The role of automatic stabilizers and emergency tax–benefit policies during the COVID-19 pandemic: evidence from Ecuador

H. Xavier Jara,[a] Lourdes Montesdeoca,[b] and Iva Tasseva[c]

[a] Corresponding author, email: hxjara@essex.ac.uk, Institute for Social and Economic Research, University of Essex, Colchester;

[b] Facultad Latinoamericana de Ciencias Sociales (FLACSO) Sede Ecuador, Quito, Ecuador;

[c] Department of Social Policy, London School of Economics and Political Science, London, UK

Abstract: By combining household survey data before and during the COVID-19 pandemic with detailed tax-benefit simulations, this paper quantifies the distributional effects of COVID-19 in Ecuador and the role of tax–benefit policies in mitigating the immediate impact of the economic shocks. Our results show a dramatic increase in income poverty and inequality between December 2019 and June 2020, the period when the economy was hit the hardest. 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%. The new Family Protection Grant provides income protection for the poorest income decile. However, overall tax–benefit policies do little to mitigate the losses in household incomes due to the pandemic. Informal workers, in particular, are left unprotected due to the lack of income support in the event of unemployment.

Key words: COVID-19, microsimulation, poverty, inequality, Ecuador

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1 Introduction

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 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 increases by 32.5pp (from 25.7% to 58.2%) and the extreme poverty headcount increases by 29.4 pp (from 9.2% to 38.6%).[1] 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 automatic 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.

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 labour 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 analysed 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. Section 2 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. Section 3 presents the methods and data. Section 4 is dedicated to the analysis of the empirical results. Finally, Section 5 concludes.

3 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).[2] 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% compared to 34.3% in the OECD (OECD et al. 2020).[3] 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.[4] The proxy means-test is based on a composite index comprising household characteristics and housing conditions. Families and individuals below a specific threshold of the index are eligible for the benefit, and certain conditionalities apply to families with children.[5] 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 to the general social security regime and paid SICs. The benefit amount consists of a fixed payment from a common 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, during the months of April to July 2020, the government reduced the waiting period to ten 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 5pp 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 instalments (i.e. US$60 each month).[6] 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 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 which fulfil 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, has 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 Methodology

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.

4.1 Data

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 contain information for 17,001 households and 59,183 individuals. Hereafter, we refer to this data as ENEMDU-2019.

ENEMDU-2019 contains information on labour and non-labour income, public pensions, cash transfers, 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.[7] 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 2011–12) (ANDA 2012).[8]

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 labour 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.[9] 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 labour market situation during the second quarter of 2020.

4.2 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.[10] ECUAMOD is a static model, i.e. tax–benefit simulations abstract from behavioural 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

programme 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.[11]

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.

