+\{I[\mathrm{t}(y)] - I[\mathrm{t}(y')]\} && \text{(taxes and SICs as automatic stabilizers)}\\
&+\{I[\mathrm{b}(t,y')] - I[\mathrm{b}(t,y)]\} && \text{(benefits as automatic stabilizers)}
\end{aligned}
\qquad [24]
$$

The policy changes component in formula (24) generally captures any tax-benefit reform introduced in the COVID scenario compared to the pre-COVID scenario. In practice, however, the only reform introduced in response to the pandemic in Ecuador was the introduction of the Family Protection Grant. Therefore, only the effect of that benefit is captured by the policy changes component in our analysis.

4.5 Empirical Results

This section presents the distributional effects of COVID-19 and the mitigating effect of tax–benefit policies in Ecuador in May/June 2020, relative to December 2019. We first discuss the effects on household disposable income, disentangling changes due to earnings losses, automatic stabilizers, and newly implemented emergency policies. We also look in detail at the contribution of specific income components. Then, we present the results of the impact of the crisis on income poverty and inequality.

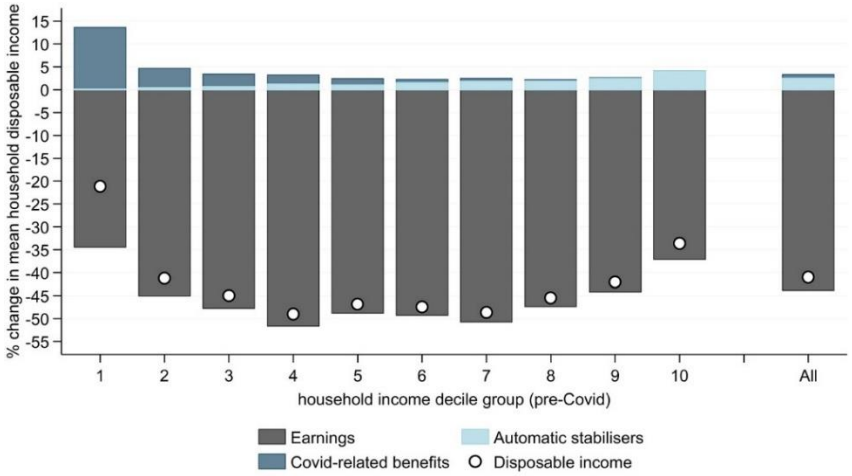
4.5.1. Changes in Mean Disposable Income

Graph 4.3 presents the percentage change in mean per capita household disposable income by disposable income decile group and the whole population. Income deciles are based on per capita household disposable income in the pre-COVID scenario (December 2019 baseline). The changes reflect the difference between the pre-COVID and the COVID scenarios, where the COVID scenario considers the role of the health emergency Family Protection Grant introduced by the Ecuadorian government. The change in disposable income is decomposed into the effects of: (i) earnings losses, (ii) automatic stabilizers, and (iii) COVID-related benefits.

Our results show that, on average, household disposable income (white circle) drops sharply by 41% as a result of the COVID-19 pandemic. The fall in household disposable income reflects the losses in earnings (dark grey bar) resulting from the crisis, which account for a 43.8% reduction in disposable income, on average. Our analysis further shows that, on average, the mitigating role of automatic stabilizers (light blue bar) and COVID-related policies (dark blue bar) is extremely modest, with a larger contribution of automatic stabilizers (light blue bar) compared to that of COVID-related policies. Automatic

stabilizers contribute to a 2.5% increase in average disposable income for the whole population, whereas COVID-related policies account only for a 0.8% increase.

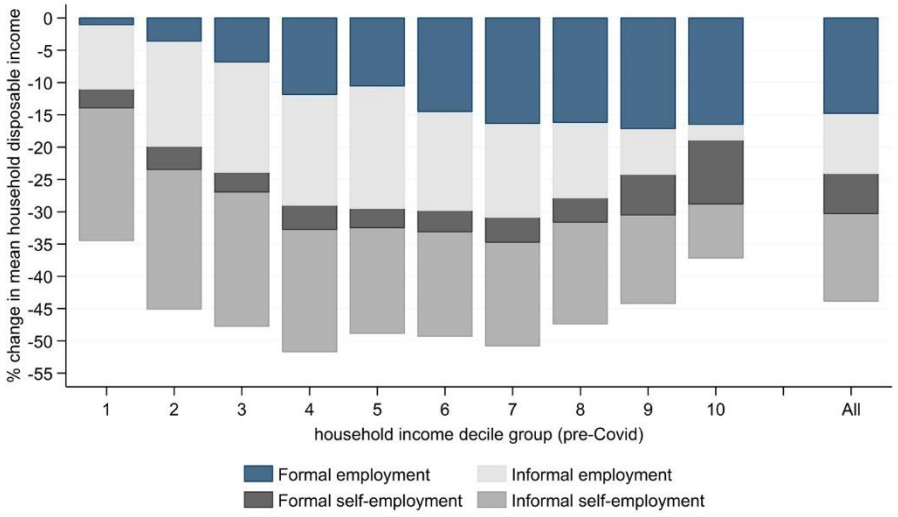
Graph 4.19 Change in mean disposable income by income decile



Note: the figure shows the distributional impact of the employment and earnings shocks and the policy response from the Ecuadorian government, i.e. the pre-COVID versus the COVID scenario. Changes in income are based on per capita household disposable income.
Source: authors' elaboration using ECUAMOD and ENEMDU-2019.

Graph 4.3 further shows a U-shaped pattern in the change of mean household disposable income across the income distribution. The pattern reflects the changes in earnings across the income distribution, with households in the middle of the distribution experiencing more significant drops in earnings compared to those at the bottom and top. These results align with the recent study by Lustig et al. (2020) where a similar U-shaped pattern was found in Argentina, Brazil, Colombia, and Chile. The effect of automatic stabilizers and COVID-related policies varies across income distribution. The contribution of automatic stabilizers increases with income. They mitigate the effect of the economic shock mostly through their effect in the top decile of the distribution, where they account for 4.1% of household disposable income. COVID-related policies play an important role in mitigating the impact of the crisis for households at the bottom of the distribution. For the first income decile group, a 34.5% drop in household disposable income due to earning losses is alleviated by a 13.4% increase as a result of COVID-related policies.

Graph 4.20. Change in mean disposable income due to earnings losses



Note: the graph shows the impact of earnings losses on changes in household disposable income. Changes in income are based on per capita household disposable income.
Source: authors' elaboration using ECUAMOD and ENEMDU-2019.

We now turn to the effect of specific income sources and tax–benefit instruments on changes in household disposable income. More precisely, we assess separately the effect of losses in employment versus self-employment earnings and the contribution of taxes, SICs, and benefits to changes in household disposable income, distinguishing between automatic stabilizers and COVID-related policies.

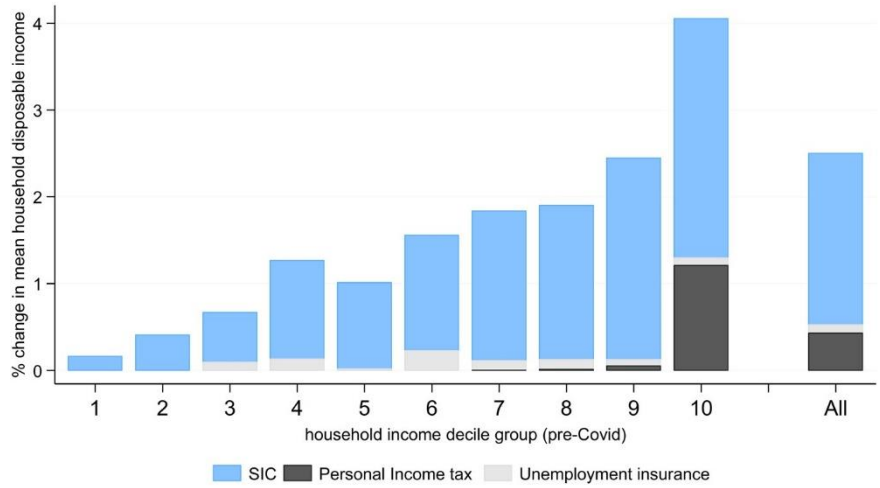
4.5.2. Earnings Losses

The contribution of employment and self-employment earnings to changes in household disposable income is depicted in graph 4.4, distinguishing between formal and informal workers. On average, for the whole population, losses in formal employment earnings (dark blue bar) account for the largest drop in household disposable income, representing a 14.8% reduction. Losses in informal employment earnings (light grey bar) are slightly smaller, accounting for a 9.3% drop in household disposable income. A reversed pattern is observed for self-employment earnings, where losses in informal self-employment (dark grey bar) exceed those in formal self- employment (black bar). Formal self-employment losses represent a 6.2% reduction of household disposable income, on average, whereas losses in informal self- employment earnings account for a 13.5% drop in disposable income.

Graph 4.4 further highlights how the role of these four income sources varies across the income distribution. Losses in formal employment earnings are larger at the top of the income distribution, representing a 17% reduction in household disposable income in deciles 9 and 10. A different pattern is observed for informal employment earnings, where losses are more prevalent in the middle of the distribution. Losses in formal self-employment

earnings are somewhat uniformly distributed in deciles 1 to 8, representing a reduction in household disposable income of around 3%, compared with a 6.3% and 9.9% drop in deciles 9 and 10, respectively. Finally, losses in informal self-employment earnings are larger at the bottom of the income distribution, representing a drop-in household disposable income of around 21% in the first three deciles, whereas they account for an 8.3% reduction in the top decile of the distribution.

Graph 4.21. Change in mean disposable income due to automatic stabilization of tax–benefit policies



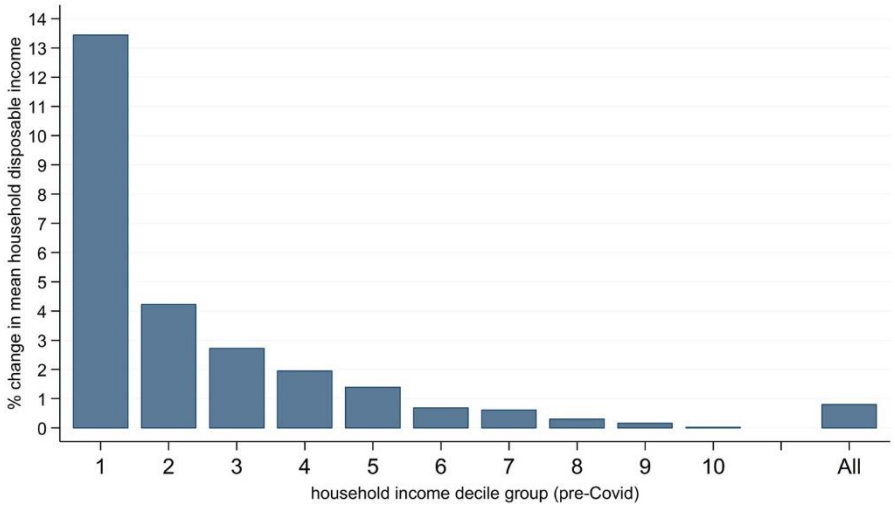
Note: the graph shows impact of automatic stabilizers on changes in household disposable income, i.e. the pre-COVID scenario versus the COVID scenario, without emergency measures. Changes in income are based on per capita household disposable income.
Source: authors' elaboration using ECUAMOD and ENEMDU-2019.

