Top earners and earnings inequality during the COVID-19 pandemic: evidence from Ecuadorian administrative data

Olivier Bargain [a], Paul Carrillo-Maldonado [b,c] and H. Xavier Jara [d]

[a] Bordeaux Université and Institut Universitaire de France

[b] Universidad de las Américas

[c] Ecuadorian Political Economy Lab

[d] International Inequalities Institute, London School of Economics

Abstract. This paper aims to assess the extent to which top earners in Ecuador were affected by the COVID-19 crisis compared to other segments of the population. Our analysis makes use of administrative data covering the universe of individuals affiliated to social security between January 2019 and December 2021. Our approach consists of identifying the top 10%, 1% and 0.1% of earners in 2019 and analysing changes in their monthly earnings during the pandemic compared to the rest of the registered workforce. Our analysis shows that employment and earnings of registered workers fell during the second quarter of 2020. Interestingly, the only group experiencing a recovery in employment is that of workers who were not at the top of the pre-pandemic earnings distribution. Conditional on being in registered employment, mean earnings also dropped in the second quarter of 2020 across all earning groups (top and non-top). By the end of 2021, earnings recovered for non-top earners and in the top 10% group. However, earnings have remained below the pre-pandemic levels in the top 1% and top 0.1% groups. Finally, earning disparities across population subgroups - e.g., by gender, educational level and sector of work - have substantially increased among individuals who are not at the top of the earnings distribution

JEL: D13, H12, H24, J22

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Corresponding author: H. Xavier Jara, h.x.jara-tamayo@lse.ac.uk

1. Introduction

The COVID-19 pandemic has induced a global recession with heterogenous effects between and within countries. Potentially important variation in income distribution is therefore expected. Some of it may result from changes in employment and earnings during the pandemic, as well as from varying degree of state interventions.[1] A common trait of many studies assessing the distributional impact of the COVID-19 pandemic is that, due to data limitations, income during the pandemic has been either simulated or captured by rapidly deployed surveys (Almeida et al. 2021, Adams-Prassl et al. 2020, Bottan and Vera-Cossio 2020, Lastunen et al. 2021, Lustig al. 2021). In this sense, additional research exploiting alternative data sources is needed to complement and expand the evidence provided by early studies. In particular, survey data (and therefore simulated data based on household surveys) usually suffers from top income under-coverage in a way that strongly biases standard inequality estimates (e.g., Burkhauser et al., 2012, 2018). The problem extends during crisis years and makes that we lack evidence on the extent to which inequality changes and, in particular, to which high earners are specifically affected by the crisis compared to the rest of the population.

This limitation is true in general but particularly strong in developing countries. The number of low- or middle-income countries in which registers are available is extremely small. Despite a longstanding tradition in distributional studies in Latin American, the limited administrative data availability – or the lack of relevant covariates in administrative data – makes that research focused on top income groups has been relatively less frequent in this region. To date, there is available evidence for Argentina (Alvaredo, 2010); Colombia (Alvaredo and Londoño Velez, 2014); Brazil (Souza and Medeiros, 2015; Morgan, 2017); Chile (López et al., 2013; Fairfield and Jorratt De Luis, 2016; Flores et al., 2019) and Uruguay (Burdín et al., 2014b; De Rosa and Vilá, 2017).[2] The limited access to administrative data is unfortunate given the fact that it represents a huge opportunity to learn more about the impact of the pandemic across the earnings distribution, and in particular among top earners. Gaining a better idea of the most (and least) affected populations in times of crisis is important in view of designing policy reforms aimed at enhancing social protection by increasing fiscal capacity.

This paper aims to exploit administrative social security data to assess whether and to which extent top earners in Ecuador experienced changes in earnings during the pandemic compared to other segments of the population. For this, we identify the top 10%, 1% and 0.1% of earners in 2019 and analyse changes in their monthly earnings during the pandemic compared to other registered workers.[3] Our motivation to focus on top earners is twofold. First, recent studies have pointed to a larger impact of the pandemic at the bottom and middle of the income distribution in Latin America, which could exacerbate inequalities in the region (Avellaneda et al. 2021, Lustig et al. 2021).[4] Second, top earners are the main contributors to government revenue from personal income tax and social insurance contributions. Therefore, assessing the extent to which earnings

[1] The coverage and generosity of social protection measures has varied widely. In general, policies implemented in high income countries have managed to cushion to a large degree the impact of the pandemic on household incomes (Almeida et al. 2021, Clark et al. 2021). On the contrary, the role of tax-benefit policies in mitigating the socioeconomic effects of the pandemic in developing countries has been limited (Avellaneda et al. 2021, Lastunen et al. 2021, Lustig et al. 2021). In this sense, the COVID-19 outbreak is likely to have reinforced inequalities, in already highly unequal regions.

[2] Distributional analysis based on administrative data for other developing regions remains scarce with a few recent exceptions (e.g., Aye et al. 2020, Chatterjee et al. 2021, Jouste et al. 2020).

[3] Throughout the paper, we will refer to the workforce captured by the data as affiliated or registered employment.

[4] These studies have relied on simulated income distributions based on household survey data.

at the top were affected during the pandemic will allow us to study the budgetary implications of the crisis and discuss potential reforms to enhance the tax progressivity affecting the top of the distribution. The context of our research is different from recent evidence (e.g., Angelov and Waldestrom, 2021) since we focus on a middle-income country characterized by high levels of inequality even prior to the pandemic and a limited role of tax-benefit policies in providing income protection against economic shocks (Jara et al. 2021).

Our analysis provides several interesting findings. First, the Ecuadorian labour market already presented signs of a deterioration prior to the pandemic. Since January 2019, the number of earners affiliated to social security had been progressively declining in most industries, and only increasing in low-paid sectors. Second, registered employment fell during the second quarter of 2020 across all industries. However, there was no change in the pattern observed prior to the pandemic, with registered work continuing to increase in low-paid sectors and decreasing in other industries until the end of 2021. Third, the evolution of earnings varies across individuals at the very top of the distribution (top 1% and top 0.1% groups) and the rest of the registered population. In all income groups, we observe a drop in mean earnings during the second quarter of 2020. However, earnings recover in 2021 for individuals who are not at the top of the earnings distribution, whereas they remain at similar levels as those observed in 2020 in the top 1% and top 0.1% earning groups. Finally, our results show that earning disparities across certain population subgroups have exacerbated during the pandemic. In particular, the gap in earnings by gender, educational level, and sector of work (public vs private) have widened among individuals who do not belong to top earning groups.

Our research contributes to the current policy debate in two main respects. First, it provides evidence of the extent to which the pandemic has exacerbated inequalities in Ecuador, a country hardly hit by the COVID-19 crisis and where public policies provided limited protection against the socioeconomic effects of the pandemic. Understanding which population groups have been the most/least affected by the pandemic is essential to design social protection policies. Second, assessing the impact of the pandemic on top earners allows discussing potential progressive reforms to direct taxation in view of creating fiscal capacity to build a sustainable welfare system in the country. In fact, our results show that increasing the progressivity of personal income tax in Ecuador, through abolishing generous deductions from personal expenditures and taxing employment bonuses would enhance the redistributive role of fiscal policy in the country. To the best of our knowledge, this is one of the rare studies exploiting administrative data from a middle-income country and one of the very first to assess differences in the impact of COVID-19 across the earnings distribution and with a particularly accurate focus on the top.[5]

The paper is structured as follows. Section 2 describes the data and the methodology. Section 3 presents changes in employment, earnings and inequality between January 2019 and December 2020 for the whole population captured by social security records in Ecuador. Section 4 focuses on changes in earnings among top earners and across population subgroups (e.g., gender, education, etc.) in top groups. Section 5 concludes.

[5] To the best of our knowledge, only the study by Angelov and Waldestrom (2021) has exploited administrative data to study income losses across the earnings distribution during the COVID-19 pandemic. Their study makes use of administrative tax and income registers from Sweden and highlights that earnings' losses were concentrated at the bottom of the distribution, whereas earners in the middle and at the top of the distribution did not experience almost any earnings change during the pandemic.

2. Data and Methodology

Data. We use administrative data from the social security register in Ecuador covering the entire universe of workers affiliated to social security from January 2019 to December 2021. The data is structured as a panel with monthly information for all affiliated workers, meaning that we have a period of analysis spanning over 36 months. By construction, the data includes only individuals who pay social security contributions. Therefore, workers in informal employment are not capture by the data. Moreover, self-employed workers are not compulsory required to affiliate to social security by law. Thus, the data only include self-employed workers who have opted to affiliate to social security. As our research will focus on top earners, the absence of informal employees in the data does not represent an important limitation. However, it is possible that the data misses self-employed workers with high earnings who have opted not to be affiliated to social security. Throughout the paper, we will refer to the workforce captured by the data as affiliated or registered employment rather than formal employment due to the fact that affiliation to social security is optional for the self-employed. Our sample of analysis contains information for around 3,000,000 registered workers per month.

The data is exceptionally rich and contains information on earnings from employment and self-employment (for affiliated self-employed workers), days of work per month, sector of economic activity (industry codes), sector of employment (private vs public) and occupation descriptions. Additionally, the dataset contains sociodemographic variables such as age, gender, marital status and education. Our analysis will exploit this information to disaggregate the analysis by population subgroups. Table A1 in the Appendix provides descriptive statistics for our period of analysis.

Two important limitations of the data used in the analysis are worth highlighting. First, as previously mentioned, only individuals affiliated to social security are observed in the data. In the context of our analysis, this means that we have no information of individuals who exit the data at any point during the period of analysis. In particular, individuals might exit the data for a number of reasons such as retirement, death, unemployment, or because they move to unaffiliated self-employment or to informal employment (i.e., they continue to work as employees but are no longer affiliated to social security). Regarding retirement or death, we are only able to rule them out if the individual re-enters the data at a subsequent point over the period of analysis. However, we have no information of individuals while they are not part of the data. In particular, we do not know whether they are perceiving earnings from unaffiliated self-employment or informal employment. Second, detailed information about different sources of income is not available in the data. More precisely, only earnings related to the social security regime to which the individual is affiliated are recorded in the data. For instance, earnings from employment are recorded for individuals affiliated to the employee's social security regime, whereas self-employment earnings are recorded for individuals affiliated to the self-employed or voluntary regime. This means that we are unable to identify individuals who perceive multiple sources of income at the same time (employment and self-employment) neither can we observe their combined income. This is an important limitation for our study because receiving income from multiple sources has been shown to increase the probability of belonging to top income groups in Ecuador (Oliva et al. 2021). Despite these limitations, the data remains the best source of information to study the month-by-month evolution of earnings at the top of the distribution during the COVID-19 pandemic.