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

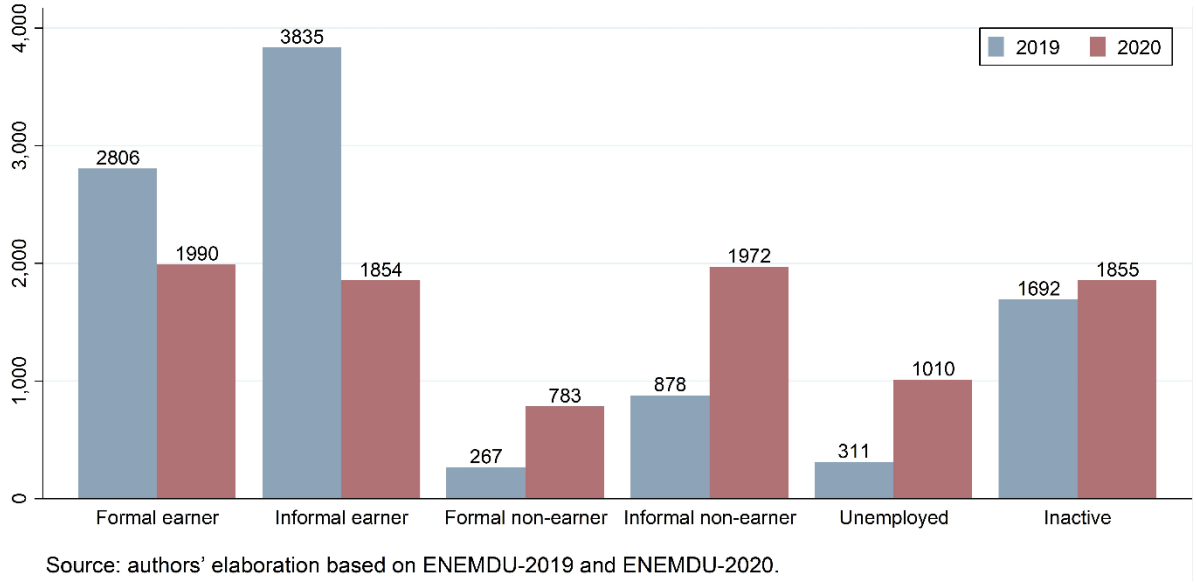
4.3 Simulating changes in employment and earnings due to COVID-19

This section presents the approach taken to derive our COVID scenario. We start the section 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 situation of the economy in May/June 2020 based on data from ENEMDU-2020.

Figure 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).[12] For those in work, we distinguish between those in formal and informal employment and those with positive earnings (earner) and zero earnings (non-earner).

Figure 1: Changes in the labour market between December 2019 and May/June 2020 (in thousands)