4.5.3. Automatic Stabilizers

The role of specific tax–benefit instruments as automatic stabilizers is presented in graph 4.5. More precisely, the figure depicts the change in household disposable income due to automatic changes in personal income tax, SICs, and Unemployment Insurance benefits under our COVID scenario. On average, SICs provide the most extensive automatic stabilization, accounting for a 2% increase in household disposable income for the whole population. The contribution of SICs as an automatic stabilizer increases along the income distribution and is largest for the top income decile, which accounts for a 2.8% increase in household disposable income. The prevalence of informal employment can explain the small effect of SICs at the bottom of the distribution, i.e. workers who do not contribute to social security. The effect of income tax also increases with income, is much smaller than that of SICs, and plays a role mostly in the top decile. On average, reductions in personal income tax account for a 0.4% increase in household disposable income, with a more significant effect in

the top income decile, representing a 1.2% increase in disposable income. In addition to the prevalence of informal employment, the modest contribution of personal income tax is most likely related to the design of this instrument, which is characterized by a high exempted threshold and the presence of deductions for personal expenditures, meaning that personal income tax is highly concentrated at the top of the distribution (Bargain et al. 2017).

Graph 4.22. Change in mean disposable income due to COVID-related policies



Note: the graph shows the impact of COVID-related policies on changes in household disposable income, i.e. the COVID scenario without versus with emergency tax–benefit measures. Changes in income are based on per capita household disposable income.
Source: authors' elaboration using ECUAMOD and ENEMDU-2019.

Unemployment Insurance also provides limited automatic stabilization and mainly impacts the distribution's middle. It contributes to an increase in household disposable income of 0.09%, on average. The modest effect of the benefit is explained by the large share of informal workers in Ecuador who are not covered by this benefit. The absence of other benefits, such as automatic stabilizers protecting incomes at the bottom of the distribution, reflects the rigid design of proxy means-tested benefits such as the human development transfer. As previously mentioned, the Human Development Transfer and other proxy means-tested benefits fail to act as automatic stabilizers, as they do not depend directly on earnings, and entitlement to such benefits is assessed over long periods.

4.5.4. COVID-Related Policies

The contribution of COVID-related policies to changes in household disposable income is presented in Fig. 6 and corresponds to the effect of the Family Protection Grant. The COVID-related Family Protection Grant has, on average, a very small effect in mitigating the impact of the crisis in Ecuador. However, it has acted as the main instrument providing

income protection to households at the bottom of the income distribution, in the absence of other benefits acting as automatic stabilizers for poor households. By design, the benefit has a larger effect for the first decile of the income distribution, accounting for a 13.4% increase in household income on average. The cushioning effect of the benefit then drops largely for the second decile, where it contributes to a 4.2% increase in household income.

Table 4.2. Decomposing the change in income inequality and poverty

	Pre-COVID scenario (A)	COVID scenario (B)	Total change (B)–(A)	Decomposition of total change	
				COVID-related policies effects	Other effects
Inequality					
Gini	0.461	0.592	0.131***	− 0.011***	0.142***
Theil	0.395	0.601	0.206***	− 0.013***	0.219***
Poverty					
FGTO (%)	25.672	58.224	32.552***	− 0.640***	33.192***
FGT1 (%)	9.626	34.062	24.436***	− 1.567***	26.002***
Extreme poverty					
FGTO (%)	9.235	38.626	29.391***	− 1.402***	30.794***
FGT1 (%)	3.579	22.22	18.641***	− 1.915***	20.556***

Poverty and inequality indicators are based on per capita household disposable income. The 2019 national poverty lines of US$85.03 per month for poverty and US$47.92 per month for extreme poverty are used in the calculations. Statistical significance based on bootstrapped standard errors after 200 replications. Significance levels indicated as $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.

Source Authors' elaboration using ECUAMOD and ENEMDU-2019

Our results point to two important lessons for the policy debate in the context of the COVID-19 pandemic. First, despite the mitigating role of the Family Protection Grant, this emergency transfer has not managed to offset the adverse effect of the pandemic for low-income households. Second, the crisis has largely affected the middle of the income distribution, and no emergency policies have been put in place to cushion the negative income shock for this part of the population. We return to these two points in the conclusion.

4.5.5. Impact on Income Poverty and Inequality

This section now turns to the effects of COVID-19 on income poverty and inequality. We start by comparing poverty and inequality indicators in the pre-COVID baseline with those under the COVID scenario. Then, we decompose the total change in income poverty and inequality into the contribution of COVID-related policies (policy effects) and other effects. Poverty and inequality are measured individually, based on per capita household disposable income. The pandemic and lockdown measures lead to a significant and sharp increase in

poverty and inequality in Ecuador. Inequality measured by the Gini coefficient increases from 0.461 to 0.592, whereas the Theil index increases from 0.395 to 0.601.

The impact of the crisis on poverty is also large. Table 2 compares statistics on absolute poverty and extreme poverty headcounts (FGT0) and gaps (FGT1). The 2019 national poverty lines of US$85.03 per month for poverty and US$47.92 per month for extreme poverty are used in the calculations[60]. As a result of the crisis, the poverty headcount increases substantially by 32.5 pp, meaning that 58.2% of the population are below the national poverty line in May/June 2020 compared to 25.7% in December 2019. Extreme poverty also increases strikingly, by 29.4 pp (from 9.2 to 38.6%). Significant and sharp increases are also observed in terms of the (extreme) poverty gap, which increases from 9.6% (3.6%) to 34.1% (22.2%).

The right-hand side (last two columns) of Table 2 presents the results of decomposing the total change in inequality and poverty into the effect of COVID-related policies and the 'other effects.' The latter includes all the factors unrelated to policy changes between the pre-COVID and COVID scenarios, notably changes in the distribution of earnings (i.e. earning losses) and automatic stabilizers. Our analysis shows that the 'other effects' explain most of the total change in inequality, contributing to a 0.142 increase in the Gini coefficient and a 0.219 increase in the Theil index. COVID-related policies play a minor but significant role in mitigating the inequality-increasing impact of 'other effects', accounting for a 0.011 decrease in the Gini coefficient and a 0.013 decrease in the Theil index.

The total change in poverty (FGT0 and FGT1) also mostly reflects the contribution of the 'other effects', which account for an increase in the (extreme) poverty headcount of 33.2 pp (30.8 pp) and an increase in the (extreme) poverty gap of 26 pp (20.6 pp). The COVID-related Family Protection Grant decreases poverty only modestly. It reduces the (extreme) poverty headcount by 0.64 pp (1.4 pp) and has a larger effect on the (extreme) poverty gap, accounting for a reduction of 1.6 pp (1.9 pp).

Looking at differences by formality status, we find large gaps in poverty rates between formal and informal workers prior to the pandemic and a large increase in poverty among both groups of workers due to the crisis (Tables A3 and A4 in the Online Appendix). The

[60] The extreme poverty line in Ecuador is defined in terms of the minimum value of a food consumption basket to satisfy the nutritional needs for a healthy life. The poverty line is then obtained by using the inverse of the Engel coefficient (measuring the relationship between expenditure in food consumption and total expenditure) to scale the extreme poverty line (INEC 2015).

percentage of informal workers living in poor households was substantially higher than before the pandemic, with 21.9% of informal workers living in poor households in the pre-COVID scenario compared to 6.6% of formal workers (Table A3). The pandemic hit the household incomes of both formal and informal workers hard, and the poverty rate went up dramatically, with 31.3% of formal and 66.3% of informal workers below the poverty line in the COVID scenario. Although the effects are modest, as a percentage of the pre-COVID poverty rate, COVID-related policies have a somewhat larger poverty-reducing effect among formal than informal workers, highlighting the importance of strengthening the safety net for informal workers. Similar findings are observed in terms of extreme poverty (Table A4).

4.6 Conclusions of the Chapter

In response to the COVID-19 outbreak, Latin American governments implemented lockdown measures and adopted various policies to mitigate the adverse effect of the economic shock on household income. However, unlike in developed economies, countries in Latin America lack the fiscal capacity to implement large income protection programs. Moreover, some countries in the region were already facing challenging economic conditions because of low commodity prices prior to the pandemic. This was the case for Ecuador, which has been hit hard by the crisis and lacks fiscal space to strengthen social protection.

This study analyses Ecuador's income distribution changes between December 2019 and June 2020, when the economy was the most affected by the COVID-19 pandemic. To assess the role of government policy interventions in mitigating the socioeconomic effects of the crisis, tax-benefit simulations are used to decompose the changes in the income distribution and quantify the effects of (i) earnings losses due to COVID-19, (ii) pre-crisis tax–benefit policies (i.e. automatic stabilizers), and (iii) COVID-related emergency measures implemented by the government.

Our analysis shows a dramatic increase in income poverty and inequality between December 2019 and June 2020. The national poverty headcount increases from 25.7 to 58.2%, the extreme poverty headcount from 9.2 to 38.6%, and the Gini coefficient from 0.461 to 0.592. On average, household disposable income drops by 41%, with a more considerable impact observed in the middle of the income distribution. Our decomposition shows that the emergency Family Protection Grant protects the poorest income decile, although with a modest effect in reducing poverty. The effect of automatic stabilizers on household disposable incomes is more significant than that of COVID-related benefits but with

heterogeneous effects across the income distribution. Benefits play a limited role as automatic stabilizers in Ecuador for two essential reasons. First, the design of the Human Development Transfer, the leading social protection scheme in Ecuador, as a proxy means-tested benefit prevents it from responding automatically to economic shocks, as eligibility is based on a composite index that does not depend on household income. Second, the Unemployment Insurance benefit protects in the event of unemployment only to individuals affiliated with social security, leaving all workers in informal employment unprotected.

From a policy perspective, our study highlights the need to rethink and enhance social protection in Ecuador and the region. In particular, the lack of benefits acting as automatic stabilizers is a limitation of many countries in the region that rely on proxy means-tested benefits as the primary schemes for social protection. Redesigning social protection should go hand in hand with efforts to build fiscal capacity to ensure the sustainability of social policies in the long term. Fiscal reforms should, however, not be restricted to personal income tax and VAT. Reforms to corporate and wealth taxes should also be considered to increase fiscal capacity to finance sustainable welfare and healthcare systems.

General Conclusions

This research has systematically documented and quantified the effects of income tax policies and tax interventions based in Ecuador. From this analysis, it has attempted to make inferences for the rest of the developing countries, in which Ecuador is a representative developing country. Particular emphasis has been placed on the role of interventions made by tax administrations, both in administrative data and field applications and through the use of survey data statistics combined with microsimulation data.

From the theoretical, methodological, and empirical review, it is evident that two groups of models analyze tax evasion: the neoclassical and the behavioral. Also, various methods measure it, and the vast majority of applied studies refer to more relatively developed countries, mainly due to the availability of information, regulations, institutional oversight, and the tax culture among taxpayers.