Methodology. Our analysis follows the growing literature on top incomes based on administrative data (Piketty 2001; Atkinson 2005; Piketty and Atkinson 2007, 2010). First, we identify top earners based on total annual earnings in 2019 and we study their labour market trajectory and evolution

of their monthly earnings over the period of 2019-2021. More precisely, we will focus on three top groups: the top 10% (p90–100), top 1% (p99–100), and top 0.1% (p99.9–100) of earners (based on total annual earnings in 2019). We will contrast the labour market trajectory and evolution of monthly earnings of top groups with that of the rest of the sample in the data. Note that throughout the study we refer to our groups as top earners or top income groups, irrespectively. However, only income from registered employment is considered, as other sources of income are not available in the data (e.g., income from capital).

The analysis will consist of four main parts. First, we assess overall changes in employment, earnings and inequality for the whole sample of workers present in social security records. Second, we provide a comprehensive characterisation of top and non-top earners by socioeconomic indicators available in the data. Such characterizations are still scarce in the literature due to the limited sociodemographic information available in administrative data (Atkinson et al. 2018; Boschini et al. 2020; Oliva et al. 2021; Ravaska 2018). Third, we analyse the labour market trajectory and evolution of monthly earnings of top and non-top groups over the period of 2019-2021. We will exploit the information in the data to look at within group (top vs non-top) differences in terms of socioeconomic characteristics. Finally, we discuss the role of social insurance contributions and personal income tax in reducing earning inequalities before and during the pandemic. The latter is aimed to provide a discussion about potential reforms to direct taxation aimed at increasing fiscal capacity in view of expanding social protection systems to face future economic crises.

3. Overall changes in employment, earnings and inequality

We start by studying how employment, earnings and inequality have evolved from January 2019 to December 2021. Our focus will be on the whole sample of earners affiliated to social security during the period of analysis. The analysis will distinguish employment and earning patterns across industries with two main aims. First, we will assess whether there were different pre-pandemic patterns in terms of the evolution of employment and earnings across industries. Second, we will study the extent to which different industries were affected during the pandemic and compare their recovery pattern (if any).

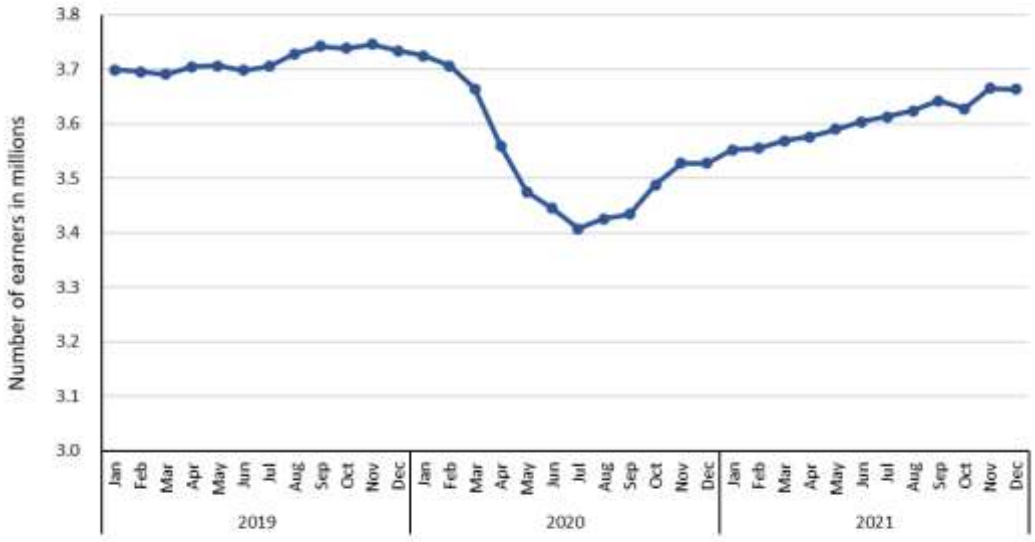
3.1. Changes in employment

Figure 1 shows the overall changes in employment for the whole sample of earners affiliated to social security over our period of analysis. Our results show little variation in the number of formal workers over the pre-pandemic period (January 2019 to February 2020). Employment drops sharply during the second quarter of 2020, when strict lockdown policies were introduced to contain the spread of COVID-19. From February 2020 to July 2020, the number of registered earners fell by 8.1 per cent. As lockdown measures were progressively lifted, employment started recovering. By the end of 2020, employment remained 4.8 per cent lower than in February of the same year. Then, employment continued recovering progressively until the end of 2021, when it almost reaches pre-pandemic levels (1 per cent lower than in February 2020).

To complement the analysis of the evolution of employment over our period of analysis, Figure A1 in the Appendix shows how the number of earners not affiliated to social security changed between January 2019 and December 2021 based on household survey data from the National Survey of Employment, Unemployment and Underemployment (ENEMDU). The figure shows that the number of unaffiliated earners had been increasing prior to the pandemic. During the

second quarter of 2020, the number of unaffiliated earners drops dramatically by 52 per cent. However, unregistered employment fully recovers by the end of 2020 and continues to increase throughout 2021.

Figure 1. Number of earners affiliated to social security (2019-2021)



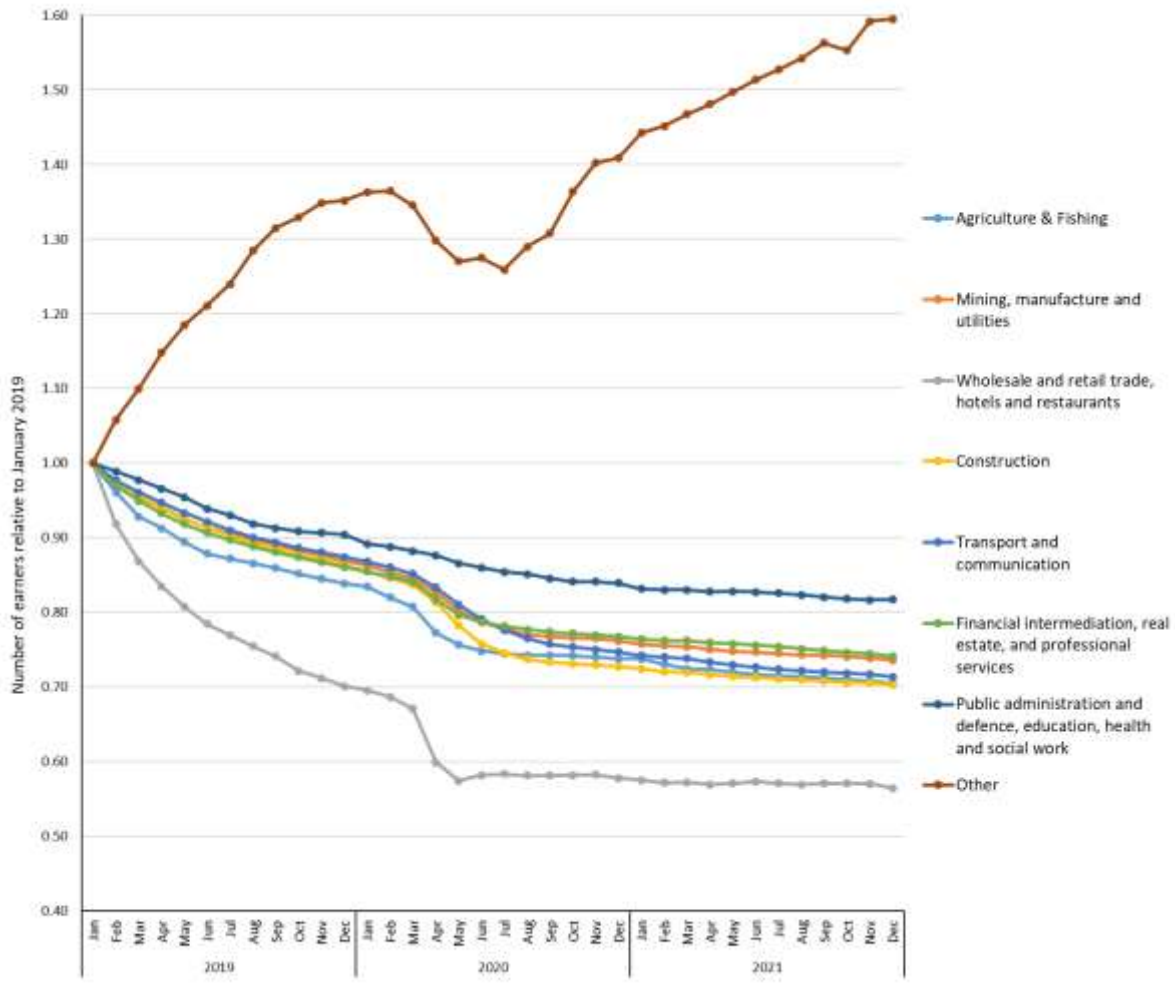
Source: Authors' elaboration based on social security records

The overall changes in registered employment presented in Figure 1 might hide differences in employment patterns across industries prior and during the pandemic. For this reason, Figure 2 presents changes in employment by industries over our period of analysis. For ease of comparison, employment is expressed relative to the number of earners in January 2019.

