World Development 190 (2025) 106976

Contents lists available at ScienceDirect

World Development

journal homepage: www.elsevier.com/locate/worlddev

Regular Research Article

Two decades of tax-benefit reforms in Ecuador: How much have they contributed to poverty and inequality reduction?

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ARTICLE INFO

JEL classification:
H23
H53
I32

Keywords:
Inequality
Poverty
Direct taxes
Cash transfers
Decomposition

ABSTRACT

The aim of this paper is to analyze the contribution of tax-benefit reforms to changes in income poverty and inequality in Ecuador from 2003 to 2022. For this, we use decomposition methods based on counterfactual distributions obtained using tax-benefit microsimulations which allow quantifying the relative contribution of policy reforms to changes in income poverty and inequality, compared to other contributors, including demographic characteristics and changes in the market income distribution. The focus is on changes over five subperiods, namely 2003–08, 2008–14, 2014–2019, 2019–20 and 2020–22. Our results show that tax-benefit reforms introduced between 2003 and 2020 contributed to the reduction of poverty and inequality in Ecuador, reinforcing the positive contribution of changes in market income and other population factors in all subperiods between 2003 and 2014, and mitigating the negative contribution of such factors between 2014 and 2020. Over the last period of analysis (2020–22), the post-pandemic economic recovery was broadly due to an improvement of market income with an almost nil contribution of tax-benefit reforms.

1. Introduction

Recent evidence of the evolution of income inequality in Latin America suggests that the decline in inequality observed over the first decade of the 2000s decelerated and stagnated during the second decade in many countries and was followed by a sharp increase in recent years as a result of the COVID-19 pandemic (Gasparini and Cruces, 2021; Alvaredo et al., 2023). Understanding the extent to which tax-benefit reforms have contributed to changes in income inequality and poverty over time is crucial to assess the effectiveness of government intervention and to consider potential reforms to enhance social protection and redistribution.

The aim of this paper is to quantify the contribution of tax-benefit reforms to changes in income poverty and inequality in Ecuador over the last two decades (2003–2022). Ecuador is an interesting example of one of the countries in the region experiencing the sharpest decline in income inequality between 2003 and 2014,[1] to then see this progress stagnate until 2019 and experience a large increase in inequality as a result of the COVID-19 pandemic (Alvaredo et al., 2023; Jara et al., 2022). Equally, over this period, Ecuador has experienced major reforms to government cash transfers and direct taxes.

To assess the contribution of policy reforms to changes in income poverty and inequality, we use decomposition methods based on counterfactual distributions obtained using tax-benefit microsimulation, following Bargain and Callan (2010) and recently applied in the context of the COVID pandemic in Ecuador by Jara et al. (2022).[2] Compared to

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[1] According to data from the Socio-Economic Database for Latin America and the Caribbean (SEDLAC), the Gini coefficient of household income per capita in Ecuador fell from 53.4% in 2003 to 44.9% in 2014. Over the same period, Ecuador also experienced an important decrease in poverty from 57.7% to 27.6%, according to data from the World Bank using the $6.85 a day poverty line (2017 PPP).

[2] This decomposition approach has been used to decompose changes in the income distribution over time in high-income countries, where tax-benefit microsimulation models are widely available (see Bargain et al. 2015 for the US; Paulus and Tasseva 2020 for EU countries, among others). Recently, similar tools have been developed for a few low- and middle-income countries. ECUAMOD, the tax-benefit model for Ecuador, used in this analysis has been developed as part of UNU-WIDER project 'SOUTHMOD-simulating tax and benefit policies for development' and has been used in a number of research applications (see Bargain et al., 2017; Jara et al., 2022; Jara et al. 2023).

https://doi.org/10.1016/j.worlddev.2025.106976
Accepted 26 February 2025
Available online 5 March 2025

other decomposition methods, microsimulation allows the creation of counterfactual income distributions by applying the tax-benefit rules of one year to the population of another, isolating the pure effect of policy reforms from changes in population characteristics and market income distribution. Under this setting, the effect of tax-benefit reforms on changes in poverty or inequality between two years can be quantified conditionally on base-year data or end-year data, and the Shorrocks-Shapley decomposition method involves averaging over these contributions (Bargain and Callan 2010).

Our analysis examines five distinct subperiods between 2003 and 2022, each marked by different tax-benefit reforms and changes in market income: 2003–08, 2008–14, 2014–19, 2019–20, and 2020–22. For each subperiod, we decompose changes in mean disposable income, poverty, and inequality into the contributions of policy reforms and the contribution of other factors, including shifts in market income distribution and demographics. Our results show that the tax-benefit reforms introduced in the first four subperiods always contributed to the reduction of poverty and inequality in Ecuador. These reforms reinforced the reduction of poverty and inequality explained by changes in market income and other population factors in the first two subperiods (2003–08 and 2008–14) and mitigated the increase in poverty and inequality due to changes in market income and other factors in the third and fourth subperiods (2014–19 and 2019–20). However, the effect of tax-benefit reforms was limited, representing on average 20 % of the total change in inequality and 12 % of the total change in poverty between 2003–20. Over the last subperiod of analysis (2020–22), the post-pandemic economic recovery was broadly due to an improvement of market income with an almost nil contribution of tax-benefit reforms.

This study makes three main contributions to the welfare literature. First, we add to the literature studying the contribution of tax-benefit policies to changes in inequality over time. By covering a long period of analysis, we provide evidence of the role of socio-fiscal policies in explaining changes in income inequality under different economic cycles, from a period of strong market income growth to a period of stagnation and economic recession under the COVID-19 pandemic. Second, to the best of our knowledge, we are the first to exploit the use of detailed tax-benefit microsimulation models to decompose changes in the income distribution in a country from Latin America, one of the most unequal regions in the world (Chancel et al., 2022). Previous literature has primarily focused on high-income countries, but the availability of microsimulation tools for low- and middle-income countries provides insights relevant to policymakers in these contexts. Finally, by quantifying the contribution of tax-benefit reforms to reducing poverty and inequality, we add to the policy debate on strengthening social protection and redistribution mechanisms in the developing world.

The remainder of the paper is organized as follows. Section 2 provides a brief review of related studies. Section 3 discusses the main tax-benefit reforms introduced in Ecuador during the period of analysis. Section 4 presents the data and microsimulation model used in the analysis and provides a detailed description of the decomposition methodology. Section 5 reports the main results of the study. Section 6 concludes.

2. Related literature

Evidence of the contribution of tax-benefit reforms to changes in income poverty and inequality in Latin America remains limited, especially looking at the role of the tax-benefit system as a whole over a long time period. In fact, many studies have focused on the effect of specific policy instruments. In terms of social protection, the literature finds that conditional cash transfers and non-contributory pensions reduce inequality in the region, but their effect is limited due to the small size of the transfers and the under-coverage of poor households (Amarante and Brum, 2018; Cecchini et al., 2021; Stampini et al., 2023). Regarding direct taxes, evidence from major reforms points to a positive impact on redistribution (Martorano, 2014). However, the incidence of direct taxation in the region remains limited (Goñi et al., 2011; Lustig et al., 2023).

Some studies have assessed the role of tax-transfer policies as a whole by comparing pre-tax and transfer and post-tax and transfer welfare indicators at specific points in time (Goñi et al., 2011; Hanni et al., 2015; Lustig et al., 2013; Lustig et al., 2023). Others have used parametric and non-parametric decompositions (López-Calva & Lustig, 2010; Azevedo et al., 2013; Cord et al., 2024; Amarante, 2016; Gasparini and Cruces, 2021). From this literature, we gather that most changes in income inequality in the region are explained by labor incomes. Nevertheless, cash transfers also play a role. For instance, around 20 % of the decline in income inequality in the first decade of the 2000s can be attributed to more progressive cash transfer programs (Azevedo et al., 2013; Gasparini and Cruces, 2021).