Although the income tax was established in Ecuador during the forties of the past century, the analysis of the democratic period (1980 onward) reveals one significant milestone in terms of tax policy in 2008, with the new constitution and tax reform that introduced new principles such as the progressivity of the tax system itself. The effects observed during the period for which data allows for comparisons (2003-2021) were in the right and expected direction but smaller than the effects of market factors.

Even the most institutionalized and restrictive interventions can have little or no impact on taxpayer behavior and, consequently, on tax revenue. Therefore, in addition to considering the institutional issues in Developing countries, it is crucial to identify and implement behavioral tools or better realistic explanations. Furthermore, it may be the case that the tax administrations themselves are encouraging *poor behavior* among taxpayers.

Finally, in emergencies like the one caused by COVID-19, tax evasion evidences the reduction in states' capacity to design timely public intervention policies, especially with automatic mechanisms like income taxes and social security contributions. As a result of the crisis, poverty and extreme poverty in Ecuador increased by more than 30 percentage points each, while the Gini coefficient rose by 14 basis points, from 0.46 to 0.60. The measures adopted reactively at that time proved to be insufficient.

References

Abadie, Alberto, and Guido Imbens. 2012. *Matching on the Estimated Propensity Score*. Cambridge: Harvard University and National Bureau of Economic Research. Wiley - Online Librery. https://doi.org/10.3982/ECTA11293.

Abdixhiku, Lumir, Besnik Krasniqi, Geoff Pugh, and Iraj Hashi. 2017. "Firm-Level Determinants of Tax Evasion in Transition Economies." *Economic Systems* Volume 41, Issue 3: 354-366. Elsevier.

Ajzen, Icek. 1985. *From Intentions to Actions: A Theory of Planned Behavior*. Berlin: Heidelberg, New York: Springer-Verlag.

Allcott, Hubt. 2011. "Social Norms and Energy Conservation." *Journal of Public Economics* 95(5): 1982-2095.

Allingham, Michael, and Agnar Sandmo. 1972. "Income Tax Evasion: A Theoretical Analysis." *Journal of Public Economics* 1: 323-338.

Alm, James. 2012. "Measuring, Explaining, and Controlling Tax Evasion: Lessons from Theory, Experiments, and Field Studies." *International Tax and Public Finance* 19(1): 54-77.

- 2018. "What Motivates Tax Compliance?" Department of Economics Working Paper. New Orleans, LA: Tulane University.

- 2021. "Tax Evasion, Technology, and Inequality." *Economics of Governance* 22(4): 321-343.

Alm, James, Lilith Burgstaller, Arrita Domi, Amanda März, and Matthias Kasper. 2023. "Nudges, Boosts, and Sludge: Using New Behavioral Approaches to Improve Tax Compliance." *Economies* 11(9): 223.

Alstadsæter, Annette, Niels Johannesen, and Gabriel. Zucman. 2019. "Tax Evasion and Inequality." *American Economic Review* 109(6): 2073-2103.

Alvaredo, Facundo, Francois Bourguignon, Francisco Ferreira, and Nora Lustig. 2024. "Inequality Bands: Seventy-Five Years of Measuring Income Inequality in Latin America." halshs-04563817.

Alves, José, and Antoni Afonso. 2019. "Tax Structure for Consumption and Income Inequality: An Empirical Assessment." *SERIEs*: 1-28.

Amemiya, Takeshi. 1984. "Tobit Models: A Survey." *Journal of Econometrics* 24(1-2): 3-61.

Anaç, Nilifer, Eva-Maria Egger, Sam Jones, Ricardo Santos, y Alex Warren-Rodriguez. 2022. "Impact of COVID-19 on urban informal workers in Maputo." The United Nations University World Institute for Development Economics Research (UNU-WIDER), Helsinki.

Andreoni, James, Brian Erard, and Johathan Feinstein. 1998. "Tax Compliance." *Journal of Economic Literature* 36(2): 818-860.

Angrist, Joshua, and Jörn-Steffen Pischke. 2010. "The Credibility Revolution in Empirical Economics: How Better Research Design is Taking the Con Out of Econometrics." *Journal of Economic Perspectives* 24(2): 3-30.

- 2014. "*Mastering Metrics*." Princeton University Press.

Antinyan, Armenak, and Zareh Asatryan. 2019. "Nudging for Tax Compliance: A Meta-Analysis." ZEW-Centre for European Economic Research. Discussion Paper 19-055.

Arévalo Gross, Jossete, and Lourdes Montesdeoca. 2022. "Evaluation in Ecuador." In *The Institutionalisation of Evaluation in the Americas*, 267-296. Cham: Palgrave Macmillan.

Ariely, Dan. 2014. "A Beginner's Guide to Irrational Behavior." *Economics* 96: 10575-1057.

- 2016. *Payoff: The Hidden Logic that Shapes Our Motivations*. Simon and Schuster.

Arrow, Kenneth Joseph. 1970. *Essays in the Theory of Risk Bearing*. North-Holland, Amsterdam.

Artavanis, Nikolaos, Adair Morse, and MMargarita Tsoutsoura. 2012. “Tax Evasion Across Industries: Soft Credit Evidence from Greece.” Chicago Booth Research Paper No. 12-25.
Asamblea Nacional Constituyente. 1998. *Constitución Política de la República de Ecuador 1998*. Quito, Ecuador: Corporación de Estudios y Publicaciones.
Asamblea Nacional del Ecuador. 2020. *Ley Humanitaria*. Registro Oficial N. 229.
- 2008. *Constitución de la República de Ecuador 2008*. Quito, Ecuador: Asamblea Nacional.
Australian Taxation Office. 2002. *Compliance Program 2002-03*. Canberra: Australian Taxation Office.
Avellaneda, Andrés, Rodrigo Chang, Diego Collado, Xavier Jara, Andrés Mideros, Lourdes Montesdeoca, David Rodriguez, Javier Torres and Omar Venegas. 2021. “Assessing the Cushioning Effect of Tax-Benefit Policies in the Andean Region during the COVID-19 Pandemic.” CeMPA Working Paper 8/21, Institute for Social and Economic Research, University of Essex, Essex.
Badertscher, Brad, Sharon Katz, and Sonja Rego. 2013. “The Separation of Ownership and Control and Corporate Tax Avoidance.” *Journal of Accounting and Economics* 56(2-3): 228-250.
Baldry, Jonathan. 1987. “Income Tax Evasion and the Tax Schedule: Some Experimental Results.” *Public Finance. Finances publiques* 42(3): 357-383.
BCE (Banco Central del Ecuador). 2022. *Boletín Estadístico Mensual del 1850 al 2054*.
Bargain, Olivier, and Tim Callan. 2010. “Analysing the Effects of Tax-Benefit Reforms on Income Distribution: A Decomposition Approach.” *Journal of Economic Inequality* 8(1): 1–21.
Bargain, Olivier, Xavier Jara, and David Rodríguez. 2017. “Learning from Your Neighbor: Swapping Tax-Benefit Systems in Latin America.” *Journal of Economic Inequality* 15(4): 369–392.
Barreix, Alberto, y Raúl Zambrano, eds. 2018. *Factura Electrónica en América Latina* (Vol. 595). Inter-American Development Bank.
Bayer, Ralph, and Frank Cowell. 2009. “Tax Compliance and Firms' Strategic Interdependence.” *Journal of Public Economics* 93(11-12): 1131-1143.
Beck, Paul, and Petro Lisowsky. 2014. “Tax Uncertainty and Voluntary Real-Time Tax Audits.” *The Accounting Review* 89(3): 867-901.
Becker, Gary. 1974. “Crime and Punishment.” In *Essays in the Economics of Crime and Punishment*, 1-54.
Beer, Sebastian, Mattis Kasper, Erick Kirchler, and Brian Erard. 2020. “Do Audits Deter or Provoke Future Tax Noncompliance? Evidence on Self-Employed Taxpayers.” *CESifo Economic Studies* 66(3): 248-264.
Behavioral Science Lab. 2019. *Charitable Giving*. Retrieved from: https://www.behavioralsciencelab.com/studies-1.
Beirne, Keelan, Karina Doorley, Mark Regan, Barra Roantree, and Dora Tuda. 2020. “The Potential Costs and Distributional Effect of Covid-19 Related Unemployment in Ireland.” *Budget Perspectives 2021* Paper 1. Dublin: The Economic and Social Research Institute.
Bellman, Richard. 1957. *Dynamic Programming*. Princeton University Press.
Belnap, Andrew, Jeffrey Hoopes, Edward Maydew, and Alex Turk. 2022. “Real Effects of Tax Audits.” *Review of Accounting Studies*: 1-36.
Benartzi, Shlomo, John Beshears, and Steven Galing. 2017. “Should Governments Invest More in Nudging?” *Psychological Science*. https://doi.org/10.1177/0956797617702501.

Benjamini, Yael, and Shlomo Maital. 1985. “Optimal Tax Evasion and Optimal Tax Evasion Policy: Behavioral Aspects.” In *The Economics of the Shadow Economy*, edited by Wulf Gaertner and Alois Wenig, 15–36. Studies in Contemporary Economics. Springer, Berlin, Heidelberg.

Bermúdez, Alexandra, y Gabriel Castillo. 2017. *La Elasticidad del Ingreso Imponible en Países en Vías de Desarrollo: El Caso de la Reforma Tributaria del Ecuador en el 2007*. Doctoral dissertation, ESPOL, FCSH.

Besley, Timoty, and Torsten Persson. 2013. “Taxation and Development.” In *Handbook of Public Economics*, Vol. 5, 51-110. Elsevier.

Bicchieri, Cristina, and Eugen Dimant. 2019. “Nudging with Care: The Risks and Benefits of Social Information.” *Public Choice*.

Blumenthal, Marsha, Charles Christian, and Joel Slemrod. 2001. “Do Normative Appeals Affect Tax Compliance? Evidence from a Controlled Experiment in Minnesota.” *National Tax Journal*: 125-138.

Bobek, Donna, and Richard Hatfield. 2003. “An Investigation of the Theory of Planned Behavior and the Role of Moral Obligation in Tax Compliance.” *Behavioral Research in Accounting* 15: 13−38.

Bottan, Nicolas, Bridget Hoffmann, and Diego Vera-Cossio. 2020. “The Unequal Impact of the Coronavirus Pandemic: Evidence from Seventeen Developing Countries.” *PLoS ONE* 15(10): e0239797.

Bourguignon, Francois, Francisco Ferreira, and Nora Lustig, eds. 2004. *The Microeconomics of Income Distribution Dynamics in East Asia and Latin America*. World Bank Publications. Wasintong D.C.

Boning, William. 2018. “Paying Taxes Automatically.” In *Proceedings: Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association*, Vol. 111, 1-45. National Tax Association.

Bradley, Curtis. 2013. “Treaty Termination and Historical Gloss.” *Texas Law Review* 92: 837.

Brent, Daniel, Chris Lott, Michael Taylor, James Cook, Klein Rollins, and Sebastian Stoddard. 2016. “Are Behavioral Nudges Moral Taxes? Evidence from a Field Experiment on Water Conservation.” Retrieved from: http://ses.wsu.edu/wp-content/uploads/2016/12/MoneyMorals_Dec2016.pdf.