The comparison of employment patterns across industries shows a number of interesting findings. First, prior to the pandemic, there was already a decreasing trend in the number of earners affiliated to social security in all industries, except those classified as 'other' services and activities. The decrease was the most pronounced among earners in the wholesale and retail trade sector, hotels and restaurants, where registered employment fell by 31 per cent between January 2019 and February 2020. The smallest decrease was observed among earners working in public administration and defence, education, health and social work, representing a 11 per cent drop in employment. On the contrary, we observe a large increase of 36 per cent in the number of earners classified as working under 'other' sectors and activities during the pre-pandemic period. This category includes arts and entertainment activities, service activities such as equipment hiring services, work in associations or organizations (e.g., political or religious), cleaning and repair services, domestic services, and activities of extra-territorial organizations. In January 2019, this category represented 29 per cent of all earners, whereas it increased to 39.8 per cent in February 2020. This compositional change of the affiliated workforce represents a deterioration of labour market conditions during the pre-pandemic period, as workers in the category of other services and activities have on average lower earnings than in other industries (see Figure 4 below).[6]

[6] Labour market conditions in Ecuador have worsened since 2015 as a result of the drop in commodity prices, from which the Ecuadorian economy is dependent. Over the period 2015-2019, the country has lived a process of economic slowdown, with an average growth of 0.52% (World Bank 2022)

Figure 2. Number of earners affiliated to social security by industry (2019-2021)



Source: Authors' elaboration based on social security records

Second, in all industries, there is a negative impact on employment during the months of March to June 2020 as a result of the lockdown policies implemented by the government. However, the extent to which employment is affected varies across industries. In all industries where employment was decreasing prior to the pandemic, the drop in employment accelerated during the lockdown. Between February 2020 and June 2020, the largest drop in employment was observed in wholesale and retail trade sector, hotels and restaurants with a 15 per cent decrease, whereas the smallest drop was observed in public administration and defence, education, health and social work (3 per cent). Employment classified under 'other' services and activities dropped by 7 per cent over the period of lockdown.

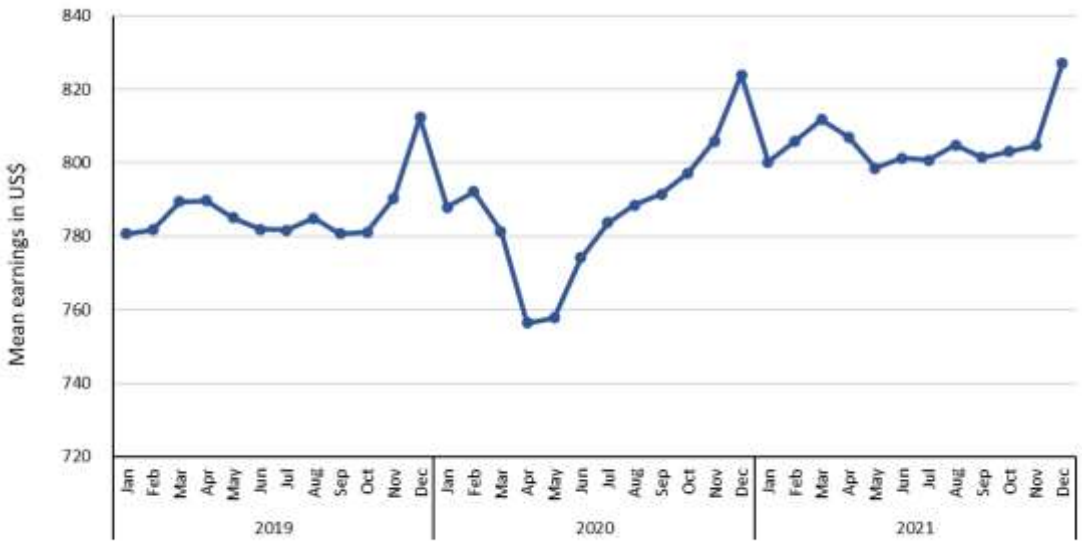
Third, the 'recovery' phase varies widely across industries. In particular, the overall recovery of employment observed from July 2020 to December 2021 (see Figure 1) seems to be explained by the strong increase in the number of earners working in the sector of 'other' services and activities, which already presented an increasing trend prior to the pandemic. Between July 2020 and December 2021, the employment classified under 'other' services and activities increased by 27

percent, representing 47 per cent of the total workforce affiliated to social security by the end of the period of analysis. For wholesale and retail trade, hotels and restaurants, we observe that employment stabilises after the period of lockdown, representing around 57 per cent on the level in January 2019. In all other industries, employment continues to fall until the end of the period of analysis, although at a lower rate than that experienced during the period of lockdown.

3.2. Changes in earnings

Next, we turn to the evolution of earnings over our period of analysis. Figure 3 presents mean monthly earnings among all earners (i.e., those with non-zero earnings) in 2019-21. All earnings are expressed in levels of December 2019 based on Consumer Price Index (CPI). The results show larger fluctuations in earnings than in employment over the period of analysis. In particular, the large peaks in earnings in the months of December are related to the payment of end-of-year bonuses, such as the 13th month payment. The smaller peaks around March and April are related to the payment of the 14th month payment.[7] Consistently with the evolution of employment, earnings also fall in the second quarter of 2020. Mean earnings fall by 4.3% in May 2020 compared to February 2020. Then, earnings recover sharply until the end of 2020 and surpass the pre-pandemic levels, to then stabilize during 2021.

Figure 3. Mean monthly earnings among all affiliated earners (2019-2021)

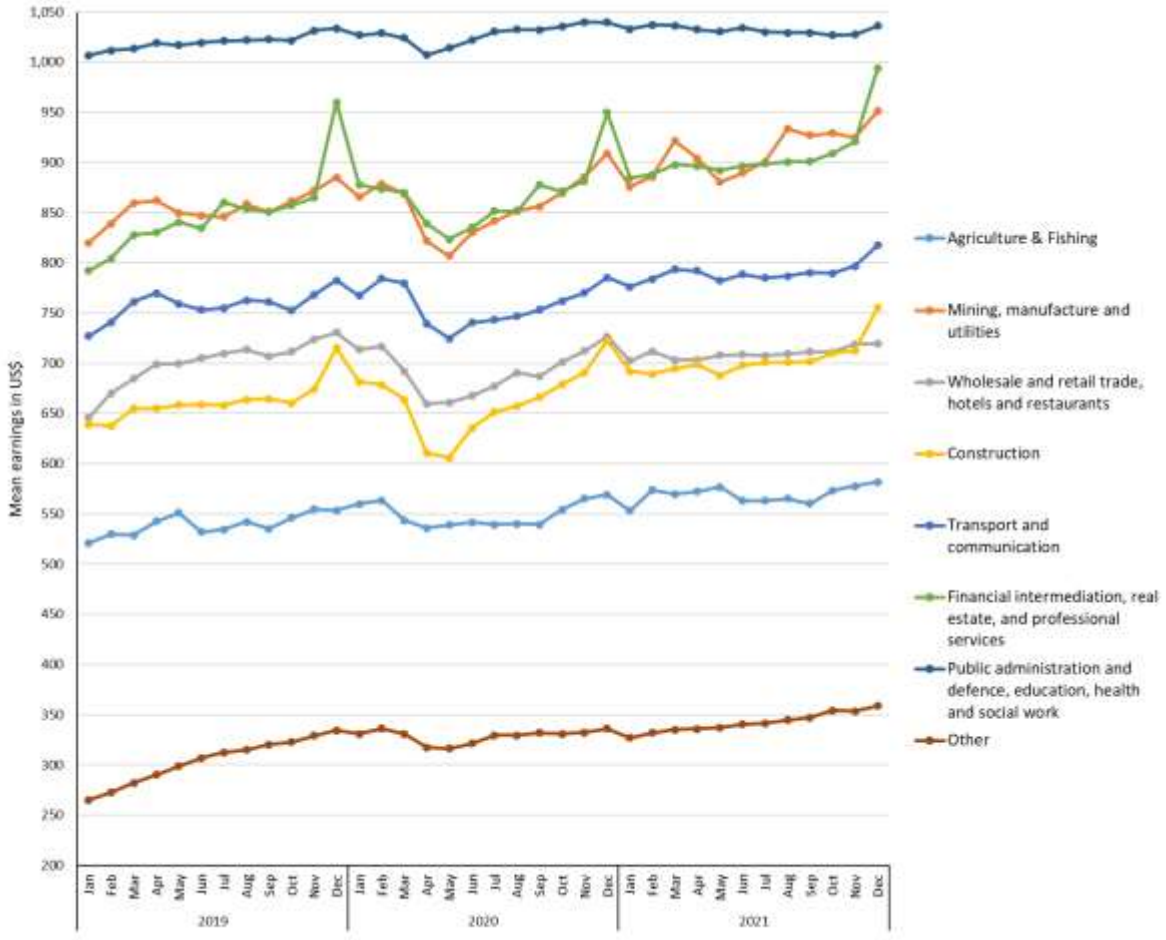


Note: All earnings are expressed in levels of December 2019 based on CPI.
Source: Authors' elaboration based on social security records

As it was the case for employment, the evolution of mean earnings among all registered earners might hide differences in levels and trends across industries. Therefore, Figure 4 depicts changes in mean monthly earnings by industry. The graph provides a number of interesting findings.

[7] The 13th month payment corresponds an additional full salary and is paid in the month of December each year. The 14th month pay corresponds to a payment equivalent to the national minimum wage, which in December 2019 was equal US$ 394. This payment needs to be made by mid-April each year. Additionally, profit sharing payments are usually made during the month of March.

Figure 4. Mean monthly earnings among all affiliated earners by industry (2019-2021)



Note: All earnings are expressed in levels of December 2019 based on CPI
Source: Authors' elaboration based on social security records

First, there are very large differences in mean earnings across industries and these differences have persisted throughout the pandemic. Mean earnings are on average 3.2 times higher in public administration and defence, education, health and social work (where mean earnings are the highest) than in other services and activities (where mean earnings are the lowest). This is particularly worrying because, as discussed before, prior the pandemic and after the lockdown period employment has been increasing in the low-paid sector of other services and activities, whereas a decrease in employment has been observed in other industries. The results point to a deterioration of the labour market which had already started before the pandemic and has exacerbated.