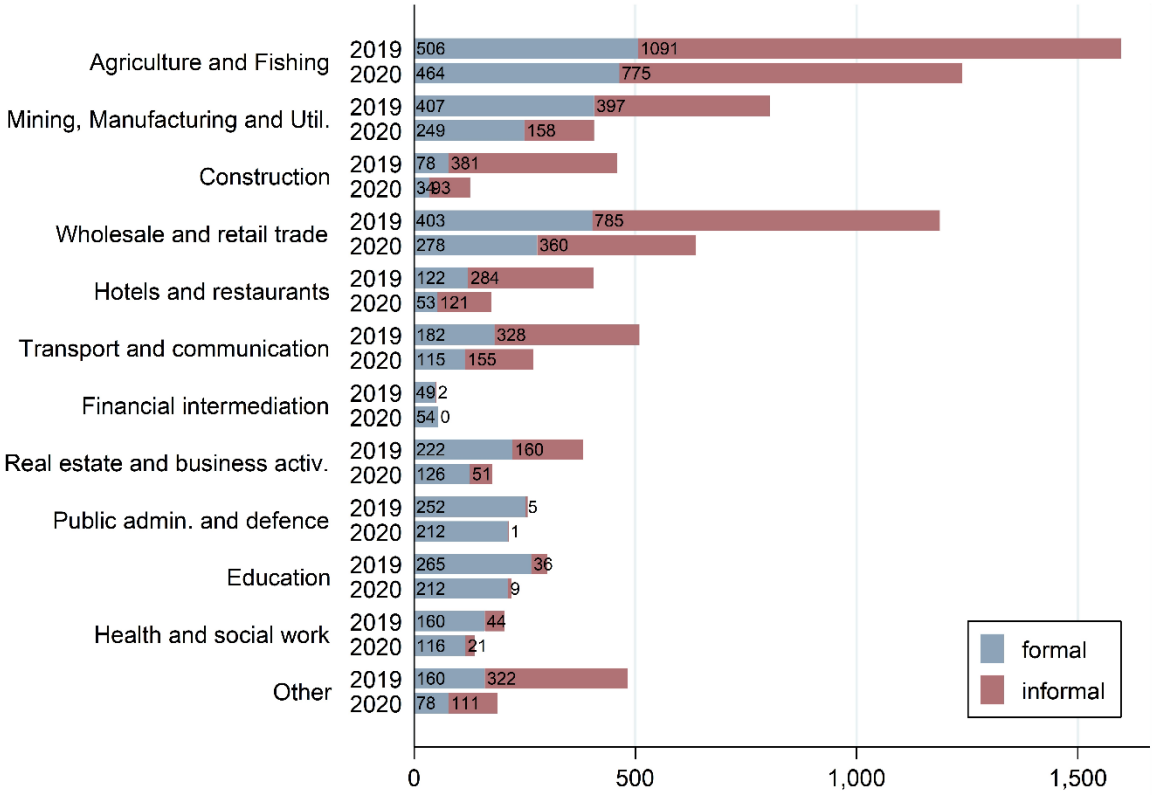


Source: authors' elaboration based on ENEMDU-2019 and ENEMDU-2020.

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 earners who remained in work lost their earnings.[13] 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%. Figure 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 Figure 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).

Figure 2: 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.

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.

Table 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
Agriculture and fishing	411.2	215.5	226.8	135.7	298.5	70.9	164.8	67.3
Mining, manufact. and utilities	702.4	550.0	316.6	255.6	631.2	284.5	214.2	135.1
Construction	567.3	870.1	361.5	407.6	483.7	515.1	175.5	153.0
Wholesale and retail trade	607.0	568.6	315.4	292.7	529.4	289.2	239.9	137.3
Hotels and restaurants	459.6	798.4	254.2	264.8	380.0	130.4	170.7	115.9
Transport and communication	791.1	569.4	414.1	372.9	725.0	221.6	312.4	156.2
Financial intermediation, real estate and business activities	646.5	741.3	302.8	396.8	605.3	354.4	352.6	258.6
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
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.

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.[14] Table 1 further shows the heterogenous effect of the pandemic on earnings across industries. The largest 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 defence, education, health, and social work (72% decrease), and informal self-employed workers in the construction sector (62% decrease).

Based on the information of the number of earners (Figure 2) and mean earnings per industry (Table 1), we adjust the data in ENEMDU-2019 to create microdata reflecting the labour 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. 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, zero otherwise. As regressors, we include sex, age, education dummies, a dummy for being married, a dummy for living in the rural area, and interactions between a female dummy and all other variables. Results from the probit estimation are presented in Table A1 in the 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. The addition of the random term means that we do not completely exclude 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 Figure 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 Appendix shows the descriptive statistics from the original and adjusted microdata. Finally, for those individuals that 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 1).[15] 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 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-crisis baseline scenario is given by:

$$\mathrm{B} = \mathrm{y} - \mathrm{t}(y) + \mathrm{b}(t, y) \quad (1)$$

Now, let y' represent gross market income under the crisis reflecting a scenario with higher unemployment and lower earnings, $t(y')$ denote income tax and SICs after the drop in earnings, and $b''(t, y')$ represent 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:

$$\mathrm{D} = \mathrm{y}' - \mathrm{t}(y') + \mathrm{b}''(t, y') \tag{2}$$

A welfare index, I, such as mean income or a measure of inequality or poverty, can be calculated on the basis of 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:

$$\Delta = I[\mathrm{y}' - \mathrm{t}(y') + \mathrm{b}''(t, y')] - I[\mathrm{y} - \mathrm{t}(y) + \mathrm{b}(t, y)] \tag{3}$$

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:

$$\Delta = \{I[\mathrm{y}' - \mathrm{t}(y') + \mathrm{b}''(t, y')] - I[\mathrm{y}' - \mathrm{t}(y') + \mathrm{b}(t, y')]\}\ \text{(policy changes)}$$

$$+ \{I[\mathrm{y}' - \mathrm{t}(y') + \mathrm{b}(t, y')] - I[\mathrm{y} - \mathrm{t}(y) + \mathrm{b}(t, y)]\}\ \text{(other effects)} \tag{4}$$