Brewer, Mike, and Iva Tasseva. 2021. “Did the UK Policy Response to Covid-19 Protect Household Incomes?” *The Journal of Economic Inequality*. https://doi.org/10.1007/s10888-021-09491-w.

Brockmeyer, Anne, Spencer Smith, Marco Hernandez, and Stewart Kettle. 2019. “Casting a Wider Tax Net: Experimental Evidence from San José - Costa Rica.” *American Economic Journal: Economic Policy* 11(3): 55-87.

Brum, Matias, and Mauricio De Rosa. 2021. “Too Little but Not Too Late: Nowcasting Poverty and Cash Transfers’ Incidence During COVID-19’s Crisis.” *World Development*. https://doi.org/10.1016/j.worlddev.2020.105227.

CAF (Corporación Andina de Fomento). 2016. “Evaluación de Impacto para la Gestión Pública.” Accessed from https://www.caf.com/es/actualidad/noticias/2016/09/intimacion-vs-notificacion/?parent=19436.

Cameron, Colin, and Pravin Trivedi. 2005. *Microeconometrics: Methods and Applications*. Cambridge University Press.

Cano, Liliana. 2017. “Personal Income Tax and Income Inequality in Ecuador between 2007 and 2011.” *Cepal Review* 123: 56-75.

Carrillo, Paul E., Edgar Castro, and Carlos Scartascini. 2021. “Public Good Provision and Property Tax Compliance: Evidence from a Natural Experiment.” *Journal of Public Economics* 198: 104422.

Carrillo, Paul., Dina Pomeranz, and Mónica Singhal. 2017. “Dodging the Taxman: Firm Misreporting and Limits to Tax Enforcement.” *American Economic Journal: Applied Economics* 9(2): 144-164. Pittsburgh.

Cason, Timothy, Lana Friesen, and Lata Gangadharan. 2016. “Regulatory Performance of Audit Tournaments and Compliance Observability.” *European Economic Review* 85: 288-306. https://doi.org/10.1016/j.euroecorev.2016.03.009. North Holland Publ, Amsterdam.

Castillo, Robertho, and David Puebla. 2016. “Aspectos Metodológicos sobre la Medición de la Pobreza por Ingresos en el Ecuador.” *Revista de Estadística y Metodologías*. Quito-Ecuador.

Castro, Lucio, and Carlos Scartascini. 2015. “Tax Compliance and Enforcement in the Pampas: Evidence from a Field Experiment.” *Journal of Economic Behavior and Organization* 116:65-82.

CEPAL (Comisión Económica para América Latina y el Caribe). 2014. *La Hora de la Igualdad: Brechas por Cerrar, Caminos por Abrir*. Santiago de Chile.

- 2018a. “Medición de la Pobreza por Ingresos." Santiago de Chile.
- 2018b. “Perspectivas Económicas de América Latina 2018: Repensando las Instituciones para el Desarrollo.” Cepal. Santiago de Chile.
- 2018c. “Panorama Fiscal de América Latina y el Caribe 2018: Los Desafíos de las Políticas Públicas en el Marco de la Agenda 2030.” Santiago de Chile.
- 2019. *Social Panorama of Latin America*, 2019. LC/PUB.2019/22-P/Rev.1. Santiago: ECLAC.
- 2020. “Addressing the Growing Impact of COVID-19 with a View to Reactivation with Equality: New Projections.” Santiago de Chile: ECLAC. https://repositorio.cepal.org/handle/11362/43405.

Chen, Kong-Pin, and Cyrus Chu. 2005. “Internal Control Versus External Manipulation: A Model of Corporate Income Tax Evasion.” *Rand Journal of Economics* 151-164.

Chiliquinga, Diana, y José Ramírez. 2017. “Impacto de las Declaraciones Sugeridas del Impuesto a la Renta de Personas Naturales: Evidencia de un Diseño Experimental.” *Documento de trabajo del Centro de Estudios Fiscales*, Quito.

Christl, Michael, Silava De Poli, Franceso Figari, Tine Hufkens, Chrysa Leventi, Andrea Papini, and Alberto Tumino. 2021. “The Cushioning Effect of Fiscal Policy in the EU During the COVID-19 Pandemic.” *JRC Working Papers on Taxation and Structural Reforms* 2/2021.

Cialdini, Robert. 2008. *Influence: Science and Practice*. 5th ed. Boston: Pearson.

Clifton, Judith, Daniel Díaz-Fuentes, and Jilio Revuelta. 2020. “Falling Inequality in Latin America: The Role of Fiscal Policy.” *Journal of Latin American Studies* 52 (2): 317-341.

Clotfelter, Charles. 1983. “Tax Evasion and Tax Rates: An Analysis of Individual Returns.” *The Review of Economics and Statistics* 363-373.

Collins, Julie, and David Plumlee. 1991. “The Taxpayer’s Labor and Reporting Decision: The Effect of Audit Schemes.” *Accounting Review* 66 (3): 559-57Comisión Económica para América Latina y el Caribe [ECLAC]. 2020. “Dimensionar los Efectos del COVID-19 para Pensar en la Reactivación."

Congdon, William, Jeffrey Kling, and Sendhil Mullainathan. 2009. “Behavioral Economics and Tax Policy.” *National Tax Journal* 62 (3): 375-386.

Congreso Nacional del Ecuador. 2004. *Ley de Régimen Tributario Interno -LRTI-. Registro Oficial N. 463.* Accessed from https://www.lexis.com.ec/biblioteca/ley-regimen-tributario-interno. Quito.

Consejo Supremo de Gobierno. 1979. *Constitución Política de la República de Ecuador 1979. Quito.*

Cowell, Frank. 2004. *Carrots and Sticks in Enforcement: The Crisis in Tax Administration*, 230.

Damgaard, Matte Trier, and Christina Gravert. 2018. "The Hidden Costs of Nudging: Experimental Evidence from Reminders in Fundraising." *Journal of Public Economics* 157: 15-26. Accessed from: http://pure.au.dk/portal/files/104829543/Submission_EJ.pdf.

Daude, Christian, Ángel Melguizo, and A. Neut. 2011. "Fiscal Policy in Latin America: Counter cyclical and Sustainable?" *Economics: The Open-Access Open-Assessment E-Journal* 5: 2011–2014.

Decoster, André, Jukka Pirttilä, Holly Sutherland, and Gemma Wright. 2019. "SOUTHMOD: Modelling Tax-Benefit Systems in Developing Countries." *International Journal of Microsimulation* 12 (1): 1–12.

Desai, Mihir, Alexander Dyck, and Luigi Zingales. 2007. "Theft and Taxes." *Journal of Financial Economics* 84 (3): 591-623.

Dhami, Sanjit, and Ali Al-Nowaihi. 2007. "Why Do People Pay Taxes? Prospect Theory Versus Expected Utility Theory." *Journal of Economic Behavior and Organization* 64 (1): 171-192.

Dolan, Paul, Michael Hallsworth, David Halpern, Domenic King, and Ivo Vlaev. 2010. *MINDSPACE: Influencing Behavior Through Public Policy*. London, UK: Cabinet Office.

Duflo, Esther. 2006. "Field Experiments in Development Economics." *Econometric Society Monographs* 42: 322. New York.

Dularif, Muh, Nurkolis Sutrisno, and Erwin Saraswati. 2019. "Is Deterrence Approach Effective in Combating Tax Evasion? A Meta-Analysis." *Problems and Perspectives in Management* 17 (2): 93-113.

Duran, Isabel Anaís. 2023. "Los Regímenes Tributarios y el Cumplimiento Tributario en el Perú, 2020-2022." Doctoral dissertation, Universidad Nacional Mayor de San Marcos. Lima.

Durlauf, Steven, and Daniel Nagin. 2011. "Imprisonment and Crime: Can Both Be Reduced?" *Criminology and Public Policy* 10 (1): 13–54.

Dybka, Piotr, Michal Kowalczuk, Bartosz Olesiński, Andrzej Torój, and Marek Rozkrut. 2019. "Currency Demand and MIMIC Models: Towards a Structured Hybrid Method of Measuring the Shadow Economy." *International Tax and Public Finance* 26 (1): 4-40.

Ellsberg, Daniel. 1961. "Risk, Ambiguity, and the Savage Axioms." *The Quarterly Journal of Economics* 75 (4): 643-669.

Engel, Edurado, and James Hines. 1994. "Retrospective Audits and Tax Evasion Dynamics in the United States." Unpublished manuscript.

- 1999. "Understanding Tax Evasion Dynamics." No. w6903. National Bureau of Economic Research. Accessed from https://www.nber.org/papers/w6903.pdf.

Erard, Brian, and Jonathan Feinstein. 1994. "Honesty and Evasion in the Tax Compliance Game." *The RAND Journal of Economics* 25 (1): 1-19.

Espino, Emilio, and Martín González-Rozada. 2012. "Automatic Stabilization and Fiscal Policy: Some Quantitative Implications for Latin America and the Caribbean." *IDB Working Paper*, 367. Washington: IDB.

Espinoza Medina, Ana Mabel. 2015. “La Política Tributaria y su Influencia en la Baja Presión Tributaria de los Principales Contribuyentes en la Provincia de Leoncio Prado Año 2014."

Esteller, Alejandro. 2024. “¿Pagar o No Pagar Impuestos?... ¿Es Ésa la Cuestión?” *Revista de Economía, Empresa y Sociedad*. Barcelona.

EUROMOD. 2022. “EUROMOD Statistics on Distribution and Decomposition of Disposable Income.” Accessed at https://euromod-web.jrc.ec.europa.eu/resources/statistics using EUROMOD version no. I4.0+.

Feige, Edgar. 2016. “Reflections on the Meaning and Measurement of Unobserved Economies: What Do We Really Know About the 'Shadow Economy'.” *Journal of Tax Administration* 2.

Feinstein, Jonathan. 1991. “An Econometric Analysis of Income Tax Evasion and Its Detection.” *The RAND Journal of Economics*, Vol. 22, No. 1 (Spring, 1991), pp. 14-35 (22 pages). https://doi.org/10.2307/2601005.

Figari, Francesco, and C. Fiorio. 2020. “The Resilience of the Italian Social Protection System at the Beginning of COVID-19 Outbreak: Territorial Evidence.” *Politica Economica* 36 (1): 3–34.

Fischer, Carol, Martha Wartick, and Melvin Mark. 1992. “Detection Probability and Taxpayer Compliance: A Review of the Literature.” *Journal of Accounting Literature* 11: 1-46. Bingley.

Flachaire, Emmanuel, Nora Lustig, and Andrea Vigorito. 2022. “Underreporting of Top Incomes and Inequality: A Comparison of Correction Methods Using Simulations and Linked Survey Tax Data.” *Review of Income and Wealth*. https://doi.org/10.1111/roiw.12618.

Fonseca, Ana. 2006. “Los Sistemas de Protección Social en América Latina: Un Análisis de las Transferencias Monetarias Condicionadas.” Documento presentado en Seminario Internacional sobre Transferencia Condicionada de Ingresos y Seguridad Alimentaria. Oficina Regional de FAO, Santiago, 4-5.