Second, during the pre-pandemic period (January 2019 to February2020), mean earnings increased slightly. In most industries, earnings increased between 6 and 11 percent, whereas they remained broadly stable for earners in working in public administration and defence, education, health and social work, and other services and activities. The only industry experiencing a large increase in earnings prior to the pandemic was that of other services and activities, with a 27 per cent increase.

Third, during the second quarter of 2020 mean earnings dropped in all industries although to different extents. Between February 2020 and May 2020, the largest drop was observed in the construction sector, representing a 10 per cent decrease in mean earnings. Important drops

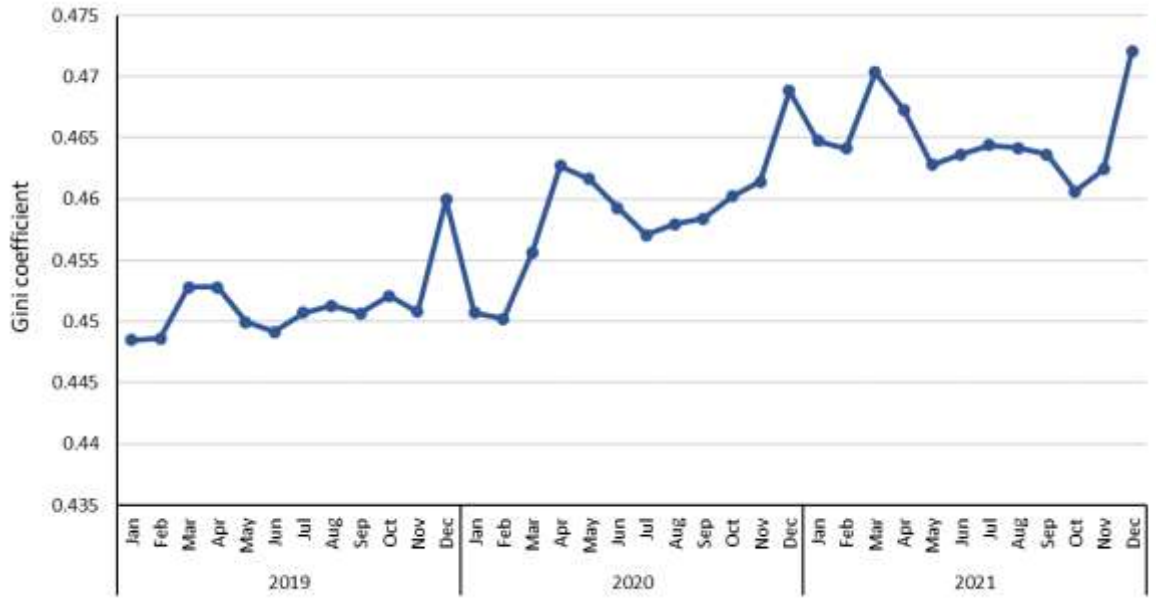
(around 8 per cent) were also experienced in the sectors of mining, manufacture and utilities, and wholesale and retail trade sector, hotels and restaurants. Earnings remained broadly stable for those in public administration and defence, education, health and social work.

Finally, as strict lockdown measures start to be progressively removed, mean earnings recover in all industries although to different extents. Between June 2020 and November 2021, mean earnings increase the most in the sector of construction (by 11 per cent), followed by mining, manufacture and utilities (by 11 per cent) and financial intermediation, real estate, and professional services (by 10 per cent). Note that we use November 2021 as reference because mean earnings in December 2021 are much higher due to the payment of end-of-year bonuses. However, the same industries are rank on top if December 2021 is compared to June 2020. The smallest increase (1 per cent) is observed for workers in public administration and defence, education, health and social work. Note that the earnings recovery observed after the period of lockdown might be explained by two factors. On the one hand, earning cuts were implemented during the period of lockdown across many industries. On the other hand, the increase in earnings might also reflect the fact that lower-paid individuals within each industry were more likely to lose their jobs during the pandemic, which would have increased mean earnings mechanically.

3.3. Changes in earnings inequality

We end this section looking at the evolution of earnings inequality over our period of analysis. Figure 5 shows changes in the Gini coefficient from monthly earnings. Note that the calculation is based only on individuals with non-zero earnings and it, therefore, does not capture the impact of employment losses or more precisely, exits from the social security register.

Figure 5. Gini coefficient from monthly earnings among all earners (2019-2021)



Source: Author's elaboration based on social security records

In all years, we observe peaks in inequality in the months of March/April and December, which are related to the 13th and 14th month payments. However, during the pandemic, rather than observing a peak in March/April, we observe an upward shift in inequality. In fact, the Gini coefficient increases by 2.8 per cent (from 0.45 to 0.463) from February to April 2020 and then remains higher on average compared to 2019 levels.

4. Top earners and the COVID-19 pandemic

This section now focuses on the evolution of employment and earnings distinguishing between top and non-top earning groups. As previously mentioned, the earning groups are defined based on their annual earnings from employment in 2019. This section starts with a description of the socioeconomic characteristics of top earners. Then, we analyse the labour market trajectory and evolution of monthly earnings of top and non-top groups over the period of 2019-2021, looking at differences across gender and sector of work.

4.1. Characteristics of top earners in Ecuador

This section describes the characteristic of top earners in 2019. To put things into perspective, the thresholds that identify the top 10% and top 1% in our data is broadly in line with the thresholds identifying the top 10% and top 1% of all earners (affiliated and not affiliated to social security) in household survey data from ENEMDU in December 2019. However, the threshold identifying the top 0.1% is larger in social security records, confirming problems related to top income under-coverage in survey data. Table 1 compares the characteristics of individuals who do not belong to the group of top earners (non-top) and those in the top 10%, top 1% and top 0.1% groups in 2019.

Table 1. Characteristics of top earners in 2019 (%)

	Non-top	Top 10%	Top 1%	Top 0.1%
Women	41.1	44.6	36.3	22.8
Employees	76.6	97.9	98.5	98.9
Self-employed	23.4	2.1	1.5	1.1
Public sector	5.7	47.4	38.1	2.5
Tertiary education	8.9	43.2	45.1	27
Agriculture & Fishing	6.6	2.4	2.4	4.5
Mining, manufacture and utilities	9.5	15.4	19.5	30.5
Wholesale and retail trade, hotels and restaurants	2.3	2.2	2.3	2.7
Construction	16.7	13.0	15.4	24.8
Transport and communication	4.8	5.9	6.5	8.8
Financial intermediation, real estate, and professional services	5.3	8.4	10.7	15.6
Public administration and defence, education, health and social work	7.7	46.8	39.3	8.2
Other	47.0	5.9	3.9	4.8

Note: Top income groups are defined based on total annual earnings in 2019
Source: Authors' elaboration based on social security records

In terms of gender, the percentage of women is slightly lower in the non-top group (41.1 percent) compared to the top 10% group (44.6 percent). The share of women decreases for higher income groups, representing 36.3 per cent and 22.8 per cent for the top 1% and top 0.1% groups, respectively. Despite the lack of detailed information about different sources of income, the gender composition of top earning groups is broadly in line with that of top income groups analysed by Oliva et al. (2021) for Ecuador based on tax records data.[8]

[8] Oliva et al. (2021) use administrative data from the Ecuadorian tax administration, which contain yearly information on income from employment, self-employment and capital income.

In terms of employment status, the data contains information about the employment status related to affiliation to social security. As such, the categories are mutually exclusive and, as previously mentioned, it is not possible to identify individuals who have combined sources of income, e.g., income from employment and self-employment. Table 1 shows that employees represent the largest employment category in all groups, with 76.6 per cent of employees in the non-top group and more than 97 per cent in top earning groups. As previously mentioned, the data does not allow to capture the fact that individuals with combined sources of income are more likely to be at the top of the income distribution as shown by Oliva et al. (2021).

Table 1 also shows differences in the presence of public sector workers across income groups. The prevalence of public sector workers is high in the top 10% and top 1% earning groups, representing 47.4 per cent and 38.1 per cent of earners, respectively. At the highest end of the earnings distribution (the top 0.1% group), only 2.5 per cent of individuals work in the public sector. The prevalence of public sector workers is also low among individuals who do not belong to top income groups, accounting for 5.7 per cent of earner.

There are also important differences between the non-top and top earning groups in terms of educational attainment. Among workers who do not belong to top earning groups, only 8.9 per cent have tertiary education, whereas the share amounts to 43.2 per cent and 45.1 per cent in the top 10% and top 1% groups, respectively. The share of workers with tertiary education decreases in the top 0.1% group, amounting to 27 per cent. The latter results are in line with findings by Oliva et al. (2021) who document a smaller prevalence of individual with tertiary education in the top 0.1% income group compared to the top 1% group, particularly among women. However, the share of workers with tertiary education in the top 0.1% group is much lower in our study than in that of Oliva et al. (2021)