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:

$$\{I[\mathrm{y}' - \mathrm{t}(y') + \mathrm{b}''(t, y')] - I[\mathrm{y}' - \mathrm{t}(y') + \mathrm{b}(t, y')]\} \quad \text{(policy changes)}$$

$$+ \{I[\mathrm{y}'] - I[\mathrm{y}]\} \quad \text{(earnings changes)}$$

$$+ \{I[\mathrm{t}(y)] - I[\mathrm{t}(y')]\} \quad \text{(taxes and SICs as automatic stabilizers)}$$

$$+ \{I[\mathrm{b}(t, y')] - I[\mathrm{b}(t, y)]\} \quad \text{(benefits as automatic stabilizers)} \quad (5)$$

The "policy changes" component in formula (5) captures, in general, any tax-benefit reform introduced in the COVID scenario compared to the pre-COVID scenario. In practice, however, the only reform 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.

5 Empirical results

This section presents the results of the distributional effects of COVID-19 and the mitigating effect of tax–benefit policies in May/June 2020, relative to December 2019, in Ecuador. We first discuss the effects on household disposable income, disentangling changes due to earnings losses, automatic stabilizers, and newly implemented emergency policies, and 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.

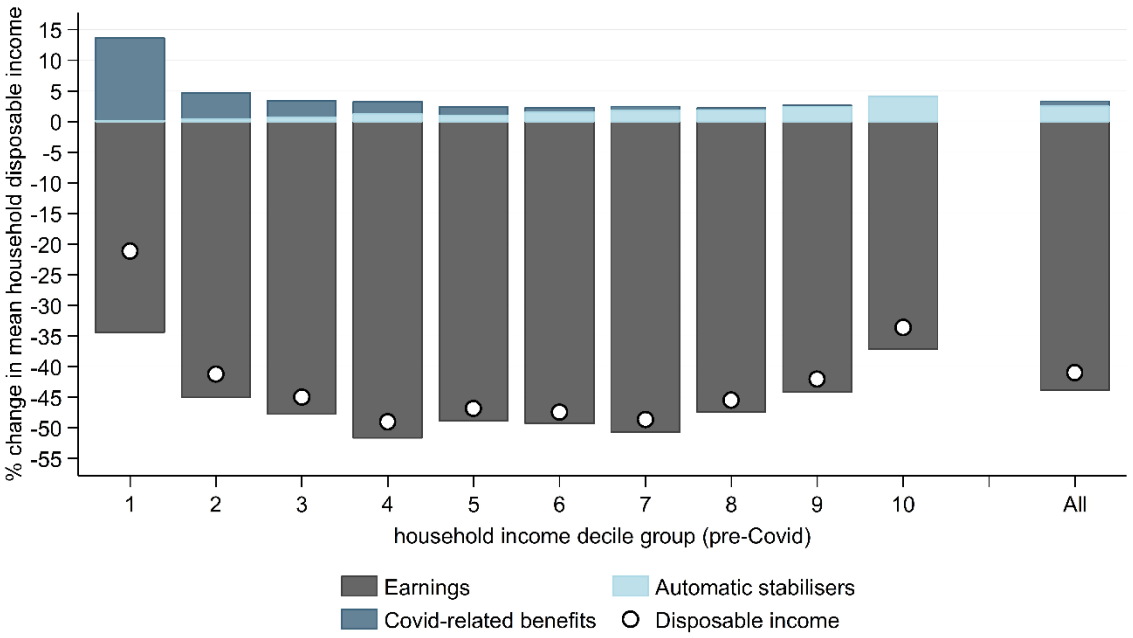
5.1 Changes in mean disposable income

Figure 3 presents the percentage change in mean per capita household disposable income by disposable income decile group and for 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 takes into account 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.

Figure 3: 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.

Figure 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 larger drops in earnings compared to those at the bottom and top. These results are in line 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 also varies across the income distribution. The contribution of automatic stabilizers increases with income and 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.