Friedland, Nehemian, Shlomo Maital, and Aryeh Rutenberg. 1978. “A Simulation Study of Income Tax Evasion.” *Journal of Public Economics* 10 (1): 107-116. https://doi.org/10.1016/0047-2727(78)90008-7.

Gabaix, Xavier. 2016. “Behavioral Macroeconomics via Sparse Dynamic Programming.” No. w21848. National Bureau of Economic Research.

Gita, Resshe, and Amir Hidayatulloh. 2019. “Determinants of Compliance with Personal Tax Obligation: Do Tax Amnesty Play?” *ACCRUALS (Accounting Research Journal of Sutaatmadja)* 3 (2): 259-267. Universitas Ahmad Dahlan, DI Yogyakarta.

Givoly, Dan, Carla Hayn, and Sharon Katz. 2010. “Does Public Ownership of Equity Improve Earnings Quality?” *The Accounting Review* 85 (1): 195-225.

Goerke, Laszlo. 2008. “Bureaucratic Corruption and Profit Tax Evasion.” *Economics of Governance* 9 (2): 177-196.

Gomez-Gil, Carlos. 2018. “Objetivos de Desarrollo Sostenible (ODS): Una Revisión Crítica.” *Papeles de Relaciones Ecosociales y Cambio Global* 140: 107-118. Universidad de la Rioja.

Gómez Sabaini, Juan Carlos, Juan Pablo Jiménez, and Martner Fanta. 2017. *Consensos y Conflictos en la Política Tributaria de América Latina.* CEPAL. Santiago de Chile.

Guerrero, Sonia. 2020. “La Amnistía Tributaria Frente a los Efectos que Genera en la Cultura Tributaria en la Municipalidad de Independencia, 2018." Universidad Cesar Vallejo.

Guo, Shenyang, Mark Fraser, and Qi Chen. 2020. “Propensity Score Analysis: Recent Debate and Discussion.” *Journal of the Society for Social Work and Research* 11 (3): 463-482.Chicago.

Honorable Congreso Nacional. 13 de marzo de 2000. “Ley para la Transformación Económica del Ecuador (Ley 2000-4)." Quito.

Hallsworth, Michael, John List, Robert Metcalfe, and Ivo Vlaev. 2017. “The Behavioralist as Tax Collector: Using Natural Field Experiments to Enhance Tax Compliance.” *Journal of Public Economics* 148: 14-31. Amsterdam.

Halpern, David, and Rory Gallagher. 2017. “Can 'Nudging' Change Behavior? Using Behavioral Insights to Improve Program Redesign.” In *Managing Austerity, Delivering Under Pressure,* 165-180. Australian National University Press.

Hashimzade, Nigar, Gareth Myles, and Binh Tran-Nam. 2013. “Applications of Behavioural Economics to Tax Evasion.” *Journal of Economic Surveys* 27 (5): 941-977. Recuperado de: http://people.exeter.ac.uk/gdmyles/papers/pdfs/69%20JOES.pdf Wiley Online Library

Hasseldine, D. John, and K. Jan Bebbington. 1991. “Blending Economic Deterrence and Fiscal Psychology Models in the Design of Responses to Tax Evasion: The New Zealand Experience.” *Journal of Economic Psychology* 12 (2): 299-324. https://doi.org/10.1016/0167-4870(91)90018-O.

Heckman, James J. 1979. “Sample Selection Bias as a Specification Error.” *Econometrica: Journal of the Econometric Society*, 153-161. https://doi.org/10.2307/1912352

Heckman, James J., Hidehiko Ichimura, and Petra E. Todd. 1997. “Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme.” *The Review of Economic Studies* 64: 605–654. Oxford University Press.

Heckman, James J., Robert J. LaLonde, and Jeffrey A. Smith. 1999. “The Economics and Econometrics of Active Labor Market Programs.” In *Handbook of Labor Economics*, Vol. 3, edited by O. Ashenfelter and D. Card, 1865-2097. Elsevier.

Hofmann, Eva, Martín Voracek, Christine Bock, and Erich Kirchler. 2017. “Tax Compliance across Sociodemographic Categories: Meta-Analyses of Survey Studies in 111 Countries.” *Journal of Economic Psychology* 62: 63-71. Science Direct.

Hölmstrom, Bengt. 1979. “Moral Hazard and Observability.” *The Bell Journal of Economics* 74-91. Swedish School of Economics and Business Administration.

Holz, Justin. E., John A. List, Alejandro Zentner, Marvin Cardoza, and Joaquin E. Zentner. 2023. “The $100 Million Nudge: Increasing Tax Compliance of Firms Using a Natural Field Experiment.” *Journal of Public Economics* 218: 104779. Science Direct.

Hsieh, Chang-Tai, and Peter J. Klenow. 2009. “Misallocation and Manufacturing TFP in China and India.” *Quarterly Journal of Economics* 124 (4): 1403–48.

Imai, Kosuke, and Marc Ratkovic. 2014. “Covariate Balancing Propensity Score.” *Journal of the Royal Statistical Society: Series B (Statistical Methodology)* 76: 243–263. Oxford Academic.

INEM (Instituto Nacional de Empleo). 1987. *Encuesta Permanente de Hogares*. Quito.

INE (Instituto Nacional de Estadística). 1976. *Encuesta de Población y Ocupación.* Quito.

INEC (Instituto Nacional de Estadística y Censos). 2008. *Medidas de Pobreza y Extrema Pobreza por Ingresos. Resumen Ejecutivo.*

- 2015. *Metodología de Construcción del Agregado del Consumo y Estimación de Línea de Pobreza en el Ecuador.* Quito: INEC.

- 2020. “Diseño Muestral de la Encuesta Nacional de Empleo, Subempleo y Desempleo Telefónica. ENEMDU—Telefónica.” https://www.ecuadorencifras.gob.ec/enemdu-telefonica/. Accessed August 2021. Quito.

James, Simon, Robert McGee, Serkan Benk and Tamer Bodak. 2019. “How Seriously Do Taxpayers Regard Tax Evasion? A Survey of Opinion in England.” *Journal of Money Laundering Control.* Emerald.

James, Simon. 2017. “Taxation and Nudging.” In *Handbook of Behavioural Economics and Smart Decision-Making: Rational Decision-Making within the Bounds of Reason*, 317.
James, Simon, and C. Alley. 2004. “Tax Compliance Cost.” *Taylor and Francis Journals* 9 (3): 281-289. Taylor and Francis Journals.
Jara, Xavier, David Rodríguez, Diego Collado, Javier Torres, Andres Mideros, Lourdes Montesdeoca, and Omar Vanegas. 2024. “Assessing the role of tax-benefit policies during the COVID-19 pandemic: Evidence from the Andean region.” *Review of Development Economics*.
Jara, Xavier, and Erik Schokkaert. 2017. “Putting measures of individual well-being to use for ex-ante policy evaluation.” *Journal of Economic Inequality* 15 (4): 421-440. https://doi.org/10.1007/s10888-017-9370-x. Springer Nature.
Jara, Xavier, Fernando Martín, Lourdes Montesdeoca, and Leonardo Vera. 2022. *SOUTHMOD Country Report–Ecuador: ECUAMOD v2.1*. Helsinki: UNU-WIDER
Jara, Xavier, Lourdes Montesdeoca, and Iva Tasseva. 2022. “The role of automatic stabilizers and emergency tax–benefit policies during the COVID-19 pandemic: Evidence from Ecuador.” *The European Journal of Development Research* 34 (6): 2787-2809. Amsterdam.
Jara, Xavier, and Lourdes Montesdeoca. 2020. *SOUTHMOD Country Report Ecuador—ECUAMOD V1.5*. Helsinki: UNU-WIDER.
Jara, Xavier, and Marcelo Varela. 2019. “Tax-benefit microsimulation and income redistribution in Ecuador.” *International Journal of Microsimulation* 12 (1): 52-82.
Jara, Xavier, and Nicolas Oliva. 2018. *Ecuador's top income adjustments and tax reforms* (No. 2018/165). WIDER Working Paper. Helsinki.
Jouste, María, and Pia Rattenhuber. 2019. “A Role for Universal Pension? Simulating Universal Pensions in Ecuador, Ghana, Tanzania, and South Africa.” *International Journal of Microsimulation* 12 (1): 13–51.
Kahneman, Daniel. 2011. *Thinking, fast and slow*. Macmillan.
Kahneman, Daniel, and Amos Tversky. 1974. “Judgment under Uncertainty: Heuristics and Biases: Biases in judgments reveal some heuristics of thinking under uncertainty.” *Science* 185 (4157): 1124-1131. Science.
- 1979. “Prospect theory: an analysis of decision under risk.” *Econometrica* 47: 263-291. World Science.
Kahneman, Daniel, Paul Slovic, and Amos Tversky. 1982. *Judgment Under Uncertainty: Heuristics and Biases*. Cambridge University Press, Cambridge.
Kettle, Stewart, Marco Hernandez, Simon Ruda, and Michael Sanders. 2016. “Behavioral interventions in tax compliance: Evidence from Guatemala.” *The World Bank*. Wasintong D.C.
King, Gary, and Richard Nielsen. 2019. “Why propensity scores should not be used for matching.” *Political Analysis* 27 (4): 435-454. Cambridge University Press.
Kirchler, Erich, Erik Hoelzl, and Ingrid Wahl. 2008. “Enforced versus voluntary tax compliance: the ‘slippery slope’ framework.” *Journal of Economic Psychology* 29: 210-225. Science Direct.
Kleven, Henrik Jacobsen, Martín B. Knudsen, Claus T. Kreiner, Soren Pedersen, and Emmanuel Saez. 2011. “Unwilling or unable to cheat? Evidence from a tax audit experiment in Denmark.” *Econometrica* 79 (3): 651–692. Wiley, Online Library.
Kotsogiannis, Christos, Luca Salvadori, John Karangwa, and Theonille Mukamana. 2024. “Do tax audits have a dynamic impact? Evidence from corporate income tax administrative data.” *Journal of Development Economics* 170: 103292. ScienceDirect.