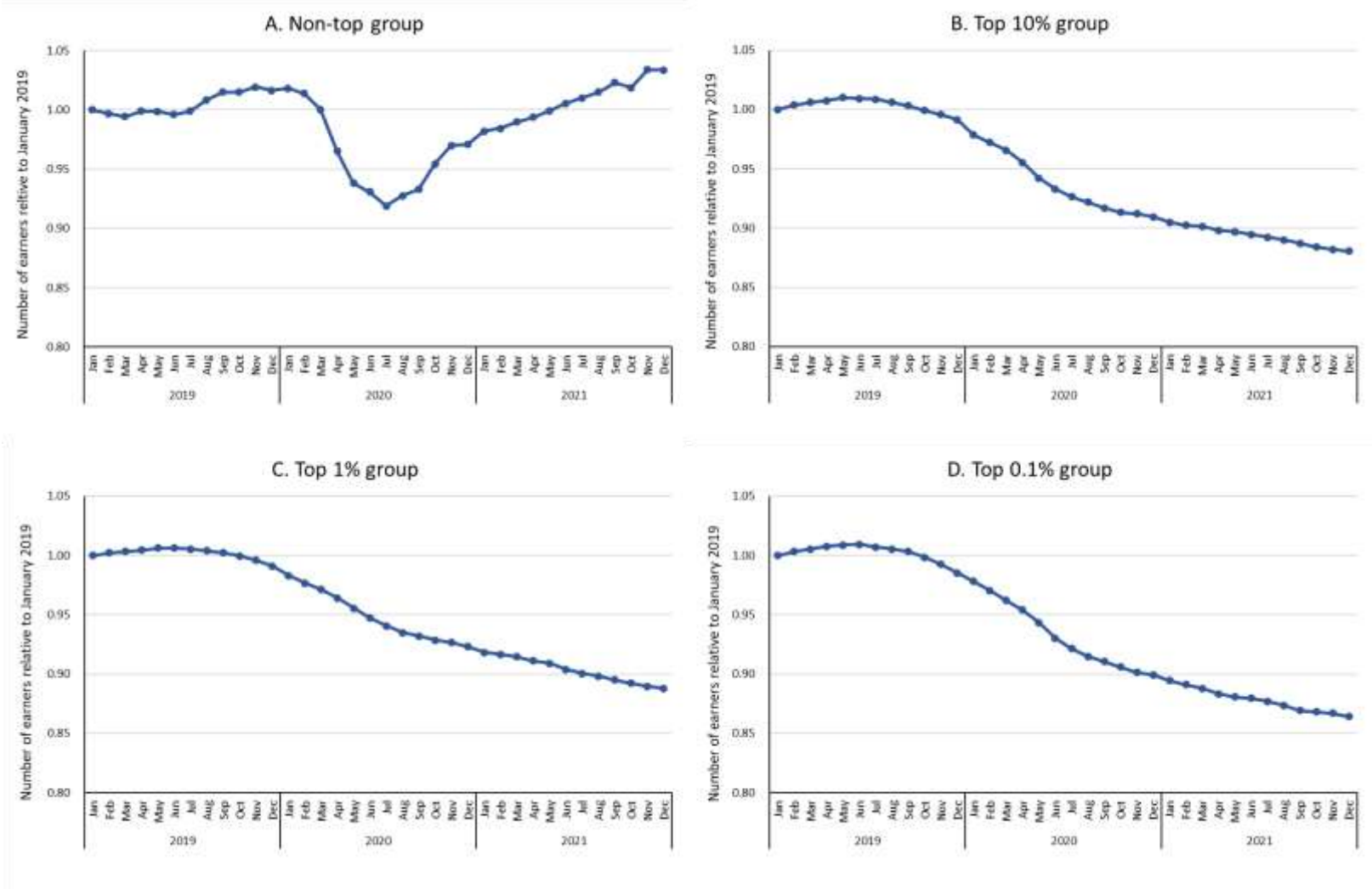
Finally, the industry composition of non-top and top earning groups varies widely. The largest share of earners in the non-top group (47 percent) work in industries classified as other services and activities. This is consistent with the results presented in the previous section which showed that mean earnings are the lowest for individuals working in this category. Moving to the top 10% and top 1% groups, the largest share of earners works in public administration and defence, education, health and social work. However, the share of earners in this sector drops in the top 0.1% group. In the latter group, the largest share of earners (30.5 percent) is found in mining, manufacturing and utilities, followed by construction (24.8 percent) and financial intermediation (15.6 percent).

4.2. Changes in employment and earnings among top earners during the pandemic

We now turn to the comparison of changes in employment and earnings across earning groups. We start by analysing differences in the evolution of employment and earnings among non-top earners and each of our top earning groups. Then, we turn to differences across population subgroups within each of these earning categories.

Figure 6 presents changes in employment among non-top earners (Panel A) and the top 10% (Panel B), top 1% (Panel C) and top 0.1% (Panel D) groups over our period of analysis. For ease of comparison, employment is expressed relative to the number of earners in January 2019 in each group.

Figure 6. Number of earners affiliated to social security by income groups (2019-2021)



Note: Top income groups are defined based on total annual earnings in 2019.
Source: Authors' elaboration based on social security records.

The results show that the evolution of employment follows a different pattern across earning groups over the period of analysis. For the non-top group, employment drops precisely in March 2020 when the period of strict lockdown due to the pandemic is introduced. In this group, the number of earners drops sharply (by 9.3 percent) from February 2020 to July 2020. Then, employment progressively recovers. By December 2020, the number of earners is 4.2 per cent lower than the pre-pandemic levels. However, by then end of 2021, employment among non-top earners is 2 per cent higher than in February 2020. The recovery in employment experienced among non-top earners is the result of the increased number of workers working in the category of other services and activities (see Figure 2 above).

By contrast, in all top earning groups, registered employment falls continuously until December 2021. Interestingly, a decrease in the number of workers was already observed prior to the pandemic in all top earning groups. The latter is in line with the drop in the number of workers affiliated to social security taking place in most industries during 2019 as depicted in Figure 2. In all three top groups, the fall in employment becomes steeper from March 2020 to July 2020. Then, employment continues decreasing but at a lower rate. The group that experiences the largest drop in employment is the top 0.1% group, with a 10.9 per cent decrease between February 2020 and December 2021.

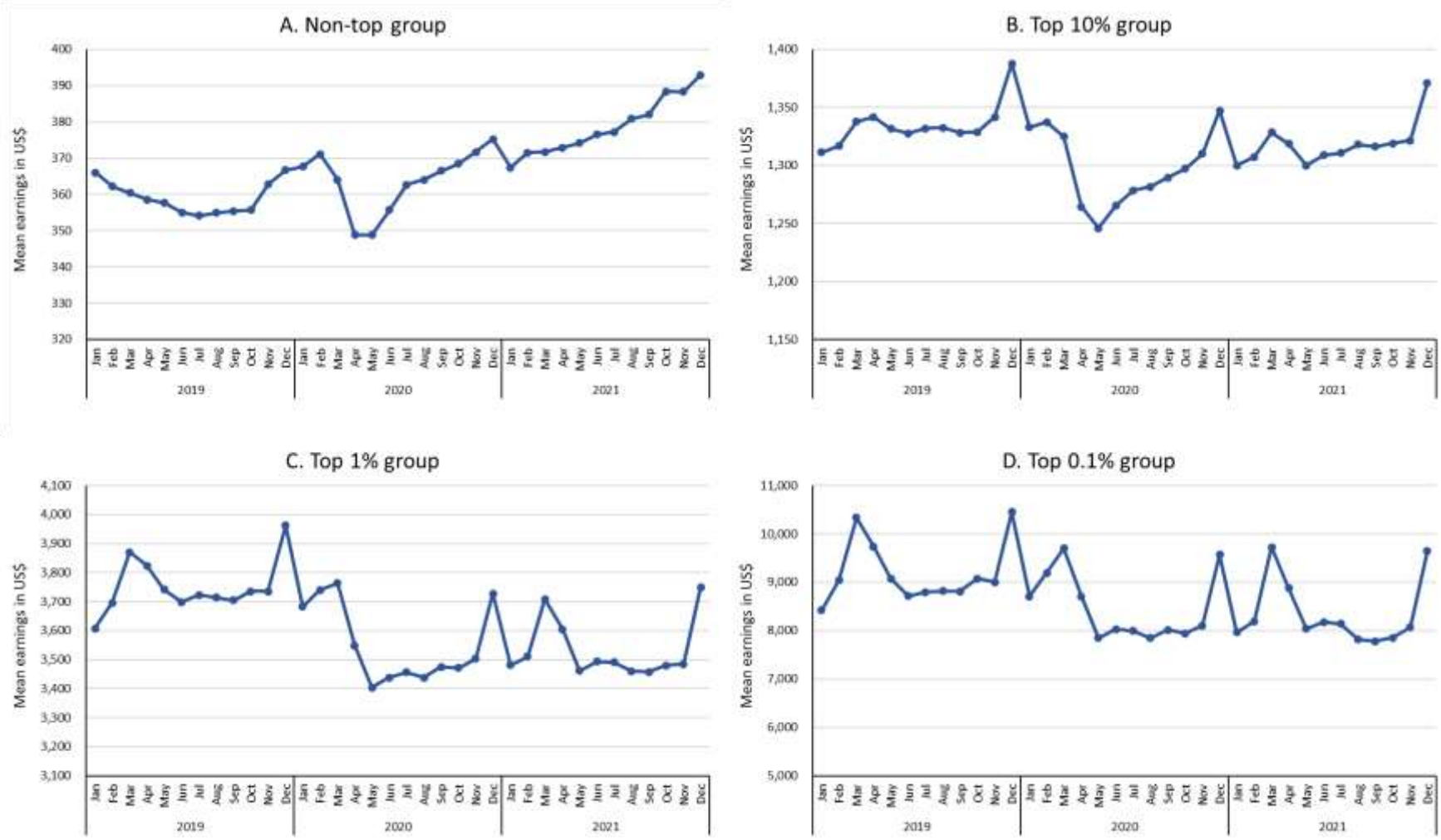
We now turn to the evolution of earnings across our earning groups. Figure 7 presents mean monthly earnings among registered earners in each of our groups. The results show a number of interesting findings.

First, the variation in earnings in the pre-pandemic period is more pronounced among individuals in the top 1% and top 0.1% groups. In particular, the peaks in earnings observed in the months of March and December are more prevalent in these groups, and are related to the payment of bonuses, as previously mentioned. The more pronounced peaks at the top of the earnings distribution, is reflected in higher levels of inequality in the months of March and December, as depicted by the changes in the Gini coefficient in Figure 5, above.

Second, in all groups we observe a sharp decline in mean earnings between March 2020 and May 2020, the period of strict national lockdown. However, the magnitude of the shock in earnings differs across groups. The drop in earnings is broadly similar among non-top earners and the top 10%, representing a decrease in earnings of 4.2 per cent and 5.9 per cent, respectively. The decrease is more pronounced at the very top. Earnings drop by 9.5 per cent in the top 1% group and by 19 per cent in the top 0.1% group.