However, these studies suffer from a number of limitations. In terms of data, many of them rely solely on reported incomes from household surveys which do not contain consistent information on taxes or social insurance contribution (SIC) payments and, therefore, the role of such instruments in explaining changes in the income distribution over time might be omitted. In terms of methods, studies comparing pre-tax and transfer and post-tax and transfer welfare indicators at different points in time might provide a biased picture of the role of socio-fiscal policies. For instance, under such approach, it is not possible to disentangle whether a larger redistributive role of personal income tax is due to the introduction of progressive reforms or to labor income growth (without any policy reforms) which might result in a larger share of individuals shifting to higher tax brackets. Studies making use of non-parametric decompositions, following for instance Lerman and Yitzhaki (1985), also have shortcomings. In particular, the contribution assigned to a specific factor can be hard to interpret in a meaningful way (Shorrocks, 2013).

In contrast, decompositions based on tax-benefit microsimulations allow for the construction of counterfactual income distributions, isolating the pure effect of policy reforms from changes in the underlying population, such as shifts in market income and demographic characteristics (Bargain and Callan, 2010; Bargain, 2012; Paulus and Tasseva, 2020). This approach is widely applied to examine the contribution of tax-benefit reforms to changes in income distribution in high-income countries, often focusing on short periods (see, for example, Bargain, 2012 for the UK; Bargain et al., 2015 for the US; Doorley, Callan, & Savage, 2021 and Paulus and Tasseva, 2020 for EU countries; Li et al., 2021 for Australia).

Recent advancements in tax-benefit microsimulation for Latin American countries have allowed similar assessments of the role of tax-benefit policies in protecting household incomes during the COVID-19 pandemic (see Jara et al., 2022 for Ecuador; Jara et al., 2024 for comparative analysis across Latin American countries). This paper builds on this line of research by coding legislative changes in direct taxes and government cash transfers over two decades (2003 to 2022) in ECUAMOD, Ecuador's tax-benefit microsimulation model. This study quantifies the impact of tax-benefit reforms on poverty and inequality throughout various economic cycles in Ecuador. To the best of our knowledge, this is the first long-term application of this approach for a Latin American country, filling an important gap in the literature on sustained tax-benefit reform impacts in the region.

3. Tax-benefit policies in Ecuador over the period of analysis

The last two decades have been characterized by important changes in the size of the tax-benefit system in Ecuador. The tax-to-GDP ratio increased from 11.6 % in 2000 to 20.9 % in 2022, compared to 17.1 % to 21.5 % on average in LAC (OECD et al., 2024). Over time, the size of social security contributions in Ecuador has increased from 1.2 % to 5 % of GDP, compared to an increase from 2.7 % to 3.6 % of GDP in LAC. Personal income tax revenue has also increased from 0.05 % to 0.16 % of GDP, but remains below the LAC average in 2022 (2 % of GDP). On the benefit side, government spending in conditional cash transfers and non-contributory pensions in Ecuador has increased from 0.49 % in 2003 to 0.99 % in 2020 (ECLAC, 2024). Throughout the entire period, this was above the average for LAC countries (0.10 % in 2003 and 0.27 % in 2020). The remainder of this section discusses the reforms to the tax-benefit instruments considered over our period of analysis, which are summarized in Table 1.

In terms of social security contributions, different rates apply to employees and self-employed workers. In general, there are only minor reforms to SIC over the period of analysis. The main reform was introduced in 2014, as part of which contribution rates increased from 9.35 % to 9.45 % for private sector employees excluding the banking sector, from 11.35 % to 11.45 % for private employees in the banking sector and civil servants, and from 17.5 % to 20.6 % for self-employed workers.

As for the personal income tax, two major reforms were introduced over the period of analysis. The first reform was introduced in 2008 as part of the Tax Equity Reform Law (*Ley Reformatoria para la Equidad Tributaria*) of 2007. Two key components of this reform are worth highlighting. On the one hand, the tax schedule was made more progressive, moving from a structure of six tax bands with rates between 0 % and 25 % to one of nine tax bands with rates between 0 % and 35 %. On the other hand, generous deductions for personal expenditures were introduced up to certain limits. Deductions apply to expenditure in food, clothing, education, health, and housing. The second reform was introduced in 2022, as part of which an additional tax band was added at the top with a marginal tax rate of 37 % and the limits for maximum deductions were lowered, both with the aim of increasing the progressivity of personal income tax.

Regarding government cash transfers, *Bono de Desarrollo Humano* (BDH),[3] the main cash transfer program in the country, has undergone a number of important changes. BDH is a proxy means-tested benefit targeting three population groups living in poor families according to the official proxy-means-test index: families with children younger than 18, elderly adults, and individuals with a disability. The proxy means-test system to identify beneficiaries has been revised four times over the period of analysis (Izurieta and Palacio, 2024). The first index was used from 2003 until 2009. The second, was in place between 2009 and 2014. The third one covered the period 2014–19 and the current one was introduced in 2020. With the introduction of each revised index, thresholds to determine eligibility to BDH are also revised. In particular, the eligibility threshold was substantially revised in 2014, which resulted in a sharp drop in the number of BHD beneficiaries.[4] In terms of benefit amounts, there were regular increases over the period of analysis. In 2007, the benefit amount was set at US$ 30 (US$ 39.52 in 2019 prices) for all eligible population groups, and in 2012 it was increased to US$ 50 (US$ 52.27 in 2019 prices). In 2018, the benefit amount for elderly adults increased to US$ 100 and a top-up for families with children was introduced which varies depending on the age and the number of children in the family up to a maximum of US$ 150 in total. Finally, in 2022, benefit amounts for all categories were increased by US $ 5.

To mitigate the economic impact of the COVID-19 pandemic, the Ecuadorian government implemented the *Bono de Protección Familiar* in 2020. The benefit targeted households who were not entitled to any contributory or non-contributory benefit or pensions and consisted of a cash transfer of US$ 120 paid in two monthly instalments (i.e., US$ 60 each month). The transfer was abolished in 2022.

4. Data and methodology

This section is divided into three parts. First, we discuss the data used in the analysis. Then, we present the tax-benefit model and describe the scope of the simulations. At the end of the section, we provide a detailed description of the decomposition approach used to quantify the contribution of tax-benefit reforms to changes in poverty and inequality over time.

4.1. Data

Our analysis is based on household survey data from the National Survey of Employment, Unemployment and Underemployment (*Encuesta Nacional de Empleo, Desempleo y Subempleo*, ENEMDU) conducted by the National Institute for Statistics and Censuses (*Instituto Nacional de Estadística y Censos*, INEC) (INEC-ANDA, 2024). Since 2003, the survey has been consistently representative at the national level, including urban as well as rural areas. From September 2003 to December 2018 the survey was conducted on a quarterly basis.[5] Then, the format changed to a monthly collection with monthly, quarterly, and annual publications.

ENEMDU represents the main data source for studies on income poverty and inequality in Ecuador. The survey contains information on income from employment and self-employment, non-labor income, contributory public pensions, government cash transfers, as well as personal and household characteristics. ENEMDU also contains information on affiliation to social security, which we use to define formal employment.[6]

For the purpose of our study, we select six ENEMDU rounds – namely, 2003, 2008, 2014, 2019, 2020 and 2022 – to capture key policy reforms and changes in the labor market over the period of analysis. For consistency, we use the last survey of each year, i.e., the last quarter of 2003–2019 and the last month of 2020–2022.[7] The analysis makes use of the whole sample included in the surveys to obtain results representative at the national level by using household weights available in the data. 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 based on information from the National Survey of Income and Expenditures of Urban and Rural Households (ENIGHUR) (INEC-ANDA, 2012).[8]

[3] In the analysis, we include within the concept of the BDH, the programs that have been derived from it over time; for example, non-contributory pension programs for the elderly and people with disabilities.