Lechner, Michael. 2002. “Program Heterogeneity and Propensity Score Matching: An Application to the Evaluation of Active Labor Market Policies” In *The Review of Economics and Statistics.* 84 (2): 205–220. MIT Press. Massachusets.
Lee, David, and Justin McCrary. 2017. “The Deterrence Effect of Prison: Dynamic Theory and Evidence.” *Advances in Econometrics*, Volume 38, Chapter 3: 73-146. Emerald.
Leicester, Andrew, Peter Levell, and Imran Rasul. 2012. *Tax and Benefits Policy: Insights from Behavioural Economics*. London: Institute for Fiscal Studies.
Leuven, Edwin, and Barbara Sianesi. 2015. “PSMATCH2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing.” *Statistical Software Components*.
Levi, M., and Suddle, M. 1989. “White-collar crime, shamelessness, and disintegration: The control of tax evasion in Pakistan.” *Journal of Law and Society* 16 (4): 489-505. Wiley.
Li, Jinjing, and Cathal O’Donoghue. 2014. “Evaluating Binary Alignment Methods in Microsimulation Models.” *Journal of Artificial Societies and Social Simulation* 17 (1): 15. Maastrich. UNU-MERIT Working Papers.
Ligthart, Jenny, and Johannes Voget. 2008. “The determinants of cross-border tax information sharing: A panel data analysis.” *The Pennsylvania State University*.
Londoño-Vélez, Juliana, and Javier Ávila-Mahecha. 2021. “Enforcing wealth taxes in the developing world: Quasi-experimental evidence from Colombia.” *American Economic Review: Insights* 3 (2): 131-148.
López-Luzuriaga, Andrea, and Carlos Scartascini. 2023. “Willing but unable to pay? The role of gender in tax compliance” (No. IDB-WP-1330). *IDB Working Paper Series*. Wasintong D.C.
Lustig, Nora, Valentina Martínez-Pabon, Fefereico Sanz, and Stephen Younger. 2020. “The Impact of COVID-19 Lockdowns and Expanded Social Assistance on Inequality, Poverty, and Mobility in Argentina, Brazil, Colombia, and Mexico.” *CEQ Working Paper 92*. New Orleans: CEQ Institute, Tulane University.
Mahler, Daniel, Nishant Yonzan, and Christoph Lakner. 2022. “The Impact of COVID-19 on Global Inequality and Poverty.” Work Bank Working Paper. Washintong D.C.
Mamesah, Joshua Jordan, and Ari Budi Kristanto. 2021. “Efektivitas Tax Amnesty Di Indonesia: Studi Meta-Analisis.” *E-Jurnal Ekonomi Dan Bisnis Universitas Udayana* 10 (5): 473.
Martorano, Bruno. 2018. “Cyclicality of Fiscal Policy in Latin America Over the Period 1990–2015.” *Review of Development Economics* 22 (1): 67–90. Wiley Online Library.
Mascagni, Giula. 2018. “From the lab to the field: A review of tax experiments.” *Journal of Economic Surveys* 32 (2): 273-301. https://onlinelibrary.wiley.com/doi/pdf/10.1111/joes.12201.
Mascagni, Giulia, Nara Monkam, and Christopher Nell. 2016. “Unlocking the potential of administrative data in Africa: Tax compliance and progressivity in Rwanda.” Working Paper 56.
Matthaei, Eva, Ho Fai Chang, Charlotte Schmid, and Benno Torgler. 2022. “Relative Trust and Tax Morale.” In *Economic and Political Studies, 11*(3), 400-418.
Mathias, B. D., Sean Lux, Russel Crook, Chad Autry, and Russel Zaretzki. 2015. “Competing against the unknown: the impact of enabling and constraining institutions on the informal economy.” *Journal of Business Ethics* 127 (2): 251-264.
Mayshar, Joram. 1991. “Taxation with costly administration.” *Scandinavian Journal of Economics* 3 (1): 75-88.
MCDS (Ministerio Coordinador de Desarrollo Social). 24 de septiembre de 2009. “Acuerdo Ministerial No.16 de 24 de septiembre de 2009.” Quito.

MIES (Ministerio de Inclusión Económica y Social). 2019. “Acuerdo Ministerial Nro. 009.” Quito: MIES.
Mischel, Walter, Ebbe Ebbesen, and Antonette Raskoff-Zeiss, A. 1972. “Cognitive and attentional mechanisms in delay of gratification.” *Journal of Personality and Social Psychology* 21 (2): 204.
Mohtadi, Hamid, Michael Ross, Uchechukwu Jarrett, and Stefan Ruediger. 2019. “Kleptocracy and tax evasion under resource abundance.” *Economics and Politics* 31 (3): 323-373.
Mossin, Jan. 1968. “Optimal Multiperiod Portfolio Policies.” *Journal of Business*. Vol. 41, No. 2 (Apr., 1968), pp. 215-229 (15 pages) https://www.jstor.org/stable/2351447.
Murshed, Muntasir, and Syed Saadat. 2018. “Modeling Tax Evasion across South Asia: Evidence from Bangladesh, India, Pakistan, Sri Lanka, and Nepal.” *Journal of Accounting, Finance, and Economics* 8 (1): 15-32.
Naritomi, Joana. 2019. “Consumers as Tax Auditors.” *American Economic Review* 109 (9): 3031-72.
New Zealand. 2003. *Report of the Inland Revenue Department for the year ended 30 June 2003*. Wellington, New Zealand: Inland Revenue Department.
Nietzsche, Friedrich. 1887. *On the Genealogy of Morality*. Broadview Press, 2023.
Oliva, Nicolas, y Gabriela Aparicio. 2010. “Selección de Contribuyentes Especiales: Evaluación de Impacto mediante Regresión Discontinua.” *Working Paper*. Centro de Estudios Fiscales del Servicio de Rentas Internas. Quito-Ecuador.
Orcutt, Guy. 1957. “A new type of socio-economic system.” *The Review of Economics and Statistics* 39 (2): 116-123. JSTORE.
ONU (Organización de las Naciones Unidas). 24 de mayo de 2022. *Objetivos de Desarrollo Sostenible*. https://www.un.org/sustainabledevelopment/es/objetivos-de-desarrollo-sostenible/ (accessed August 27 2022).
OECD (Organización para la Cooperación y el Desarrollo Económico). 2019. *Society at a Glance 2019: OECD Social Indicators.* París: OECD Publishing. Nueva York.
- 2020. *Revenue Statistics in Latin America and the Caribbean 2020*. Paris: OECD Publishing. Nueva York.
- 2021. *Fomentando la cultura tributaria, el cumplimiento fiscal y la ciudadanía: Guía sobre educación tributaria en el mundo, segunda edición*. OECD Publishing, Paris. https://doi.org/10.1787/17a3eabd-es. Nueva York.
Paulus, Alari, and Iva Tasseva. 2020. “Europe Through the Crisis: Discretionary Policy Changes and Automatic Stabilisers.” *Oxford Bulletin of Economics and Statistics* 82 (4): 864–888. Oxford.
Palacio, Maria Gabriela, Andrea Molina-Vera, y Gabriela Izurieta. 2023. “Asistencia Social en el Ecuador,” en *Política Social, Pobreza y Desigualdad en el Ecuador: 1980-2021*. Quito.
Pissarides, Christopher, y Guglielmo Weber. 1989. “An Expenditure-Based Estimate of Britain’s Black Economy.” *Journal of Public Economics* 39: 17–32.
PNUD (Programa para el Desarrollo de las Naciones Unidas). 1990. *Informe 1990.* Pub. PNUD-Tercer Mundo. Edics. Bogotá.
Pomeranz, Dina. 2015. “No Taxation Without Information: Deterrence and Self-Enforcement in the Value-Added Tax.” *American Economic Review* 105 (8): 2539-69.
Ponce, Juan. 2023. *Los Primeros Pasos: Políticas para el Desarrollo Infantil y la Educación en América Latina.* FLACSO Ecuador. Quito.
Presidencia de la República. 1980. *Decreto Supremo N. 3815.* Publicado en el Registro Oficial N. 208 de 12 de junio de 1980.

- 1998. *Decreto Ejecutivo 129.* Subsidio para madres con al menos un hijo menor de 18 y para Personas Adultas Mayores. 18 de septiembre de 1998.
- 1999. *Decreto Ejecutivo N. 1323.* Publicado en el Registro Oficial N. 294 de 8 de octubre de 1999.
- 2000. *Decreto Ejecutivo N. 23.* Publicado en el Registro Oficial N. 8 de 2 de febrero de 2000.
- 2003a. *Decreto Ejecutivo 347.* Cámbiase el Programa Bono Solidario por Programa Bono de Desarrollo Humano BDH. 7 de mayo de 2003.
- 2003b. *Decreto Ejecutivo 535.* Se define al Sistema de Identificación y Selección de Beneficiarios de programas sociales (SELBEN). 30 de junio de 2003.
- 2007a. *Decreto Ejecutivo 12.* Incremento del valor del bono de desarrollo humano a la suma de treinta dólares. 15 de enero de 2007.
- 2007b. *Decreto Ejecutivo 580.* 23 de agosto de 2007, donde se cambia de denominación de Ministerio de Bienestar Social al de Ministerio de Inclusión Económica y Social.
- 2009. *Decreto Ejecutivo 1838.* Incremento a US$ 35,00 mensuales Bono de Desarrollo Humano, Pensión para Adultos Mayores y Personas con Discapacidad, y se delega al Programa Protección Social administración varios subprogramas. 20 de julio de 2009.
- 2013. *Decreto Ejecutivo 1395.* Se establece el incremento a US$ 50,00 mensuales del Bono de Desarrollo Humano, Pensión para Adultos Mayores y Pensión para Personas con Discapacidad. 2 de enero de 2013.
- 2017a. *Decreto Ejecutivo 253.* Se establece el componente variable en el Bono de Desarrollo Humano, con el objeto de mejorar los niveles de vida y de ingresos de los beneficiarios con hijos menores de 18 años. 22 de diciembre de 2017.
- 2017b. *Decreto Ejecutivo 374.* Se sustituye el artículo 3 del Decreto Ejecutivo No. 129, publicado en el primer Suplemento del R.O. No. 78, de 13 de septiembre de 2017, (Determina la métrica de selección de beneficiarios en la base del Registro Social). Quito: Presidencia Constitucional de la República.
- 2019a. *Decreto Ejecutivo 732.* Se suprime la Secretaría Nacional de Planificación y Desarrollo (SENPLADES), 13 de mayo de 2019.
- 2019b. *Decreto Ejecutivo 712.* Créase el Comité Interinstitucional del Registro Social, encargado de los lineamientos para la administración del Registro Social. Quito: Presidencia Constitucional de la República.
- 2020a. *Decreto Ejecutivo No. 1022.* Registro Oficial No 173, 27 de marzo. Ecuador: Gobierno del Ecuador.
- 2020b. *Decreto Ejecutivo No. 1026.* Registro Oficial, 24 de abril. Ecuador: Gobierno del Ecuador.

Purwanti, Dyan, Ari Kuncoro, and Arifah Andriani. 2020. "The Influence of Tax Audit, Tax Avoidance and Company Risk on Company Involvement in Tax Amnesty Programs in Indonesia." *Riset: Jurnal Aplikasi Ekonomi Akuntansi dan Bisnis* 2 (1): 181-2.

Ramírez-Álvarez, Jose. 2019. *Networks: Empirical and Theoretical Analysis.* Tesis doctoral, FLACSO-Andes. Quito, Ecuador.

- 2023. "The Accountant as a Means to Corporate Tax Compliance: Evidence from a Randomized Field Experiment in Ecuador." *Latin American Research Review* 58 (1): 69-89.

Ramírez-Álvarez, Jose, Paul Carrillo-Maldonado, y Mauro Andino. 2024. "Cronología, Hallazgos y Desafíos del Sistema Tributario Ecuatoriano en el Periodo 1980-2021." En *Política Social, Pobreza y Desigualdad en el Ecuador: 1980-2021*, editado por H.X. Jara, A. Mideros y M.G. Palacio, 12-59. Centro de publicaciones PUCE.