Finally, the evolution of earnings after the second quarter of 2020 differs widely across groups. For the non-top group, we observed a progressive increase in mean earnings. Mean earnings in each month of 2021 are higher than their counterparts in 2019, the pre-pandemic year. For instance, mean earnings in December 2021 are 7.1 per cent higher than in December 2019. In the top 10% group, earnings recover but they do not increase compared to 2019. Mean earnings in each month of 2021 are slightly lower than those in their counterparts in 2019. Lastly, no actual recovery is observed in terms of mean earnings in the top 1% and top 0.1% groups. For the latter two groups, a month-to-month comparison shows that since March 2019 mean earnings remain consistently below the levels observed in 2019. In fact, mean monthly earnings in 2020 and 2021 are very similar for these higher income groups.

Figure 7. Mean earnings by income groups (2019-2021)



Note: Top income groups are defined based on total annual earnings in 2019. All earnings are expressed in levels of December 2019 based on CPI.
Source: Authors' elaboration based on social security records.

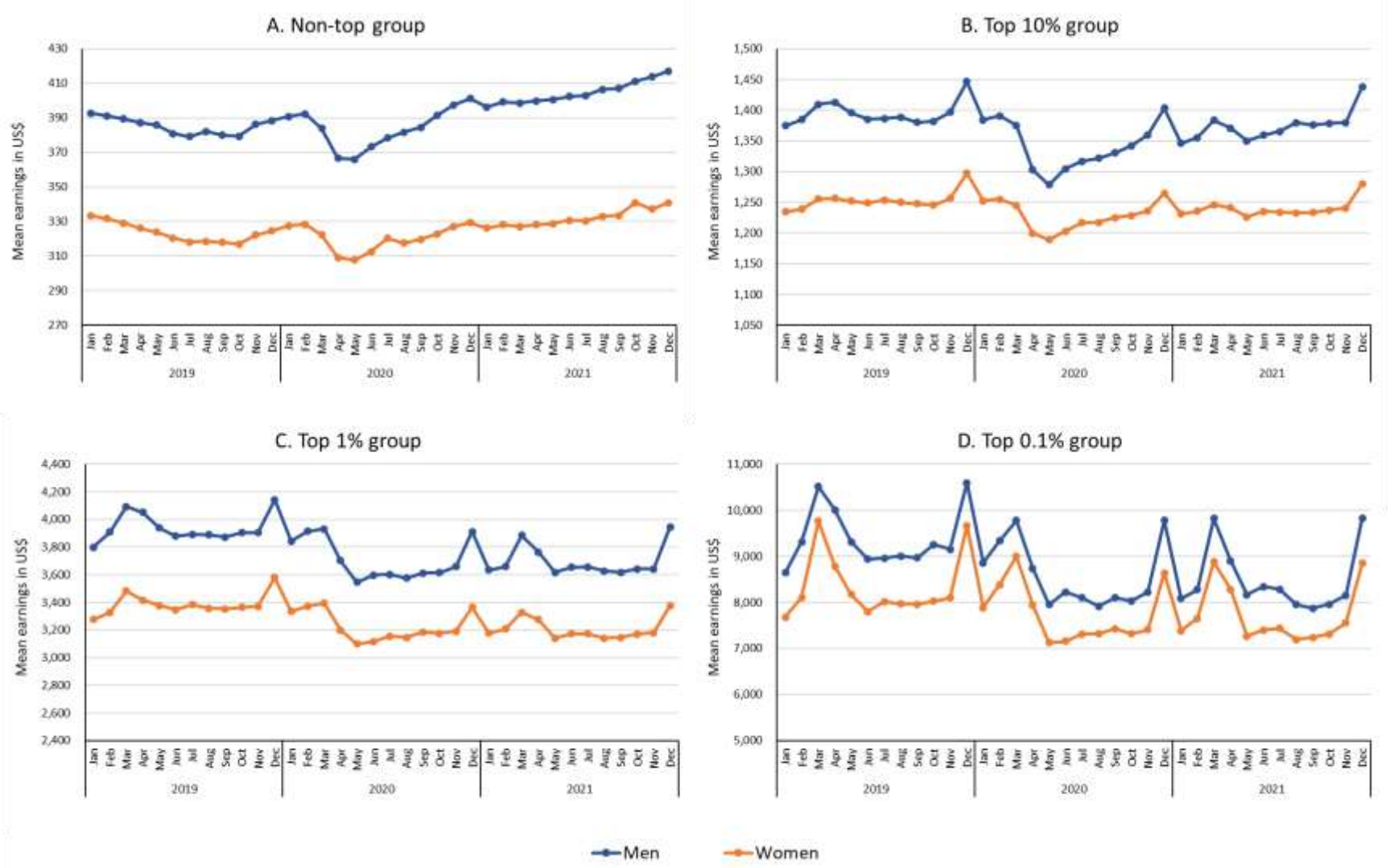
The remainder of this section discusses differences in the evolution of earnings by population subgroups, namely in terms of gender (men vs. women), sector of work (public vs. private) and educational attainment (non-tertiary vs. tertiary).

Figure 8 shows gender differences in the evolution of earnings across our four earning groups. A number of findings are worth highlighting. First, gender differences in earnings were already prevalent across all groups before the pandemic. Between January 2019 and February 2020, women's earnings were on average 16 per cent lower than men's earnings among non-top earners, 10 per cent lower in the top 10% group, 14 per cent lower in the top 1% group and 10 per cent lower in the top 0.1% group. During the second quarter of 2020, men and women's earnings fell in all groups, reaching their lowest levels in May 2020. Between February and May 2020, the drop in earnings is broadly similar across gender among non-top earners (6 per cent decrease) and in the top 0.1% group (15 per cent decrease). However, over this period, the drop in earnings is 3 percentage points and 1 percentage points larger for men than for women in the top 10% and top 1% groups, respectively. Finally, there are gender differences in terms of the evolution of earnings from May 2020 to the end of the period of analysis. Among non-top earners, women's earnings in December 2021 are 5 per cent higher than in December 2019, whereas men's earnings increase by 7.4 per cent. In the top 10% group, men's earnings at the end of the period reach almost the same level as in December 2019, whereas women's earnings remain 1.3 per cent lower. At the very top (top 1% and top 0.1%), men's earnings recover slightly more than women's, but for both groups, they remain lower at the end of 2021 compared to 2019. The evolution of earnings across gender during the pandemic translates into an increase of the gender gap in earnings among non-top earners, whereas at the very top (top 1% and top 0.1% groups) the gap slightly narrows.

Figure 9 turns to differences between private and public sector workers. Important differences are also observed between these two groups. First, earnings in the public sector are consistently higher than in the private sector in the group of non-top earners, whereas the opposite is observed in top earning groups. Second, earnings in the public sector increase throughout the pandemic among non-top earners, recover after the period of lockdown in the top 10% group, and remain broadly stable throughout the period of analysis in the top 1% group. Only in the top 0.1% group, we observe a decrease in public sector earnings, of around 14 per cent between February 2020 and December 2021. Third, larger changes in earnings are observed among private sector workers during the pandemic. In all income groups, a drop in earnings is observed between February 2020 and May 2020. Over this period, mean earnings drop by 7.4 per cent among non-top private earners and up to 14.8 per cent for those in the top 0.1% group. From May 2020 to end 2021, the evolution of private sector earnings varies across groups. For non-top earners, mean earnings in each month of 2021 are higher than their counterparts in 2019. For the top 10% group, mean earnings in 2021 recover compared to 2020 but remain lower than those in 2019. Lastly, in the top 1% and top 0.1% groups, mean earnings in 2021 remain as low as during the first year of the pandemic.

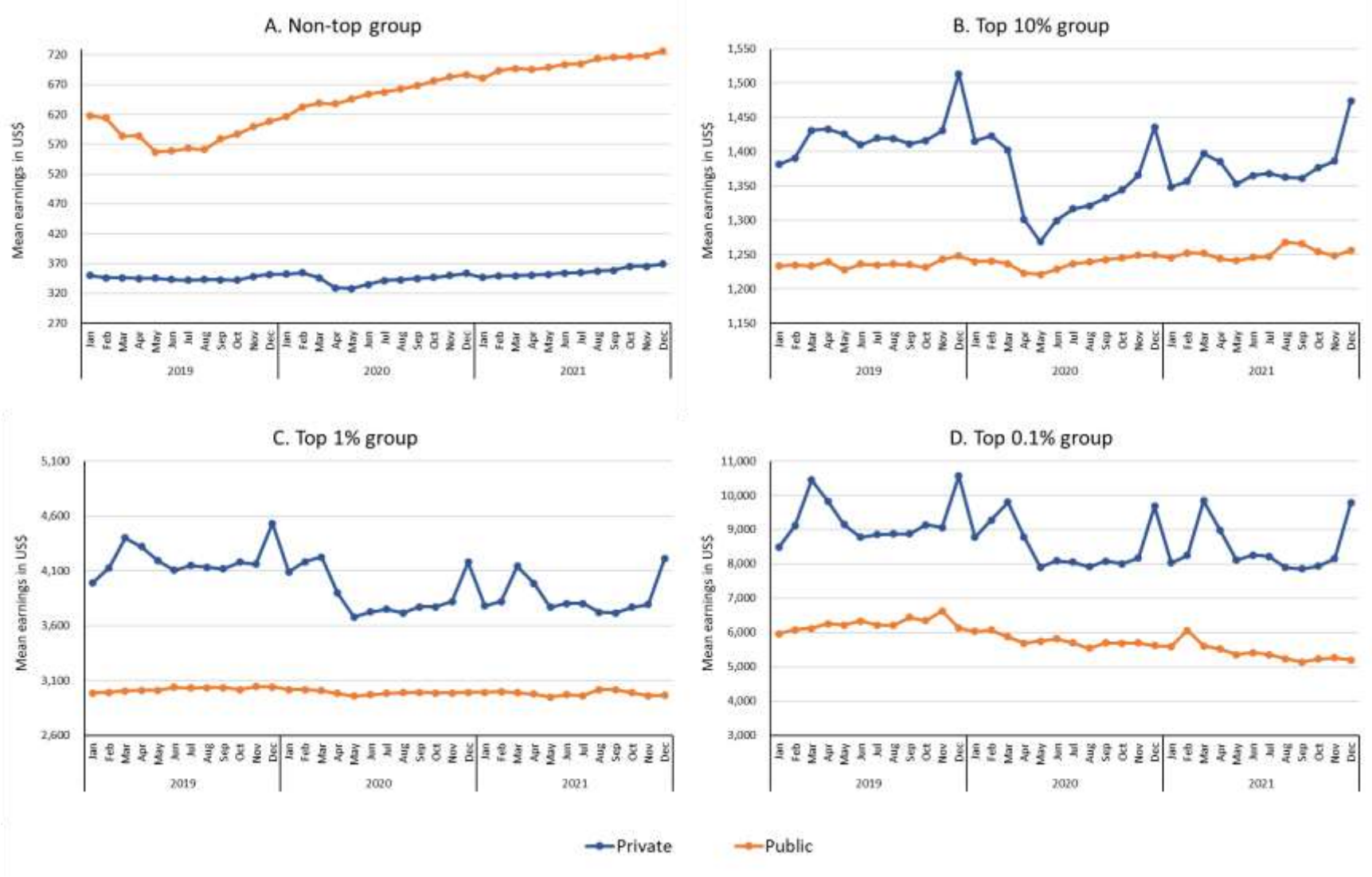
Finally, Figure 10 compares the evolution of earnings for registered workers with and without tertiary education. Interestingly, we observe that mean earnings are consistently higher for those with tertiary education than for those without tertiary education in the non-top and top 10% groups, whereas the opposite pattern is depicted in the top 1% and top 0.1% groups. In all income groups, we observe a drop in earnings during the second quarter of 2020. However, the extent to which earnings fall varies by educational attainment, and so does the evolution of earnings after the period of strict lockdown.