[4] The drop in the number of beneficiaries was justified as a process of "graduation" according to which households that no longer received the transfer were considered no longer poor according to the new index. However, there was no evaluation of the situation of households that lost entitlement to the transfer (Izurieta and Palacio, 2024).

[5] In March 2020, face-to-face interviews were suspended due to the declaration of a health emergency resulting from the COVID-19 pandemic. In May and June 2020, INEC conducted the survey by phone with a reduced questionnaire (INEC 2020). In September 2020, ENEMDU was resumed with a face-to-face modality.

[6] Information on affiliation to social security in ENEMDU is cross validated with information from the Ecuadorian Institute of Social Security (*Instituto Ecuatoriano de Seguridad Social*, IESS).

[7] The end-of-year surveys are collected in December of each year and report income information corresponding to November in each year.

[8] ENIGHUR contains information on both income and expenditures, however, the survey is not conducted on a regular basis and the latest data available are for years 2011–2012. For the imputations, expenditure amounts in ENIGHUR 2011–2012 are updated to the specific years of ENEMDU using the Consumer Price Index. A two-step 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.

Table 1
Description of simulated tax-benefit policies and reforms.

Instrument	Parameter	2003	2008	2014	2019	2020	2022
Social Insurance Contributions	Employee rate	9.35 % or 11.35 %	9.35 % or 11.35 %	9.45 % or 11.45 %	9.45 % or 11.45 %	9.45 % or 11.45 %	9.45 % or 11.45 %
	Self-employed rate	17.50 %	17.50 %	20.60 %	20.60 %	20.60 %	20.60 %
	Floor	rate*Min wage	rate*Min wage	rate*Min wage	rate*Min wage	rate*Min wage	rate*Min wage
Personal Income Tax	# tax bands	6	9	9	9	9	10
	low tax band (ltb)	10,893	10,340	10,883	11,310	11,422	10,796
	high tax band (htb)	87,145	105,376	111,023	115,290	116,424	104,590
	low tax rate	0 %	0 %	0 %	0 %	0 %	0 %
	high tax rate	25 %	35 %	35 %	35 %	35 %	37 %
	max deduction	–	1.3*ltb + 2*ltb (old-age) + 3*ltb (disability)	1.3*ltb + 2*ltb (old-age or disability)			5,007 or 7 basic food baskets
Bono de Desarrollo Humano – families	targeting	proxy means-test	proxy means-test	proxy means-test	proxy means-test	proxy means-test	proxy means-test
	max amount (per month)	24.03	39.52	52.27	150	151.41	156.89
Bono de Desarrollo Humano – old-age pension	targeting	proxy means-test	proxy means-test	proxy means-test	proxy means-test	proxy means-test	proxy means-test
	max amount (per month)	18.42	39.52	52.27	100	100.94	104.59
Bono de Desarrollo Humano – disability	targeting	proxy means-test	proxy means-test	proxy means-test	proxy means-test	proxy means-test	proxy means-test
	max amount (per month)	18.42	39.52	52.27	50	50.47	57.52
	targeting	proxy means-test	proxy means-test	proxy means-test	proxy means-test	proxy means-test	proxy means-test
COVID-emergency	max amount (per month)	–	–	–	–	59.45	–

Note: All monetary parameters are expressed in US$ of December 2019 values using CPI.
Source: Authors' elaboration

4.2. *Tax-benefit simulations*

Our analysis makes use of ECUAMOD, the tax-benefit microsimulation model for Ecuador.[9] Tax-benefit microsimulation models are computer programs which calculate social insurance contributions, taxes, and government cash transfers based on the rules governing each instrument according to the legislation and the market income and the sociodemographic characteristics of each individual in the microdata. ECUAMOD is used to simulate social insurance contributions, direct taxes and government cash transfers in Ecuador. 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; Jara et al., 2022; Jara and Palacio, 2024).[10]

4.2.1. *Scope of the simulations*

Our analysis focuses on the concept of disposable income, which is defined as market income plus government cash transfers and contributory pensions minus social insurance contributions and personal income tax.[11] More precisely, for each ENEMDU year considered in the analysis, we simulate: (i) employee and self-employed social insurance contributions; (ii) personal income tax; and (iii) BDH, which represents the main cash transfer in the country. Additionally, we simulate the COVID-related Family Protection Grant, which was in place in 2020 and 2021. Social insurance contributions and personal income tax are simulated only for workers reporting affiliation with social security to account in some way for the presence of informal employment.[12] Non simulated benefits such as contributory pensions are taken directly from the data.

ECUAMOD allows assessing the role of tax-benefit policies by comparing indicators based on market and disposable income. More importantly, ECUAMOD allows producing counterfactual simulations whereby the tax-benefit system of one year is applied to the population (microdata) of another year to decompose changes in the income distribution over time into the contribution of tax-benefit reforms and the contribution of other factors (e.g., market income and demographic changes). The latter is the approach used in this paper, which is described in detail in section 3.3.

4.2.2. *Limitations and assumptions*

The simulation of taxes and benefits in ECUAMOD relies on the quality of the information available in the microdata used, in this case ENEMDU. For instance, contributory public pensions cannot be simulated because ENEMDU does not contain information on individual histories of contributions to social security. Equally, disability benefits cannot be simulated because information on the severity of disability is not available in the data. Tax instruments such as property tax and motor vehicle taxes cannot be simulated as the value of these assets is not reported in the data. Nevertheless, with the exception of

[9] ECUAMOD has been developed as part of UNU-WIDER project 'SOUTHMOD-simulating tax and benefit policies for development', in which microsimulation models of taxes and transfers have been built for a set of developing countries (Decoster et al., 2019). ECUAMOD and other models of the SOUTHMOD project have been implemented in the EUROMOD software, which provides a harmonized environment for comparative analysis between countries (Sutherland and Figari, 2013).

[10] For a formal description of ECUAMOD, see Appendix B of Jara and Palacio (2024).

[11] Market income is defined as the sum of employment and self-employment income, work bonuses, in-kind income, own-consumption from self-employment activities, capital and property income, inter-household payments, and private transfers, minus alimony payments. Imputed rent is not included.

[12] In Ecuador, personal income tax is automatically withheld and reported by employers for employees affiliated to social security, whereas the self-employed are required to file taxes.

contributory pensions, other non-simulated taxes and benefits represent only a small part of disposable income.

As previously mentioned, to account somehow for the presence of informal employment, social insurance contributions and personal income tax are simulated only for formal workers, who are defined as paid workers reporting affiliation with social security. Additionally, ENEMDU – and household surveys in general – suffer from problems of income underreporting and under-coverage of top incomes. As a result, our simulations of personal income tax might underestimate the effect of this policy instrument on income inequality.

As it is the case in many low and middle-income countries, the main government cash transfer in Ecuador (BDH) is designed as a proxy mean-tested benefit, meaning that eligibility is assessed based on a composite index comprising household characteristics and housing conditions. In ECUAMOD, eligibility is simulated based on a pseudo composite index generated in ENEMDU, following as closely as possible the methodology to generate the official index. As the distribution of both indices might differ, we determine the threshold for eligibility with our pseudo index based on information of the number of individuals below the official threshold.