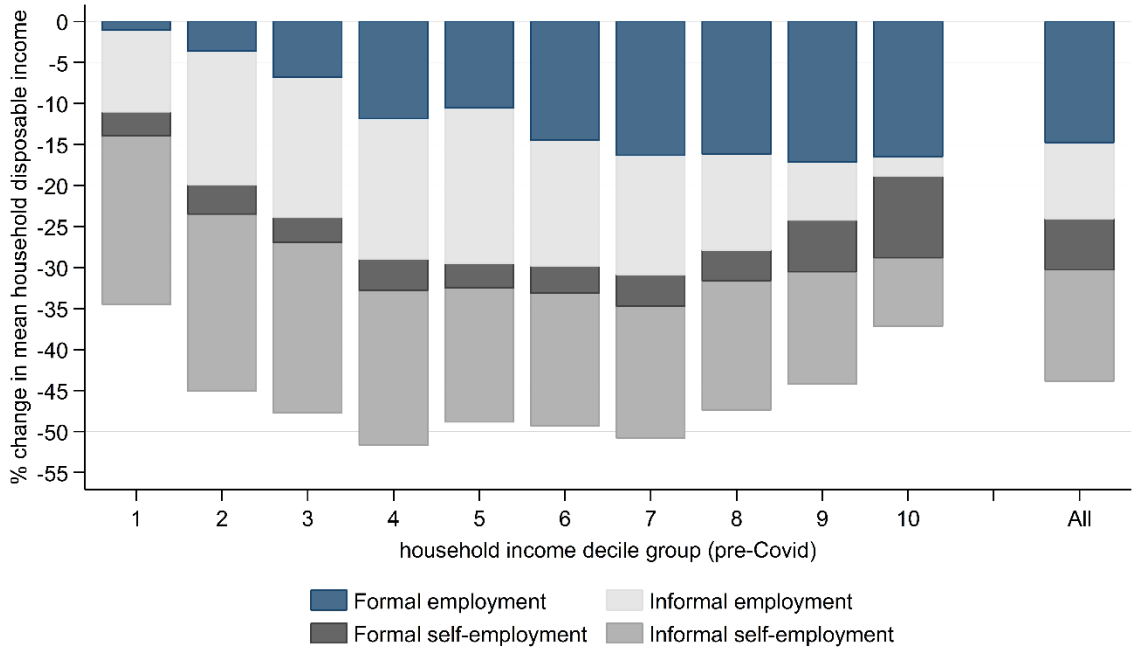
We now turn to the effect of specific income sources and tax–benefit instruments on changes in household disposable income. More precisely, we assess separately the effect of losses in employment versus self-employment earnings, and the contribution of taxes, SICs and benefits to changes in household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

Earnings losses. The contribution of employment and self-employment earnings to changes in household disposable income is depicted in Figure 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.

Figure 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.