Rasteletti, Alejandro, y Estefania Saravia. 2023. *Gasto Tributario y Evasión en el Impuesto al Valor Agregado en América Latina y el Caribe.* Nota técnica del BID, 2741. Washintong D.C.
Ravallion, Martin, Shaohua Chen, y Prem Sangraula. 2009. "Dollar a Day Revisited." *World Bank Economic Review* 23 (2): 163–184. Washintong D.C.
Ravallion, Martin, Gaurav Datt, and Dominique van de Walle. 1991. "Quantifying Absolute Poverty in the Developing World." *Review of Income and Wealth* 37: 345–361.
Restuccia, Diego, and Richard Rogersib. 2008. "Policy Distortions and Aggregate Productivity with Heterogeneous Plants." *Review of Economic Dynamics* 11 (4): 707–720.
Richardson, Grant. 2016. "The Determinants of Tax Evasion: A Cross-Country Study." En *Financial Crimes: Psychological, Technological, and Ethical Issues*, 33-57. Springer, Cham.
Rosenbaum, Paul, and Donald Rubin. 1983. "The Central Role of the Propensity Score in Observational Studies for Causal Effects." *Biometrika* 70: 41–50. Oxford Academic.
Rosid, Arifin, Chris Evans, and Binh Tran-Nam. 2019. "Perception of Corruption and Tax Non-Compliance." Disponible en SSRN 3317994.
Ruan, Jianfei, Zheng Yan, Bo Dong, Qinghua Zheng, and Buyue Qian. 2019. "Identifying Suspicious Groups of Affiliated-Transaction-Based Tax Evasion in Big Data." *Information Sciences* 477: 508-532.
Rubin, Donald. 1974. "Estimating Causal Effects to Treatments in Randomised and Nonrandomised Studies." *Journal of Educational Psychology* 66: 688–701.
Samuelson, William, and Richard Zeckhauser. 1988. "Status Quo Bias in Decision Making." *Journal of Risk and Insurance* 1: 7-59. Springer Nature.
Sánchez, Gonzalo. 2015. "The Impact of Low-Cost Intervention on Tax Compliance: Regression Discontinuity Evidence."
Sandmo, Agnar. 2005. "The Theory of Tax Evasion: A Retrospective View." *National Tax Journal* 58 (4): 643-663. The University of Chicago Press.
Scartascini, Carlos. 2019. "Ventajas y Desventajas de las Amnistías y las Notificaciones Tributarias Simplificadas." Consultado en: https://blogs.iadb.org/ideas-que-cuentan/es/ventajas-y-desventajas-de-las-amnistias-y-las-notificaciones-tributarias-simplificadas/.
Schächtele, Simeon, Huascar Eguino, y Soraya Roman. 2022. "Improving Taxpayer Registration through Nudging? Field Experimental Evidence from Brazil." *World Development* 154: 105887.
Schneider, Friedrich. 2005. "Shadow Economies Around the World: What Do We Really Know?" *European Journal of Political Economy* 21 (3): 598-642.
Scotchmer, Suzane. 1989. "Who Profits from Taxpayer Confusion?" *Economic Letters* 29 (1): 49-55. Elsevier.
Scotchmer, Suzane, y Joel. Slemrod. 1989. "Randomness in Tax Enforcement." *Journal of Public Economics* 38: 17-32. Elsevier.
Seco, Antonio, y Andrés Muñoz. 2018. *Panorama del Uso de las Tecnologías y Soluciones Digitales Innovadoras en la Política y la Gestión Fiscal.* Discussion Paper, IDB-DP-602, Inter-American Development Bank, Washington, D.C.
SRI (Servicio de Rentas Internas). 2009-18. Ecuador- Tablas del Impuesto a la Renta. Descargadas de la página oficial www.sri.gob.ec.
- 2012a. Una nueva política fiscal para el buen vivir. La equidad como soporte del pacto fiscal. Quito: Abya-Yala
- 2012b. Qué es el impuesto a la renta. Disponible en: *https://www. sri. gob. ec/web/guest/impuesto*

- 2018. Ecuador- Estadísticas de Recaudación 2018. *Descargado de*: Estadísticas de Recaudación SRI.
- 2019. Estadísticas de Recaudación. *Descargado de*: Estadísticas de Recaudación SRI.
- 2020a. Impuesto a la Renta. Ecuador: SRI. *Descargado de*: Impuesto a la Renta SRI en septiembre 2022.
- 2020b. Formularios e Instructivos. *Descargado de*: Formularios e Instructivos SRI.
- 2020c. Formularios e Instructivos. *Descargado de*: Formularios e Instructivos SRI.
- 2023a. Reglamento a la ley de régimen tributario interno. *Descargado de*: Reglamento SRI.
- 2023b. Informe de Labores de Gestión Institucional Enero-diciembre 2022. *Descargado de*: file:/Downloads/InformeLabores%20SRI%20Ene-Dic2022.pdf.

Slemrod, Joel. 1985. "An Empirical Test for Tax Evasion." *The Review of Economics and Statistics*, 232–238.

- 2019. "Tax Compliance and Enforcement." *Journal of Economic Literature* 57(4): 904–54.

Stiglitz, Joseph. 1969. "The Effects of Income, Wealth, and Capital Gains Taxation on Risk-Taking." *Quarterly Journal of Economics* 83: 262–283. Oxford.

Storm, Ansia. 2013. "Establishing the Link Between Money Laundering and Tax Evasion." *International Business and Economics Research Journal (IBER)* 12(11): 1437–1450.

Sutherland, Holly. 2014. "Multi-Country Microsimulation." In *Handbook of Microsimulation Modelling*, Vol. 293, 77–106. Emerald Group Publishing Limited.

Sutherland, Holly, and Francesco Figari. 2013. "EUROMOD: The European Union Tax-Benefit Microsimulation Model." *International Journal of Microsimulation* 6(1): 4–26.

Thaler, Richard. 1980. "Toward a Positive Theory of Consumer Choice." *Journal of Economic Behavior and Organization* 1: 39–60.

- 1988. "Anomalies: The Winner's Curse." *Journal of Economic Perspectives* 2(1): 191–202.
- 1990. "Anomalies: Saving, Fungibility, and Mental Accounts." *The Journal of Economic Perspectives* 4: 193–205.
- 2008. "Mental Accounting and Consumer Choice." *Marketing Science* 27: 15–25.

Tilahun, M. 2019. "Determinants of Tax Compliance: A Systematic Review." *Economics* 8(1): 1–7. https://doi.org/10.11648/j.eco.20190801.11.

Thaler, Richard, and Cass Sunstein. 2003. "Libertarian Paternalism." *American Economic Review* 93(2): 175–179.

- 2008. *Nudge: Improving Decisions About Health, Wealth, and Happiness.* London.
- 2021. *Nudge: The Final Edition.* Penguins Books. London

Tobin, James. 1958. "Estimation of Relationships for Limited Dependent Variables." *Econometrica* 26: 24–36.

Torgler, Benno. 2012. "A Field Experiment on Moral Suasion and Tax Compliance." *CREMA Working Paper No. 2012-06.*

Tulkens, Henry, and Alex Jacquemin. 1971. "The Cost of Delinquency: A Problem of Optimal Allocation of Private and Public Expenditure." *Center for Operations Research and Econometrics.*

Van Dalen, Hendrik, and Kéne Henkens. 2014. "Comparing the Effects of Defaults in Organ Donation Systems." *Social Science and Medicine* 106: 137–142.

Vegh, Carlos, Guillermo Vuletin, Daniel Riera-Crichton, Jorge Puig, José-Andree Camarena, Luciana Galeano, Luis Morano, and Lucila Venturi. 2019. "Effects of the Business Cycle on Social Indicators in Latin America and the Caribbean: When Dreams Meet Reality." *LAC Semiannual Report*. Washington: World Bank.

Weber, Gustavus. 1919. *Organized Efforts for the Improvement of Methods of Administration in the United States* (No. 6). D. Appleton.

Weber, Till Olaf, Jonas Fooken, and Benedikt Herrmann. 2014. “Behavioral Economics and Taxation.” *No. 41. Directorate General Taxation and Customs Union, European Commission.*

Wendel, Steve. 2016. “Behavioral Nudges and Consumer Technology.” In *Nudge Theory in Action*, 95–123. Palgrave Macmillan, Cham.

WIDER (World Institute for Development Economies Research). 2023a. “Building Up Efficient and Fair Tax Systems – Lessons Based on Administrative Tax Data.” Retrieved from: WIDER - Tax Systems.

- 2023b. “Detecting and Countering Illicit Financial Flows.” Retrieved from: WIDER - Illicit Financial Flows.

World Values Survey. 2017–2022. *World Values Survey Wave 7 Version.*

Yitzhaki, Shlomo. 1974. “A Note on Income Tax Evasion: A Theoretical Analysis.” *Journal of Public Economics* 3: 201–202.

Yogama, Eko Arief, Daniel Gray, and MMatthew Rablen. 2024. “Nudging for Prompt Tax Penalty Payment: Evidence from a Field Experiment in Indonesia.” *Journal of Economic Behavior and Organization* 224: 548–579.

Statistical Data Set Sources

INEC (Instituto de Estadística y Censos). 2012. *Encuesta Nacional de Ingresos y Gastos de los Hogares Urbanos y Rurales. 2011–2012*. Guayaquil: Instituto Nacional de Estadística y Censos. Archivo Nacional de Datos y Metadatos Estadísticos. Available at: ANDA Catalog. Accessed December 2020.

- 2019. *Encuesta Nacional de Empleo, Desempleo y Subempleo. ENEMDU—diciembre 2019*. Available at: INEC ENEMDU Diciembre 2019. Accessed December 2020.

- 2020. *Encuesta Nacional de Empleo, Desempleo y Subempleo. ENEMDU Telefónica*. Available at: INEC ENEMDU Telefónica. Accessed December 2020.

IMF (International Monetary Fund). 2024. *Datamapper*. Available at: IMF Datamapper.

SRI (Servicio de Rentas Internas). 2022a. *Estadísticas de Recaudación 2000-2021*. Retrieved from: SRI Estadísticas Generales. Acceso Restringuido.

- 2022b. *Bases de datos zonal 9 2010-2018*. Solicitud ciudadana de acceso a la información. Acceso Restringuido.
- 2022c. *Bases de datos zonal 9 Diferencias 2010-2018*. Solicitud ciudadana de acceso a la información. Acceso Restringuido.
- 2022d. *Bases de datos zonal 9 Omisos 2010-2018*. Solicitud ciudadana de acceso a la información. Acceso Restringuido.

WHO (World Health Organization). 2020. *Coronavirus Disease (COVID-19) Dashboard*. Available at: WHO COVID-19 Dashboard.