Figure 8. Mean earnings by income groups and gender (2019-2021)



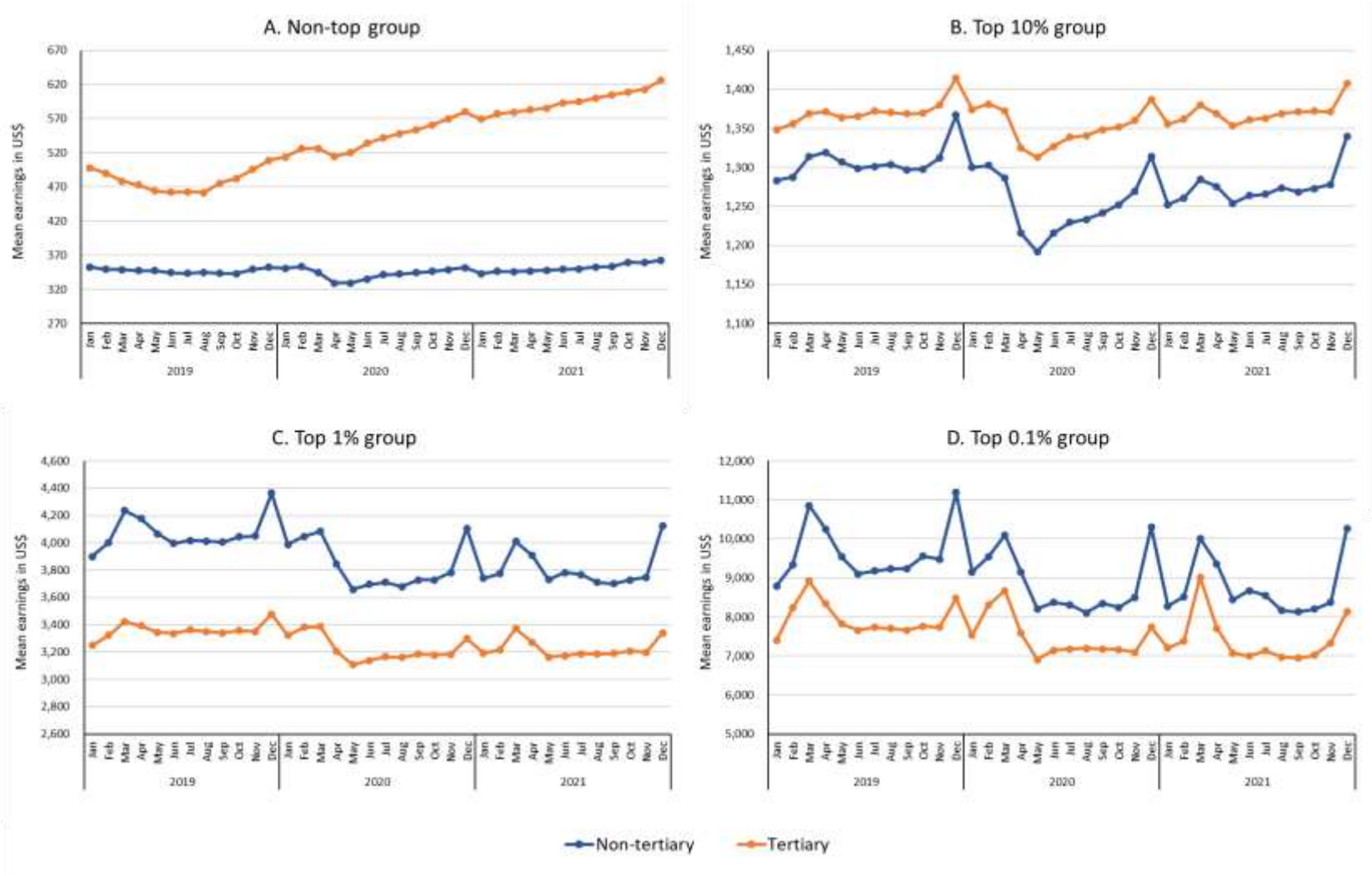
Note: Top income groups are defined based on total annual earnings in 2019. All earnings are expressed in levels of December 2019 based on CPI.
Source: Authors' elaboration based on social security records.

Figure 9. Mean earnings by top income groups and sector (2019-2021)



Note: Top income groups are defined based on total annual earnings in 2019. All earnings are expressed in levels of December 2019 based on CPI.
Source: Authors' elaboration based on social security records.

Figure 10. Mean earnings by income groups and education level (2019-2021)



Note: Top income groups defined based on total annual earnings in 2019. All earnings are expressed in levels of December 2019 based on CPI.
Source: Authors' elaboration based on social security records.

During the second quarter of 2020, mean earnings in the non-top group drop only by 1 per cent for those with tertiary education compared to a 7 per cent decrease for those without tertiary education. In the higher income groups, the drop in earnings is more pronounced for both groups. In the top 10% and top 1% groups, the drop in earnings is larger for those without tertiary education. The pattern is reversed in the top 0.1% group where earnings of those with tertiary education drop by 16.8 per cent compared to 14 per cent for the lower educated. After the period of lockdown, earnings recover and increase for both groups of non-top earners. However, the increase in earnings is much larger among non-top earners with tertiary education. By December 2021, mean earnings of workers with tertiary education in the non-top group are 1.7 times higher than for lower educated workers, compared to 1.4 times in December 2019. In the top 10% group, mean earnings of those with tertiary education in 2021 have reached the pre-pandemic levels, whereas they remain lower for those without tertiary education. Finally, at the very top (top 1% and top 0.1% groups), mean earnings in 2021 remain at the same levels as 2020, independently of the level of education.

5. Fiscal policy and earnings inequality

So far, our analysis has focused on the evolution of pre-tax earnings and has pointed to a deterioration of labour market conditions which had started taking place even prior to the pandemic. Moreover, the pandemic has increased earnings inequality and has reinforced disparities across population groups. This section, therefore, assesses the role played by fiscal policy, namely social insurance contributions (SIC) and personal income tax (PIT), in reducing earnings inequality. Looking at the role of fiscal policy in the context of the pandemic is also important to discuss potential reforms aimed at increasing fiscal capacity to strengthen social protection to face future crises.

Figure 11 compares pre- (blue) and post-tax (orange) mean earnings across top and non-top income groups. Average tax rates (including SIC and PIT) are around 9 per cent for non-top earners and mainly explained by SIC because individuals in this income group fall below the exempted tax threshold.[9] In fact, the exempted threshold is high in Ecuador (as in many Latin American countries), representing 2.4 times the annualised minimum wage. Average tax rates are around 12 per cent, 19.6 per cent and 36.5 per cent for the top 10%, top 1% and top 0.1% groups, respectively. Personal income tax has, therefore, a redistribute effect as it reduces income at the top. The redistributive effect of personal income tax is, however, modest. Previous research has shown that personal income tax decreases the Gini coefficient by around 0.01 points (Jara and Varela 2019).

The modest redistributive effect of tax policy in Ecuador is the result of several characteristics in the design of SIC and PIT. In terms of SIC, as previously mentioned, it is not compulsory for the self-employed to affiliate to social security. This might create incentives for self-employed workers with high earnings not to contribute to social security. In terms of PIT, three characteristics limit its redistributive role: (i) the high exempted threshold; (ii) exempting the 13th and 14th month payment from tax payments; and (iii) the presence of generous deductions for personal expenditures. The combination of these characteristics reduces the tax mass (with less individuals entering the tax brackets after deduction are considered) and also tax revenue (reducing the amount of tax collected among those who fall in the tax brackets). These aspects of the design of

[9] Two main social security regimes apply in Ecuador. On the one hand, the general regime applies to employees with rates of 9.45 per cent for most industries and a rate of 11.45 for the banking sector. On the other hand, the self-employed can opt to affiliate to the voluntary regime, with a rate of 17.6 per cent.