Figure 4: Change in mean disposable income due to earnings losses

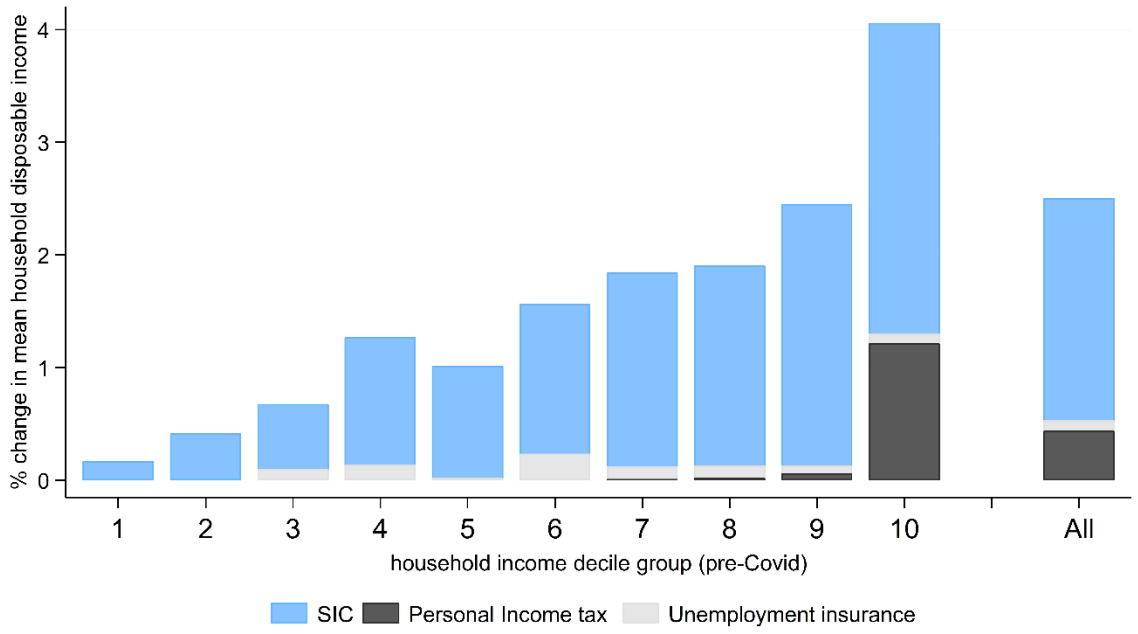


Note: the graph shows the impact of earnings losses on changes in household disposable income. Changes in income are based on per capita household disposable income.
Source: authors' elaboration using ECUAMOD and ENEMDU-2019.

Automatic stabilizers. The role of specific tax–benefit instruments as automatic stabilizers is presented in Figure 5. More precisely, the figure depicts the change in household disposable income due to automatic changes in personal income tax, SICs, and Unemployment Insurance benefit under our COVID scenario. On average, SICs provide the largest 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, where it accounts for a 2.8% increase in household disposable income. The small effect of SICs at the bottom of the distribution can be explained by the prevalence of informal employment, 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 larger 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).

Figure 5: Change in mean disposable income due to automatic stabilization of tax–benefit policies



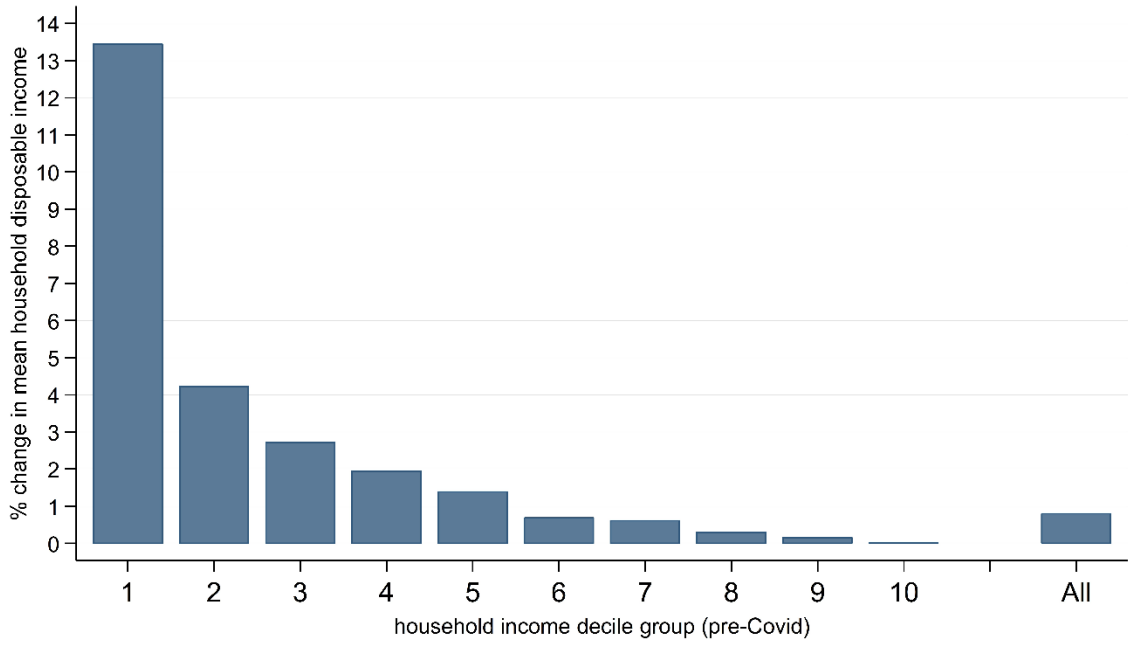
Note: the graph shows impact of automatic stabilizers on changes in household disposable income, i.e. the pre-COVID scenario versus the COVID scenario, without emergency measures. Changes in income are based on per capita household disposable income.
Source: authors' elaboration using ECUAMOD and ENEMDU-2019.