Finally, ECUAMOD is a static model, meaning that the simulation of tax-benefit reforms does not consider potential behavioral reactions of individuals. As such, in our decomposition, we assume that the proportion of formal workers does not change when the tax-benefit system of one year is applied to the population of another. Our simulations represent a first-order approximation, and further work should attempt to take behavioral responses into account.

4.3. Decomposing changes in poverty and inequality over time

The levels of income poverty and inequality of a country at a specific point in time are the result of the combination of population characteristics (including demographic composition and market income distribution) and tax-benefit policies. Our aim is to quantify to what extent the main tax-benefit reforms in Ecuador have contributed to changes in household disposable income over time. Tax-benefit models are particularly useful for this type of exercise because, through counterfactual simulations, they allow isolating the effect of one factor while keeping the rest fixed. Our analysis draws on the decomposition proposed by Bargain and Callan (2010) that combines the use of household surveys with microsimulation techniques to separate the direct effect of tax-benefit reforms from other effects.

Formally, let matrix x_t represent the population in period t. For each individual, it contains information on market income and sociodemographic characteristics. Disposable income is given by $y_t(p_t, x_t)$, where y_t denotes the "tax-benefit function" transforming, for each individual, market income and sociodemographic characteristics (x_t) into a certain level of disposable income. The function y_t represents the structure (i.e., non-monetary elements) of the tax-benefit system, e.g., the number of tax bands and marginal tax rates of personal income tax, contribution rates, etc. The "tax-benefit function" also depends on a set of monetary parameters p_t, e.g., the amounts of cash transfers, the monetary level of income tax thresholds, etc. Finally, let $I[y_t(p_t, x_t)]$ represent a welfare indicator based on the distribution of disposable income in period t, e.g., the poverty headcount or the Gini coefficient.

The total difference in the welfare indicator I between two periods (t = 0, 1) can be represented by:

$$\Delta = I[y_1(p_1, x_1)] - I[y_0(p_0, x_0)] \tag{1}$$

The terms $I[y_0(p_0, x_0)]$ and $I[y_1(p_1, x_1)]$ denote the value of welfare indicator based on the distribution of disposable income at the beginning ($t = 0$) and end of the period ($t = 1$), respectively. This total difference can be decomposed into the contribution of changes in tax-benefit policies ("policy effect"), the contribution of other factors —such as demographic changes or changes in the distribution of market income ("other effect") — and the contribution of changes in nominal levels ("nominal effect").[13]

Two alternative decompositions can be applied. The first decomposition (Decomposition I) consists of a shift in data from period 0 to period 1 conditional on tax-benefit policies of the initial period, followed by a change in policies evaluated on period 1 data. Formally, the change in the welfare indicator I can be rewritten as:

$$\begin{aligned}\Delta &= \{I[y_1(p_1, x_1)] - I[y_0(\alpha p_0, x_1)]\}(\text{"policy effect"}) \\ &+ \{I[y_0(\alpha p_0, x_1)] - I[y_0(\alpha p_0, \alpha x_0)]\}(\text{"other effect"}) \\ &+ \{I[y_0(\alpha p_0, \alpha x_0)] - I[y_0(p_0, x_0)]\}(\text{"nominal effect"})\end{aligned} \tag{2}$$

The term $I[y_0(\alpha p_0, x_1)]$ represents the value of the welfare indicator of a counterfactual disposable income distribution obtained by applying the tax-benefit policies of the period $t = 0$ to the population of the period $t = 1$. To obtain this counterfactual distribution, it is necessary to make the nominal amounts of the two periods comparable. For this reason, the monetary policy parameters of the base year p_0 have been adjusted with a factor α, which captures changes in nominal levels (for example, prices or wages). In our analysis we use the Consumer Price Index (CPI) as an adjustment factor to bring the monetary parameters from the beginning of the period to the end levels. Finally, the term $I[y_0(\alpha p_0, \alpha x_0)]$ also represents the value of the welfare indicator from a counterfactual disposable income distribution. This is obtained by nominally adjusting both the policy parameters of the initial year and the market income of the initial year to end-of-period levels.

Alternatively, the second decomposition (Decomposition II) consists of a change of policies from period 0 to period 1 based on data from the initial period ($t = 0$), followed by a shift in data conditional on the policies of period 1. Thus, the change in the welfare indicator I can be rewritten as:

$$\begin{aligned}\Delta &= \{I[y_1(p_1, x_1)] - I[y_1(p_1, \alpha x_0)]\}(\text{"other effect"}) \\ &+ \{I[y_1(p_1, \alpha x_0)] - I[y_0(\alpha p_0, \alpha x_0)]\}(\text{"policy effect"}) \\ &+ \{I[y_0(\alpha p_0, \alpha x_0)] - I[y_0(p_0, x_0)]\}(\text{"nominal effect"})\end{aligned} \tag{3}$$

The term $I[y_1(p_1, \alpha x_0)]$ represents the value of welfare indicator of a counterfactual disposable income distribution obtained by applying the tax-benefit policies of the period $t = 1$ to the population of the period $t = 0$, where monetary values of the initial period have been nominally adjusted to price levels of the end period.

The last term ("nominal effect") of equation (2) and (3) represents the effect of nominally adjusting the base-year data and monetary parameters to end-year price levels, and relates to an interesting property of tax-benefit systems. In particular, if the tax-benefit function $y_t(p_t, x_t)$ is linearly homogenous in p_t and x_t,[14] the "nominal effect" is zero because a simultaneous nominal adjustment to the database and to the monetary tax-benefit parameters does not affect the relative location of households in the distribution of disposable income. This property of the tax-benefit system has been empirically verified in the case of Ecuador

[13] The "other effect" could in turn be decomposed into the contribution of changes in market income and the automatic stabilization provided by tax-benefit policies (see Paulus and Tasseva 2020). However, evidence for Ecuador suggests a limited role of tax-benefit policies as automatic stabilizers (Jara et al. 2022). On the one hand, cash transfers fail to act as automatic stabilizers due to their design as proxy means-tested benefits, meaning that eligibility is based on a composite index which does not depend on household income. On the other hand, social insurance contributions and personal income tax provide limited stabilization and mostly concentrated at the top of the distribution due to the high exempted threshold of personal income tax and the prevalence of informal employment.

[14] That is: $y_t(\alpha p_t, \alpha x_t) = \alpha y_t(p_t, x_t)$

(Bargain et al., 2017).[15]

Following Shorrocks (2013), the Shapley value procedure can be applied to decompose a welfare statistic *I* by considering the marginal effect on *I* of eliminating each contributory factor in sequence, and then assigning to each factor the average of its marginal contributions in all possible elimination sequences. In our case, if the homogeneity property holds, the "policy effect" and the "other effect" under the Shorrocks-Shapley decomposition is obtained by taking the average of the contributions from the two alternative decompositions (Bargain and Callan, 2010).

5. Empirical results

This section presents the main results of our analysis. First, we provide an overview of the redistributive and poverty reducing role of taxes and benefits over the period of analysis. Then, we apply the decomposition method to five distinct subperiods between 2003 and 2022 (i.e., 2003–08, 2008–14, 2014–19, 2019–20, and 2020–22). Pairwise comparisons are made between base-year and end-year of each subperiod. Decomposition results are presented for changes in mean disposable income, poverty, and inequality, based on the Shapley-Shorrocks decomposition.