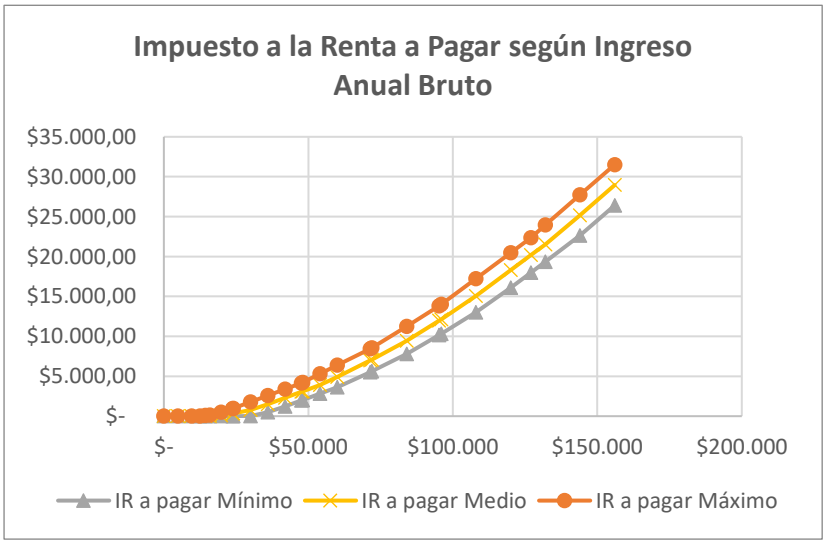
Annexes

Annex 1. Panel Data Descriptive Statistics

Año	Taken variables	Taxpayers
2010	305	569746
2011	305	682876
2012	305	753937
2013	305	795918
2014	305	860955
2015	305	883528
2016	305	873149
2017	305	912763
2018	305	882900

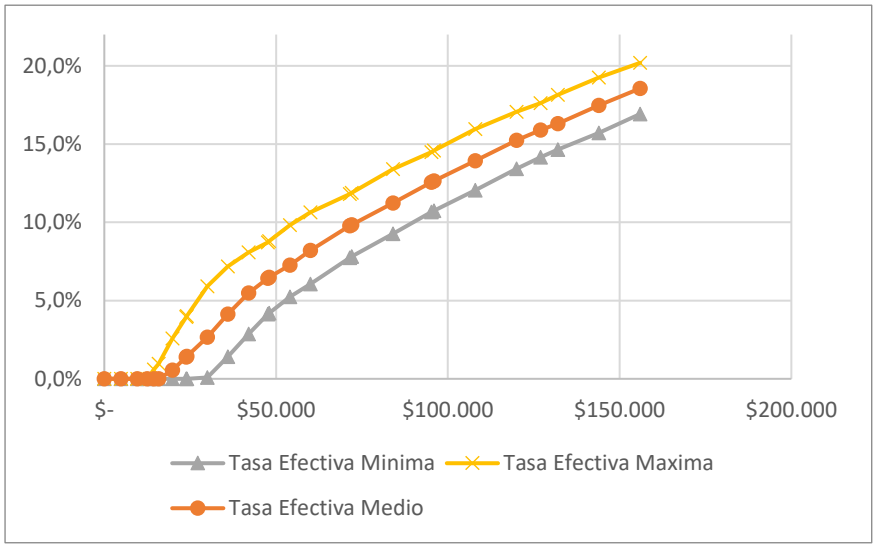
Source: SRI (2010-2018) panel data

Annex 2. Expected relation between income tax and annual income and tax rate



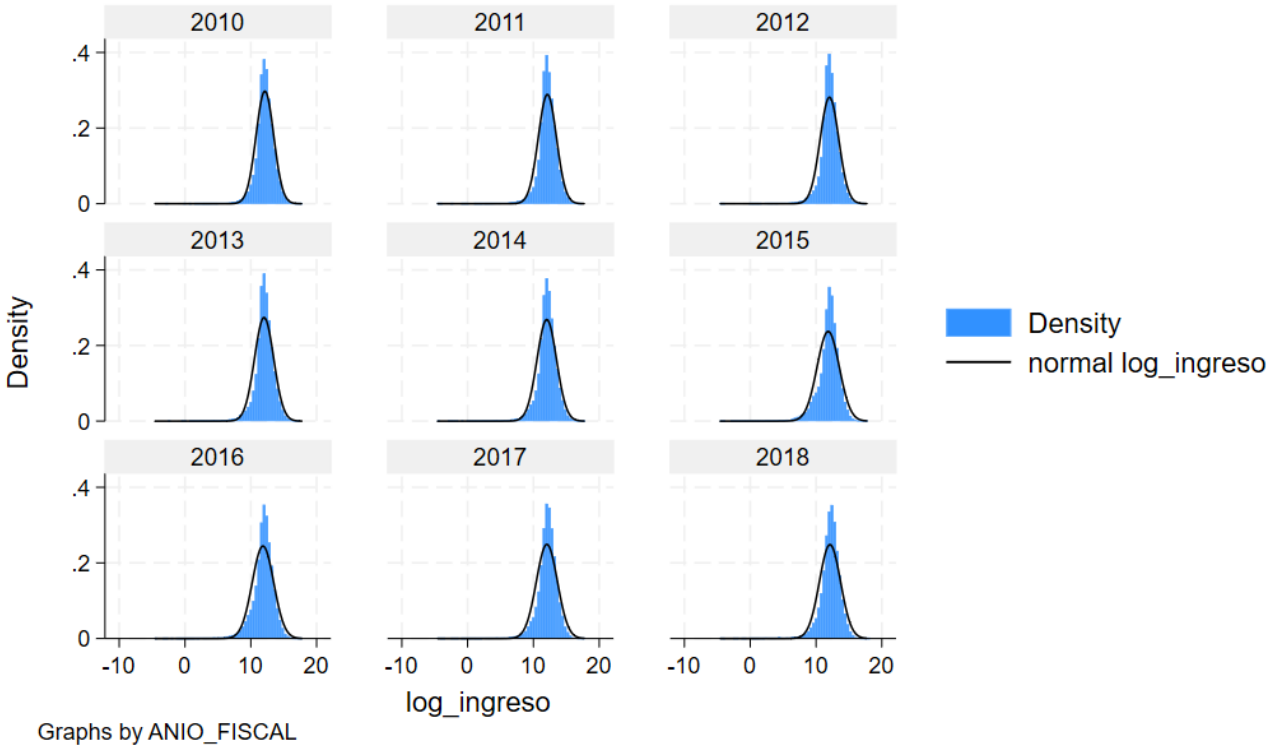
Source: SRI (2018) *Elaboration:* Author

Annex 3. Tasas efectivas según el Ingreso Anual Bruto



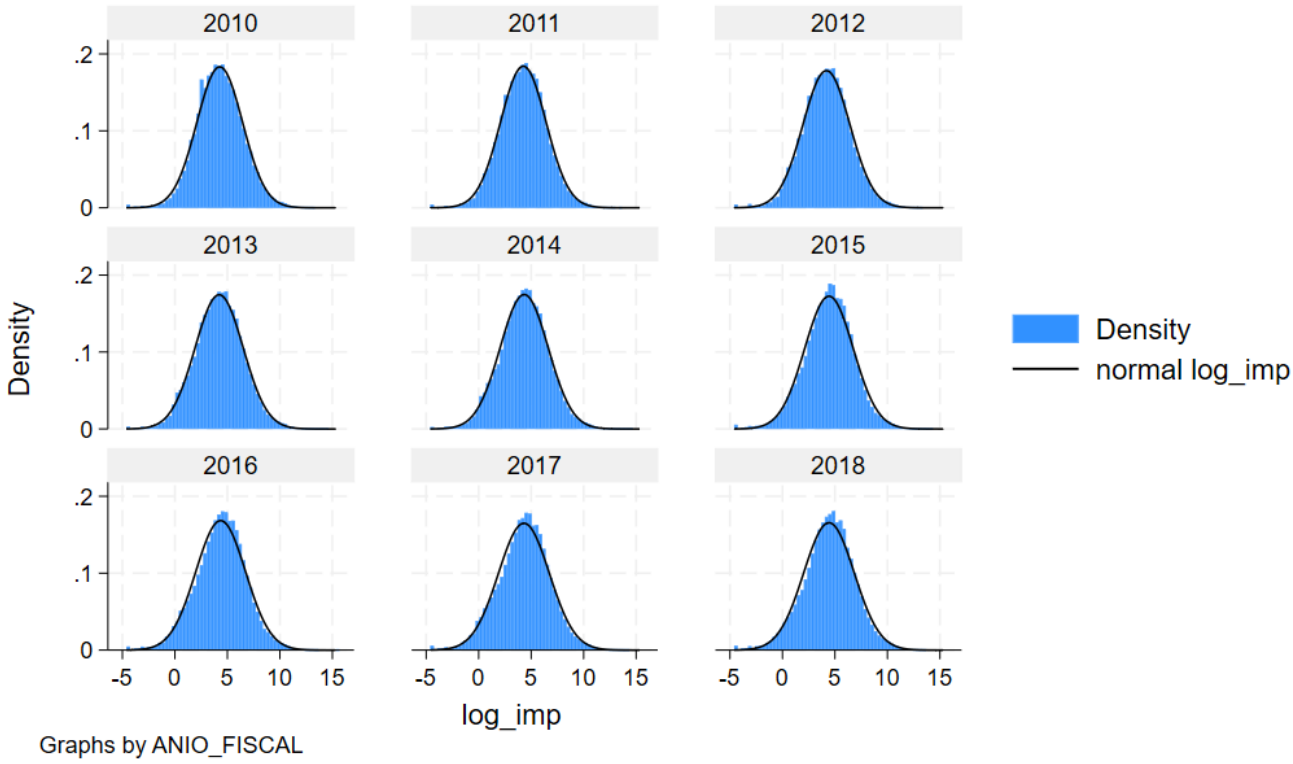
Source: SRI (2018) *Elaboration:* Author

Annex 4. Income Log-Distribution per year



Source: SRI (2010-2018) *Elaboration:* Author

Annex 5. Income Tax Log-Distribution per year



Source: SRI (2010-2018) *Elaboration:* Author

Annex 6. Elasticities for Income Tax and Total Declared Income

VARIABLES	(1) MPool_log log_imp	(2) MFE_log log_imp
log_base_imp	-1.056*	1.512***
	(0.510)	(0.00493)
log_activo	-0.415	
	(0.677)	
log_pasivo	0.193	
	(0.592)	
log_st_saldo_favor	0.250	
	(0.416)	
log_gto_pers	1.376	
	(0.816)	
log_sueldos	-0.647	
	(0.541)	
autonomo	-0.279	
	(1.851)	
multado	-1.427**	
	(0.632)	
2013.anio_fiscal	2.929*	0.0171**
	(1.630)	(0.00739)
2014.anio_fiscal	-0.451	0.0438***
	(1.658)	(0.00759)
2015.anio_fiscal	5.565*	0.00910
	(2.979)	(0.00786)
2018.anio_fiscal	2.304	-0.0783***
	(1.742)	(0.00870)
2011.anio_fiscal		0.135***
		(0.00715)
2012.anio_fiscal		0.0620***
		(0.00730)
2016.anio_fiscal		-0.0640***
		(0.00815)
2017.anio_fiscal		-0.111***
		(0.00840)
Constant	10.98	-10.58***
	(9.915)	(0.0481)
Observations	30	978,265
R-squared	0.508	0.149
Number of id_pers		411,514

Source: SRI (2010-2018) *Elaboration:* Author