Unemployment Insurance also provides limited automatic stabilization and impacts mainly the middle of the distribution. 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 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 of time.

COVID-related policies. The contribution of COVID-related policies to changes in household disposable income is presented in Figure 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.

Figure 6: 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.

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.

5.2 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 at the individual level, based on per capita household disposable income.

The left-hand side (first three columns) of Table 2 present income inequality and poverty indicators under the pre-COVID scenario (A), the COVID scenario (B), and the total change between the two (A-B). Our results show that the COVID-19 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.

Table 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	.131***	-.011***	.142***
Theil	0.395	0.601	.206***	-.013***	.219***
Poverty					
FGTO (%)	25.672	58.224	32.552***	-.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***

Note: 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.

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.[16] As a result of the crisis, the poverty headcount increases substantially by 32.5pp, 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 29.4pp (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 not related to changes in policies 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 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 33.2pp (30.8pp) and an increase in the (extreme) poverty gap of 26pp (20.6pp). The COVID-related Family Protection Grant decreases poverty only modestly. It reduces the (extreme) poverty headcount by 0.64pp (1.4pp) and has a larger effect on the (extreme) poverty gap, accounting for a reduction of 1.6pp (1.9pp).

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 Appendix). The percentage of informal workers living in poor households is substantially higher already 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 hits household incomes of both formal and informal workers hard and the poverty rate goes 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).

6 Conclusion

In response to the COVID-19 outbreak, Latin American governments implemented lockdown measures and adopted a variety of policies aimed at mitigating the adverse effect of the economic shock on household income. However, unlike in developed economies, countries in Latin America lack fiscal capacity to implement large income protection programmes. 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 the changes in the income distribution in Ecuador between December 2019 and June 2020, the period 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 larger impact observed in the middle of the income distribution. Our decomposition shows that the emergency Family Protection Grant provides protection for the poorest income decile, although with a modest effect in reducing poverty. The effect of automatic stabilizers on household disposable incomes is larger than that of COVID-related benefits but with heterogenous effects across the income distribution. In particular, benefits play a limited role as automatic stabilizers in Ecuador for two important reasons. First, the design of the Human Development Transfer, the main 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 which does not depend on household income. Second, the Unemployment Insurance benefit provides protection in the event of unemployment only to individuals affiliated to 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 main 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, with the aim of increasing fiscal capacity to finance sustainable welfare and healthcare systems.

NOTES

[1] 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.

[2] For comparability, OECD estimates include only spending in pensions and income support to the working age population.

[3] Data for 2018 are used for LAC and 2017 data for the OECD average as the 2018 data are not available.

[4] Here, we consider all the sub-programmes 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.

[5] 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 enrol 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 centres at least twice per year for medical check-ups.

[6] US$60 is equivalent to 70.6% of the national poverty line in 2019.