5.1. Tax-benefit systems, poverty and inequality

This section discusses the evolution of income inequality and poverty based on per capita household disposable income between 2003 and 2022, as well as the impact of the tax-benefit system on inequality and poverty at specific points in time. Table 2 compares the Gini coefficient and poverty and extreme poverty headcount measures for per capita household disposable income and per capita household market income. The difference between these two measures captures the redistributive and the poverty reducing effect of the tax-benefit system in each year presented in the table. National poverty and extreme poverty lines are used to produce poverty headcount measures.[16]

Table 2 shows that inequality, poverty and extreme poverty based on disposable income dropped sharply between 2003 and 2014. Inequality and (extreme) poverty increased slightly in 2019, before a much larger increase in 2020 due to the COVID-19 pandemic. Finally, in 2022, inequality and extreme poverty dropped to levels similar as those in 2014, whereas poverty dropped but remained above pre-pandemic levels.

Moreover, Table 2 shows that the redistributive impact of the tax-benefit system, measured by the difference between the market and disposable income Gini coefficients, has increased over time. In 2003, inequality based on market income was 2.5 points higher than that based on disposable income, whereas this difference amounts to 4.6 points in 2022. A similar pattern is observed in terms of the poverty reducing impact of tax-benefit policies. The (extreme) poverty headcount based on market income was 2.4 (3.5) points higher than that based on disposable income in 2003, compared to a difference of 6.3 (7.3) points in 2022.

Note, however, that Table 2 only provides information about the redistributive and poverty reducing role of the tax-benefit system at specific points in time. In fact, it is not possible to infer from that information how much tax-benefit reforms have contributed to explain changes in poverty and inequality based on disposable income between two points in time. This is because the redistributive and poverty reducing role of tax-benefit systems does not only depend on the tax-benefit rules in place each year but also on the underlying distribution of market income and population characteristics which might also change over time. As previously mentioned, a larger redistributive role could be due to the introduction of more progressive taxation but also due to growth in labor income in the absence of any policy change because a larger share of individuals would shift to higher tax brackets given the increase in labor income. The decomposition approach presented in section 4.3 allows isolating the contribution of tax-benefit reforms on changes in the income distribution by applying tax-benefit rules of two different years to the same population. The next sections present the results of our decomposition analysis.

5.2. Changes in mean disposable income

Fig. 1 presents the results of the averaged Shorrocks-Shapley decomposition on changes in mean per capita household disposable income across the entire population (Panel A), as well as the bottom (Panel B) and top (Panel C) deciles. The results are presented for five subperiods of analysis: (i) 2003–08; (ii) 2008–14; (iii) 2014–19, (iv) 2019–20; and (v) 2020–22. The total change in mean disposable income between two years is depicted by the white circles. The contribution of "other effects" to changes in mean disposable income, which include changes in the distribution of market income and demographics, are represented by the light blue bars. The contribution of "policy effects" is decomposed into the contribution of changes in benefits (dark blue bars), changes in social insurance contributions (SIC) (black bars) and changes in direct taxes (white bars).

For the population as a whole (Panel A), our findings indicate that mean disposable income (white circles) increased by 23.8 % and 16 % in the first and second subperiods, respectively. Mean disposable income then fell by 2.7 % in the third subperiod and by a substantial 12.1 % in the fourth subperiod due to the pandemic. Over the last subperiod, 2020–22, mean disposable income increased by 12.2 %. In all subperiods, changes in mean disposable income were largely driven by the "other effects", capturing changes in market income and demographics. In fact, reforms to cash transfers contributed, on average, to a 1.29 % increase in mean disposable income in the first subperiod but their contribution was below 1 % in the other subperiods of analysis. On average, for the whole population, the contribution of reforms to direct taxes and SIC is also below 1 % over the whole period of analysis.

As expected, the contribution of cash transfer reforms to changes in mean income is larger at the bottom of the distribution (Panel B). Between 2003 and 2008, mean disposable income grew by 65 % in the bottom income decile, and more than a quarter of this change (dark blue bar: 21.35 %) is explained by the increased generosity of cash transfer payments to all population groups covered by *Bono de Desarrollo Humano* (see Table 1). Over the second subperiod, mean income increased by 80 %, out of which 15.3 % was due to reforms to cash transfer programs. The third subperiod is characterized by a fall in mean income at the bottom of the distribution, driven by the "other effects" which represent a 10.7 % drop in disposable income but it is partly mitigated by a 6.4 % increase in disposable income due to changes in cash transfers. During the pandemic (2019–2020), the "other effects" (light blue bar) represent a drop of 31.7 % of disposable income due to earnings losses. This effect is somewhat alleviated by a 6.2 % increase in benefits (dark blue bar). Finally, mean income recovers after the pandemic (2020–2022) and the recovery at the bottom of the distribution is fully explained by the "other effects" as no major reforms to cash

[15] Note, that the nil "nominal effect" relies on the simultaneous nominal adjustment of monetary tax-benefit parameters and base-year data by the same factor. It would be, however, possible to use different factors. For instance, market income in the base-year data could be uprated with income growth and tax-benefit monetary parameters, with CPI. In such case, the last term of the decomposition will not drop and would capture the distributional effect of a uniform income growth vis-à-vis a price-indexation of tax-benefit policies (Bargain 2012).

[16] The extreme poverty line is defined as the minimum cost of a food consumption basket which satisfies the nutritional needs for a healthy life. The poverty line is calculated using the inverse of the Engel coefficient (which measures the relationship between expenditure in food consumption and expenditure in total consumption) to scale the extreme poverty line (INEC 2015).

Table 2
Impact of tax-benefit systems on income inequality and poverty at specific points in time.

	Inequality (Gini %)			Poverty (FGT0 %)			Extreme Poverty (FGT0 %)		
	Disposable Income	Market Income	Δ	Disposable Income	Market Income	Δ	Disposable Income	Market Income	Δ
2003	55.3	57.1	−1.8	51.2	52.9	−1.7	27.8	30.2	−2.4
2008	50.8	53.8	−3.0	36.8	39.6	−2.8	17.0	20.7	−3.7
2014	45.1	48.4	−3.4	23.4	26.6	−3.2	7.8	11.5	−3.7
2019	45.9	49.3	−3.4	25.5	31.0	−5.5	9.2	14.7	−5.5
2020	48.5	52.5	−4.0	33.7	39.3	−5.6	14.1	21.6	−7.5
2022	44.7	49.2	−4.5	26.0	32.2	−6.2	8.0	15.1	−7.1

Source: Author's own calculation based on ECUAMOD.

transfers were implemented during the last subperiod of analysis. Note that at the bottom of the distribution, we observe no contribution of reforms to direct taxes or SICs to changes in mean income. This is explained by two factors. First, the threshold above which personal income tax is paid in Ecuador is very high (see Table 1), meaning that individuals in the bottom decile are exempt from personal income tax payments. Second, informal employment is mostly concentrated at the bottom of the distribution, meaning that most individuals in the bottom decile are not paying SICs.

At the top of the distribution (Panel C), mean disposable income (white circles) increased by around 12.3 % in the first subperiod and 3.8 % in the second subperiod. During the third subperiod and during the pandemic, the top decile group experienced only a minor drop in disposable income, which contrasts with the situation of those at the bottom of the distribution. Finally, in the post-pandemic period, disposable income increased by around 1.5 %. In all subperiods, changes in mean disposable income are mainly driven by the "other effects". However, we do observe a larger contribution of direct tax reforms (white bars) in periods characterized by the introduction of changes to personal income tax. For instance, changes in direct taxes reduce mean disposable income at the top by 0.94 % in the first subperiod due to the introduction of a more progressive tax schedule moving from a marginal top tax rate of 25 % to one of 35 %. A similar effect is observed in the last subperiod, where reforms to direct tax contribute to a drop of 0.58 % in mean disposable income at the top due to the introduction of an additional personal income tax band for high earners with a top tax rate of 37 % and the reduction of the maximum amount of tax deductions. The contribution of SIC reforms to changes in mean disposable income is small in all subperiods, as in general only minor changes to SICs have been introduced over our period of analysis.

Note that the analysis presented for the bottom and top deciles in Fig. 1 can be extended to all deciles of the income distribution, which would provide a representation similar in nature to that of growth incidence curves (Ravallion and Chen, 2003, Lakner et al., 2022), where the growth rate of per capita household disposable income for each decile is decomposed into the contribution of tax-benefit reforms and that of "other effects" (including market income growth). Fig. A1 in the appendix presents results of the averaged Shorrocks-Shapley decomposition for every decile of the income distribution, in each of the subperiods under study. The figure shows a downward sloping curve in the first (2003–08), second (2008–14) and last subperiod (2020–22) of analysis meaning that growth in these periods was pro-poor (i.e., the income at the bottom of the distribution was growing faster than that of at the top). In the subperiod 2014–19, we observe a somewhat s-shaped curve with larger income losses at the bottom of the distribution. Finally, during the pandemic (2019–20), all deciles experienced a drop in income, but losses were higher at the bottom of the distribution despite the mitigating role of cash transfers. Reforms to cash transfers contributed to increasing income at the bottom of the distribution in all but the last subperiod.

5.3. Changes in income inequality and poverty

Table 3 presents the results of the Shorrocks-Shapley decomposition in our five subperiods of analysis. For each subperiod, the table presents the total change in income poverty and inequality between the two years, as well as the tax-benefit "policy effect" and the "other effects" namely capturing changes in market income inequality. All poverty and inequality measures are based on per capita household disposable income. For inequality, we use the Gini coefficient and the Atkinson index with two levels of inequality aversion. Absolute poverty and extreme poverty are measured using national poverty and extreme poverty lines. We report the (extreme) poverty headcount (FGT0), the (extreme) poverty gap (FGT1) and the (extreme) poverty severity (FGT2). Tables A1–A5 in the Appendix provide detailed results of decompositions I and II for each subperiod.

In terms of income inequality measured by the Gini coefficient, we observe a drop in inequality (negative total change) in the first two subperiods, followed by a slight increase between 2014 and 2019. Then, the Gini coefficient increases by 2.6 percentage points (p.p.) during the pandemic, to finally drop by 3.8 points in the subperiod of the post-pandemic recovery. Throughout all subperiods, the "other effects" are the main contributor to changes in income inequality. Tax-benefit "policy effects" always have an inequality reducing effect, reinforcing the contribution of "other effects" between 2003 and 2014 and 2020 to 2022, and mitigating the negative contribution of changes in market income between 2014 and 2020. However, the contribution of tax-benefit reforms to changes in the Gini coefficient are significant only in the first subperiod, where the "policy effect" represents 24 % of the total change in the Gini coefficient (1.1 out of 4.6p.p.). This is the period characterized by the largest reforms to taxes and benefits, including the increased generosity of *Bono de Desarrollo Humano* which raised income at the bottom of the distribution and the increase progressivity of personal income tax which reduced income at the top (see Fig. 1). The pattern observed for the Gini coefficient is robust when inequality is measured by the Atkinson index for the two levels of inequality aversion considered. In the case of the Atkinson index with an inequality aversion parameter equal to 1, the contribution of tax-benefit reforms to changes in inequality is also significant between 2008 and 2014.

In terms of poverty, the pattern of total changes over time is similar to that of inequality. The poverty headcount (FGT0) decreased sharply between 2003 and 2014 –by 14.4 and 13.4p.p. in the first and second subperiods, respectively. It, then, increased slightly in the third subperiod, before a sharp increase (8.3p.p.) as a result of the COVID pandemic. Finally, the poverty headcount dropped during the post-pandemic recovery subperiod. The "policy effect" contributes significantly to reducing poverty in each subperiod between 2003 and 2020. Between 2003 and 2008, the "policy effect" represents 6.9 % of the total change in the poverty headcount (1 out of 14.4p.p.). For the subperiod 2008–14, the contribution of the "policy effect" decreases —though still reducing poverty— representing 4.5 % of the total change in poverty (0.6 out of 13.4p.p.). The more modest effect for this subperiod is explained by the type of reform to *Bono de Desarrollo Humano* observed between 2008 and

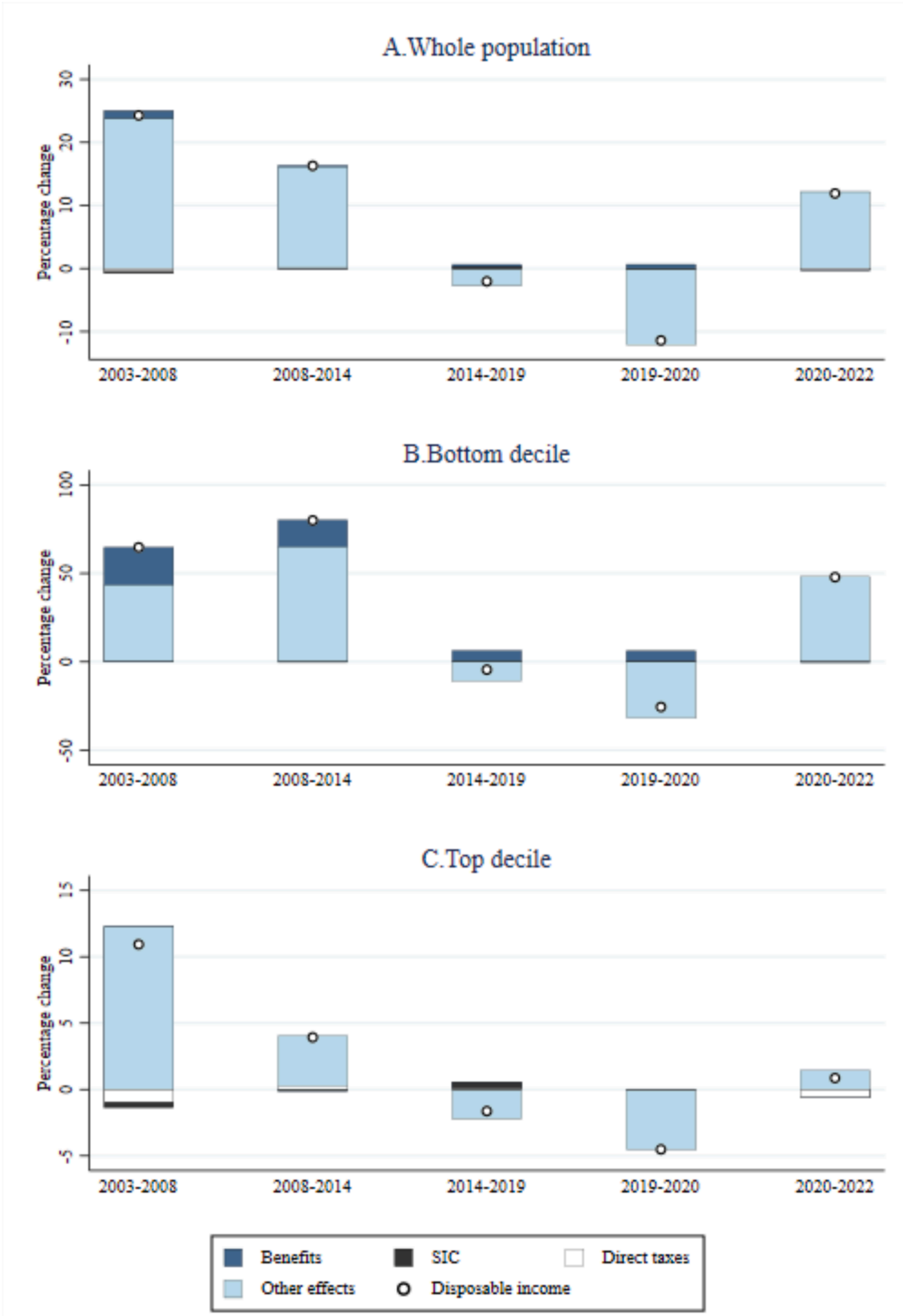

Fig. 1. Changes in mean per capita household disposable income.