[7] 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)

[8] 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 2011–12. Expenditure amounts in ENIGHUR 2011–12 are updated to 2019 values using the Consumer Price Index when imputed to ENEMDU 2019. 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.

[9] 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).

[10] 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).

[11] Market income is defined as the sum of employment and self-employment income, 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] Differences in the total number of individuals across categories in Figure 1 between 2019 and 2020 are explained by the exclusion of full-time 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.

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

[14] 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) self-employed workers experienced on average a 7% (10%) reduction in weekly hours of work.

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

[16] 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).

Conflict of interest. On behalf of all authors, the corresponding author states that there is no conflict of interest.

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Appendix

Table A1: Probit estimation of the probability of being unemployed in 2020

	Coef.	St. error
Constant	0.465**	(0.211)
Age	-0.0624***	(0.00717)
Age^2	0.000546***	(8.12e-05)
Married	-0.247***	(0.0460)
Low education	0.117	(0.161)
Middle education	0.295*	(0.162)
High education	0.310*	(0.165)
Rural area	-0.497***	(0.0451)
Female	0.759**	(0.335)
x Age	-0.00318	(0.0120)
x Age^2	-0.000121	(0.000139)
x Married	-0.0279	(0.0697)
x Low education	0.0442	(0.246)
x Middle education	-0.0695	(0.249)
x High education	-0.485*	(0.253)
x Rural area	0.0912	(0.0705)
Number of observations	11,440	

Note: the dependent variable is one if the person is unemployed, zero otherwise. The model is estimated on the sample of individuals in work or unemployment. Standard errors are shown in parenthesis. Significance levels indicated as * p < 0.1, ** p < 0.05, *** p < 0.01.

Source: authors' elaboration based on ENEMDU-2020.

Table A2: Sample characteristics of the original and adjusted microdata

	ENEMDU-2019		ENEMDU-2020		ENEMDU-2019 adjusted	
	Formal earner	Informal earner	Formal earner	Informal earner	Formal earner	Informal earner
Male	60.9	64.1	62.7	67.1	62.6	68.8
Female	39.1	35.9	37.3	32.9	37.4	31.2
Education:						
Primary or lower	31.7	57.0	28.2	52.2	29.5	59.0
Secondary	34.4	33.7	36.6	38.1	35.9	33.0
Tertiary	33.9	9.3	35.3	9.7	34.7	8.0
Employment status:						
Employee	76.5	40.3	77.9	35.5	73.7	36.6
Self-employed	23.5	59.7	22.1	64.5	26.3	63.4

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

Table A3: Decomposing the change in poverty by formality status.

	Pre-COVID scenario (A)	COVID scenario (B)	Total change (B)-(A)	Decomposition of total change	
				COVID-related policies effects	Other effects
Formal workers					
FGTO (%)	6.607	31.326	24.719***	-.492***	25.211***
FGT1 (%)	2.025	18.228	16.203***	-.621***	16.824***
Informal workers					
FGTO (%)	21.932	66.318	44.386***	-.822***	45.208***
FGT1 (%)	7.333	39.097	31.764***	-1.839***	33.604***

Note: poverty indicators are based on per capita household disposable income. The 2019 national poverty line of US$85.03 per month is 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.

Table A4: Decomposing the change in extreme poverty by formality status.

	Pre-COVID scenario (A)	COVID scenario (B)	Total change (B)-(A)	Decomposition of total change	
				COVID-related policies effects	Other effects
Formal workers					
FGTO (%)	1.545	19.169	17.624***	-.585***	18.209***
FGT1 (%)	0.634	12.757	12.123***	-.614***	12.738***
Informal workers					
FGTO (%)	6.596	43.807	37.211***	-1.800***	39.010***
FGT1 (%)	2.057	25.97	23.913***	-2.193***	26.105***

Note: poverty indicators are based on per capita household disposable income. The 2019 national extreme poverty line of US$47.92 per month is 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.