2014. On one hand, the amount of the transfer increased, which contributes to reducing poverty. On the other hand, coverage decreased, leading to an increase in poverty. The prevailing effect is that of the increased generosity.

For the subperiod 2014–19, policy changes mitigate the impact of "other effects" on changes in poverty by 0.8p.p. The increased contribution of the "policy effect" compared to the previous subperiod is explained by an increase in the coverage of *Bono de Desarrollo* and the introduction of a variable component to this transfer with additional payments for children of different ages. Between 2019 and 2020, the significant contribution of "policy effects" to mitigating the impact of the pandemic on poverty is due to the introduction of the COVID-related

Table 3
Decomposing the change in income inequality and poverty.

	2003–2008			2008–2014			2014–2019			2019–2020			2020–2022		
	Total change	Policy effect	Other effects	Total change	Policy effect	Other effects	Total change	Policy effect	Other effects	Total change	Policy effect	Other effects	Total change	Policy effect	Other effects
Inequality															
Gini	−4.6***	−1.1***	−3.4***	−5.7***	−0.5	−5.2***	0.8***	−0.3	1.1***	2.6***	−0.5	3.1***	−3.8***	−0.1	−3.7***
	(0.0041)	(0.0039)	(0.004)	(0.0031)	(0.003)	(0.003)	(0.0028)	(0.0029)	(0.0027)	(0.0032)	(0.0032)	(0.0030)	(0.0036)	(0.0036)	(0.0036)
Atkinson 0.5	−4.0***	−1.0**	−2.9***	−4.2***	−0.4	−3.8***	0.5***	−0.2	0.7***	2.4***	−0.2	2.6	−3.2***	−0.2	−3.0***
	(0.0041)	(0.0042)	(0.004)	(0.0035)	(0.003)	(0.004)	(0.0026)	(0.0025)	(0.0029)	(0.0029)	(0.0026)	(0.0046)	(0.0031)	(0.0032)	(0.0032)
Atkinson 1	−5.7***	−1.9***	−3.8***	−7.2***	−1.1***	−6.2***	1.1***	−0.6	1.7***	3.7***	−0.2	4.0***	−5.1***	−0.4*	−4.7***
	(0.0048)	(0.0045)	(0.005)	(0.0038)	(0.004)	(0.004)	(0.0031)	(0.0033)	(0.0031)	(0.0038)	(0.0038)	(0.0055)	(0.0042)	(0.0043)	(0.0043)
Poverty															
FGT0 (%)	−14.4***	−1.0***	−13.4***	−13.4***	−0.6***	−12.8***	2.1***	−0.8***	2.9***	8.3***	−1.0***	9.3***	−7.7***	0.2	−7.9***
	(0.0031)	(0.0029)	(0.003)	(0.0022)	(0.003)	(0.003)	(0.0021)	(0.0021)	(0.0022)	(0.0031)	(0.0028)	(0.0031)	(0.0034)	(0.0034)	(0.0034)
FGT1 (%)	−8.7***	−1.3***	−7.5***	−7.5***	−0.8***	−6.7***	1.1***	−0.6***	1.7***	4.0***	−0.7***	4.7***	−4.8***	0.0	−4.8***
	(0.0017)	(0.0017)	(0.002)	(0.0012)	(0.004)	(0.004)	(0.0010)	(0.004)	(0.0010)	(0.0015)	(0.0015)	(0.0020)	(0.0016)	(0.0025)	(0.0018)
FGT2 (%)	−6.0***	−1.2***	−4.8***	−5.0***	−0.7***	−4.3***	0.6***	−0.4***	1.0***	2.7***	−0.5***	3.2***	−3.4***	0.0	−3.5***
	(0.0014)	(0.0013)	(0.001)	(0.0009)	(0.012)	(0.006)	(0.0007)	(0.0007)	(0.0012)	(0.0007)	(0.0019)	(0.0018)	(0.0021)	(0.0026)	(0.0022)
Extreme poverty															
FGT0 (%)	−10.8***	−1.2***	−9.5***	−9.2***	−1.3***	−7.9***	1.4***	−0.5**	1.9***	4.9***	−0.9***	5.8***	−6.1***	0.0	−6.1***
	(0.0025)	(0.0024)	(0.002)	(0.0017)	(0.021)	(0.003)	(0.0014)	(0.0017)	(0.0012)	(0.0021)	(0.0021)	(0.0018)	(0.0023)	(0.0023)	(0.0017)
FGT1 (%)	−5.3***	−1.2***	−4.0***	−4.1***	−0.7***	−3.4***	0.3***	−0.4***	0.7***	2.0***	−0.4***	2.5***	−2.7***	0.0	−2.7***
	(0.0013)	(0.0013)	(0.001)	(0.0009)	(0.004)	(0.007)	(0.0007)	(0.0007)	(0.0007)	(0.0012)	(0.0014)	(0.0012)	(0.0012)	(0.0048)	(0.0012)
FGT2 (%)	−3.2***	−1.0***	−2.3***	−2.7***	−0.5***	−2.2***	0.2***	−0.2***	0.4***	1.8***	−0.4***	2.2***	−2.4***	0.0	−2.4***
	(0.0011)	(0.0011)	(0.006)	(0.0007)	(0.002)	(0.002)	(0.0007)	(0.007)	(0.0007)	(0.0048)	(0.0096)	(0.0049)	(0.0048)	(0.0037)	(0.0049)

Note: The table presents the results of the Shorrocks-Shapley decomposition. Poverty and inequality measures are based on per capita household disposable income. The Gini and Atkinson indices are multiplied by 100. National poverty and extreme poverty lines are used. Standard errors are reported in parenthesis and have been obtained using the STATA program DASP (Araar & Duclos 2007). ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.
Source: Authors' own calculation based on ECUAMOD.

Bono the Protección Familiar aimed at protecting vulnerable households during the pandemic. Finally, we observe no significant "policy effect" in the last subperiod. The latter is due to the fact that *Bono de Desarrollo Humano* was increased only marginally between 2020 and 2022 and at the same time *Bono the Protección Familiar* was abolished in 2022 (see Table 1). Table 3 shows similar patterns for the poverty gap (FGT1) and the poverty severity (FGT2), with a significant poverty reducing contribution of tax-benefit reforms between 2003 and 2020.

The findings regarding extreme poverty mirror those observed for poverty. The extreme poverty headcount declined by 10.8p.p. during the period 2003–2008, followed by a decrease of 9.2p.p. between 2008 and 2014. Extreme poverty increased slightly (1.4p.p.) during the period 2014–19, followed by a larger increase of 4.9p.p. due to the COVID pandemic. Finally, a decrease of 6.1p.p. was observed between 2020 and 2022. Similar to poverty, the main driver of changes in extreme poverty is the "other effects" component, primarily linked to changes in market income. Reforms to the *Bono de Desarrollo Humano*, captured in the "policy effects", consistently contribute to reducing the extreme poverty headcount in all subperiods between 2003 and 2020. In contrast to the impact on changes in the poverty headcount, *Bono de Desarrollo Humano* reforms during the 2008–14 subperiod have a more pronounced effect on reducing extreme poverty compared to the preceding subperiod. This is attributed to the fact that, for changes in extreme poverty, the reduction in the coverage of *Bono de Desarrollo Humano* has a lesser impact than the increase in the benefit amount. As it was the case for changes in poverty, we observe no effect of tax-benefit reforms on changes in the extreme poverty headcount in the last subperiod of analysis. Table 3 shows similar patterns across subperiods in terms of changes in the extreme poverty gap (FGT1) and the extreme poverty severity (FGT2).

5.3.1. *Potential behavioral responses*

Our decomposition results isolated the direct effect of tax-benefit reforms without accounting for potential behavioral responses to policy changes. Under our setting, such responses would be captured by the other effects together with changes in the market income distribution. In the short run –the case considered in most of our pairwise comparisons– and under no major tax-benefit reforms, we would expect behavioral effects to be small. However, in the case of major reforms, behavioral responses could be important.

In the context of middle-income countries, like Ecuador, the main margin on which individuals might react to tax-benefit reforms is informal employment. Evidence of informal employment responses to policy changes in Latin America is mixed and depends on the design of the policy considered. In the case of conditional cash transfer reforms, there is some evidence of disincentives to remain in formal employment (see Garganta and Gasparini, 2015 for Universal Child Allowance (*Asignación Universal por Hijo*) in Argentina; De Brauw et al., 2015 for *Bolsa Familia* in Brazil; and Bergolo and Cruces, 2021 for Familly Allowance (*Asignaciones Familiares*) in Uruguay). For Ecuador, Bosch and Schady (2019) show that *Bono de Desarrollo Humano* –the main cash transfer analyzed in this paper– had no effect on overall employment and only small effects on female transitions from formal to informal employment. Based on this evidence for Ecuador, the distributional impact of behavioral changes due to reforms to *Bono de Desarrollo Humano* might be limited, not only because behavioral responses are small but also because a potential drop in earnings upon entry to informal employment might be compensated (at least to some extent) by the increase in benefit amounts observed over our period of analysis leading to small effects on poverty and inequality. In the case of taxes and SIC, most studies in the region have focused on the impact of reforms to payroll taxes on formal employment and show mixed results. In Argentina and Chile, the evidence points to an absence of effects on employment of changes in payroll tax rates (Cruces et al., 2010; Gruber, 1997). However, a number of studies for Colombia show that the drop in payroll tax in 2012 had a significant and positive effect on formal employment (Morales and Medina, 2017; Antón, 2014; Fernandez and Villar, 2017; Bernal et al., 2017). For Ecuador, recent evidence by Bargain et al. (2024) point to a negative and significant effect of increased SIC and personal income tax on formal employment. Their results suggest large formalization costs for self-employed workers with low earnings due to increased SIC. The distributional impact of behavioral changes due to reforms in SIC and personal income tax in our study depend on the response by particular types of workers. If affiliated self-employed workers respond the most by moving to informal employment (i.e., non-affiliation to social security), the short-run impact might be an increase in their earnings as they would no longer be subject to social insurance payments. However, if responses are driven by transitions of formal employees to informal employment, they might be accompanied by drops in earnings as the minimum wage is not binding in informal employment.

The discussion provided in this section highlights the complexity of accounting for behavioral effects in our decomposition exercise. The distributional impact of such responses is particularly unclear in low- and middle-income countries due to the presence of informal employment. Further evidence on formal employment responses to changes in tax-benefit policies is needed, ideally considering heterogenous reactions across population subgroups. This remains an important avenue for future research.

6. Conclusions

Over the last two decades, Ecuador has experienced significant political, economic, and social changes that have shaped the evolution of income poverty and inequality in the country. Over this time, a number of reforms to direct taxes and cash transfer programs have been introduced by the government. From a policy perspective, it is crucial to assess the extent to which these reforms have been effective in reducing poverty and inequality.

This paper applies a decomposition based on counterfactual income distributions, by means of tax-benefit microsimulations, to quantify the direct contribution of tax-benefit reforms ("policy effect") to changes in income poverty and inequality over time, relative to the contribution of other factors ("other effects"). We focus on changes in mean income, poverty and inequality over five subperiods between 2003 and 2022. These subperiods are characterized by changes in market income and the introduction of several tax-benefit reforms.

Our results show that the tax-benefit reforms introduced in each subperiod between 2003 and 2020 contributed to the reduction of poverty and inequality in Ecuador, reinforcing the positive effect of changes in market income and other population factors in the subperiods between 2003 and 2014, and mitigating the negative effect of those factors in the subperiods between 2014 and 2020. Over the last subperiod of analysis (2020–22), the post-pandemic economic recovery was broadly due to an improvement of market income with an almost nil contribution of reforms to tax-benefit policies. *Bono de Desarrollo Humano*, the main cash transfer program in the country, has undergone several reforms over the period of analysis which have increased income at the bottom of the distribution and significantly contributed to the reduction of poverty and extreme poverty in all subperiods between 2003 and 2020. The effect of tax-benefit reforms on changes in the Gini coefficient have been more limited, and significant only in the first subperiod of analysis (2003–2008). The contribution of reforms to SIC and personal income tax to changes in the income distribution is limited. Reforms to the latter affect mainly the top income decile, due to the high exempted tax threshold, and contributed to changes in mean income of this group in the first and last subperiod of analysis, which were characterized by the introduction of reforms to increase the progressivity of this policy instrument.

Despite the positive contribution of tax-benefit reforms to reducing poverty and inequality in Ecuador, their role remains small compared to that of market income. As a result, changes in poverty and inequality remained mainly determined by changes in the economy that affect the labor market. This became more evident during the COVID-19 pandemic which also highlighted the problems of *Bono de Desarrollo Humano* whose eligibility is based on proxy-means-testing and cannot provide protection to non-eligible households in the event of job or earnings losses (Jara et al., 2022). In this sense, there is a need to rethink the design of tax-benefit systems in the country from a perspective of redistribution and poverty reduction. The limited role of personal income tax in reducing inequality should also be reconsidered in view of increasing fiscal capacity.

CRediT authorship contribution statement

H. Xavier Jara: Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Lourdes Montesdeoca:** Writing – review & editing, Validation, Formal analysis, Data curation. **María Gabriela Colmenarez:** Writing – review & editing, Validation, Resources, Formal analysis, Data curation. **Lorena Moreno:** Writing – review & editing, Validation, Resources, Formal analysis, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The results presented here are based on the tax-benefit microsimulation model for Ecuador in SOUTHMOD_A1.0. Models in the SOUTHMOD bundle are developed, maintained and managed by UNU-WIDER in collaboration with SASPRI (Southern African Social Policy Research Insights), the International Inequalities Institute at the London School of Economics and Political Science, and local partners in selected developing countries (Bolivia, Colombia, Ecuador, Ethiopia, Ghana, Mozambique, Peru, Rwanda, Mainland Tanzania, Uganda, Viet Nam, Zambia, and Zanzibar) in the scope of the SOUTHMOD project. The results presented here are based on EUROMOD version 3.6.2. Originally maintained, developed and managed by the Institute for Social and Economic Research (ISER), since 2021 EUROMOD is maintained, developed and managed by the Joint Research Centre (JRC) of the European Commission, in collaboration with EUROSTAT and national teams from the EU countries. We are indebted to the many people who have contributed to the development of SOUTHMOD and EUROMOD. ECUAMOD, the tax-benefit microsimulation model for Ecuador, in SOUTHMOD_A1.0 has data available for simulations in 2019 and 2020 based on ENEMDU and provides tax-benefit codes for policy years 2011 to 2022. Data and tax-benefit policies for years not available in SOUTHMOD_A1.0 were harmonized and coded by the authors. The results and their interpretation presented in this publication are solely the authors' responsibility.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.worlddev.2025.106976.

Data availability

Data will be made available on request.

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