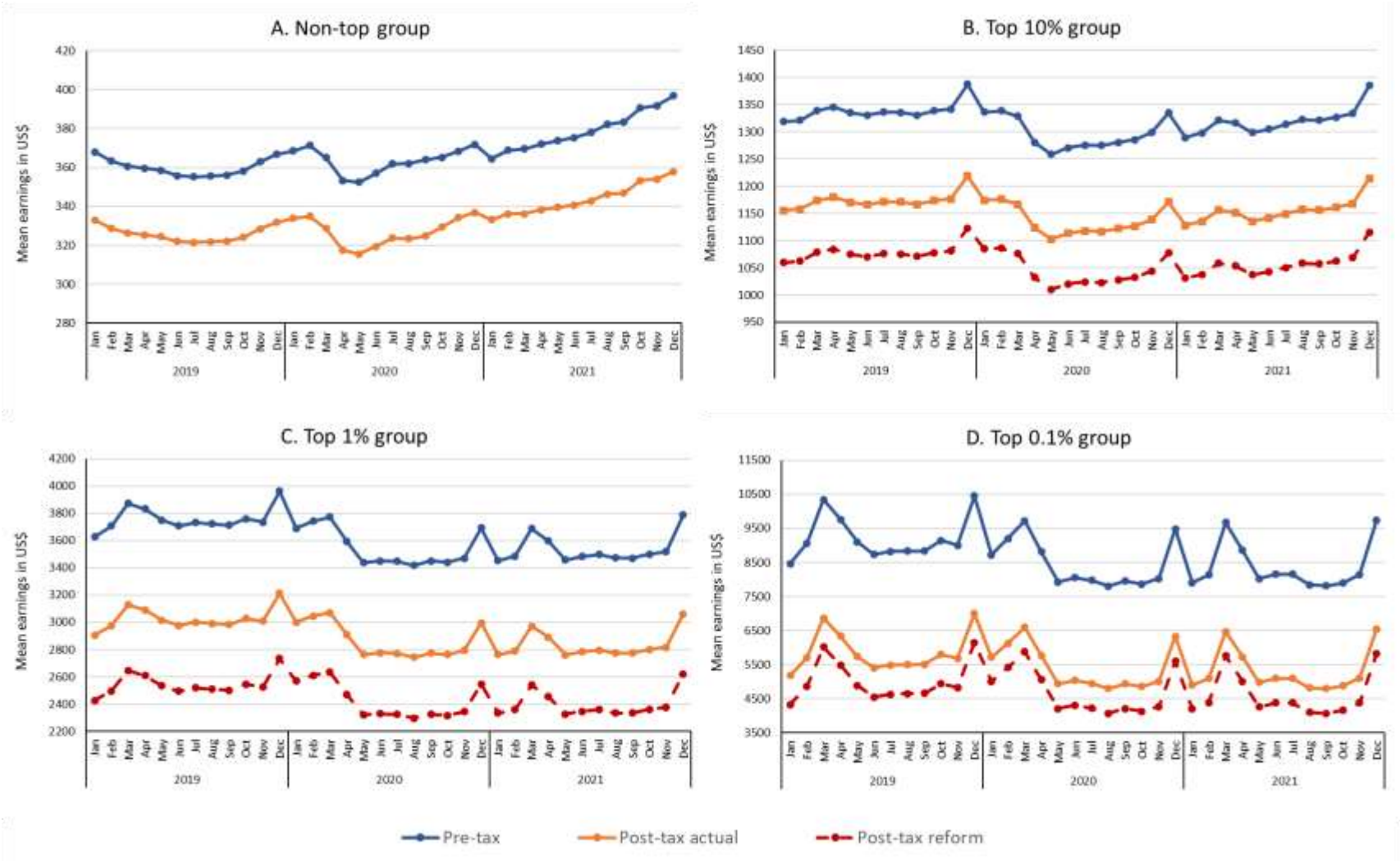
tax policy deserve attention as reforms aimed at increasing the progressivity of personal income tax could contribute to reducing inequality. Moreover, additional revenues from increased taxation could be used to improve welfare policies and protect households in the event of future economic shocks.

To illustrate the potential of personal income tax reforms to reduce inequality, we simulate the effect of a hypothetical reform. The counterfactual scenario consists of two changes. First, we include the 13th and 14th payments as part of taxable income. Second, we abolish all deductions for personal expenditures. Both changes should increase the progressivity and the redistributive role of personal income tax.

Figure 11 shows the effect of our hypothetical reform on mean earnings. The dashed line in Figure 11 shows post-tax mean earnings under our counterfactual scenario. In all top income groups, mean earnings decrease as a result of higher personal income tax payments. Under our hypothetical reform, average tax rates increase by 7.2 percentage points (pp.) in the top 10% group, 12.6 pp. in the top 1% group and 8.8 pp. in the top 0.1% group. Moreover, tax revenue would increase by 40 per cent under this hypothetical reform, which could be used at least partly to enhance social protection in view of future economic crises.

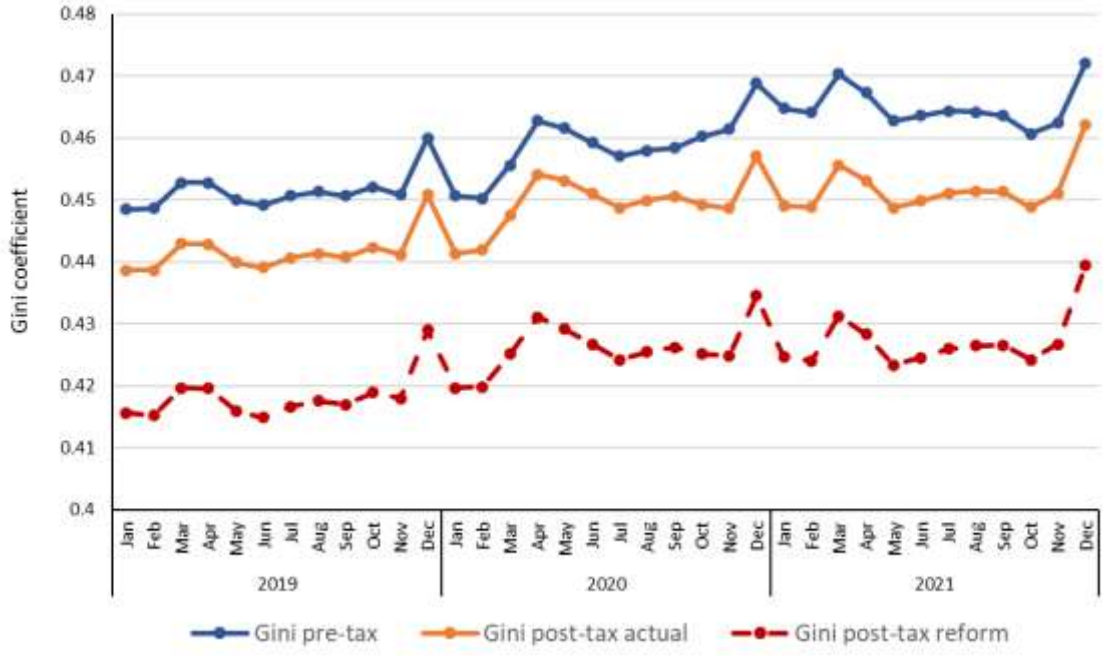
Finally, Figure 12 shows the effect of our counterfactual reform on earnings inequality measured by the Gini coefficient. The blue line depicts the Gini coefficient from pre-tax earnings. The orange line represents the Gini coefficient from post-tax earnings under the actual personal income tax in each year under analysis. The dashed red line represents the Gini coefficient from post-tax earnings under our counterfactual reform. Under the actual system, the Gini coefficient is reduced by 0.01 points as a result of the role of social insurance contributions and personal income tax. The effect is broadly in line with previous research using tax-benefit microsimulation based on household survey data (Jara and Varela 2019). The effect of our hypothetical reform is substantial as the Gini coefficient would be reduced by 0.03 points in 2019 and 2020 and by 0.04 points in 2021, when inequality from pre-tax earnings is compared to inequality in post-tax earnings under our reform. The slightly larger effect of personal income tax in 2021 under our counterfactual scenario means that such reform would have mitigated slightly the effect of the pandemic on post-tax earnings inequality during 2021.

Figure 11. Pre-tax vs post-tax earnings by income groups (2019-2021)



Note: Top income groups defined based on total annual earnings in 2019. All earnings are expressed in levels of December 2019 based on CPI.
Source: Authors' elaboration based on social security records.

Figure 12. Gini coefficient from pre- and post-tax monthly earnings (2019-2021)



Source: Authors' elaboration based on social security records.

6. Conclusion

Evidence from household survey data has highlighted an increase in income inequality in Latin America as a result of the COVID-19 pandemic (Almeida et al. 2021, Bottan and Vera-Cossio 2020, Lustig al. 2021). However, household survey data is usually affected by problems of top income under-coverage, which does not allow us to assess changes in income among the richest fraction of the population and how this affects standard inequality estimates (e.g., Burkhauser et al., 2012, 2018).

This paper aimed to assess differences in the evolution of earnings and earnings inequality prior and during the COVID-19 distinguishing between individuals who were at the top of the earnings distribution before the pandemic and the rest of the registered employed population. For this, we made use of rich administrative data from social security records in Ecuador, which contains sociodemographic information allowing us to look at differences in earnings across population subgroups. Our analysis, therefore, complements previous research focused on the impact of the pandemic on earnings but based on household survey data.

Our analysis shows that prior to the pandemic, the Ecuadorian labour market was already experiencing a deterioration. Since January 2019, we observe a progressive decline in the number of earners affiliated to social security in most industries, which is compensated by a progressive increase in employment in low paid services and activities. In the wake of the pandemic, the decline in registered employment intensifies as a result of the lockdown policies implemented to contain the spread of COVID-19. After the period of strict lockdown, the pre-pandemic pattern in registered employment persists with an increasing number of earners entering low paid sectors of work. Looking at results across top and non-top income groups, we observe diverging patterns in terms of the evolution of mean earnings. In all groups we observe a sharp decline in mean

earnings during the period of strict national lockdown. However, the magnitude of the shock and the evolution of earnings thereafter differ across groups. The decrease in earnings is more pronounced for the top 1% and top 0.1% group than for lower income groups. Moreover, by 2021, mean earnings at the very top remain as low as those observed during the first year of the pandemic, whereas they recover if we consider individuals who do not belong to top income groups or the top 10% group. Finally, the evolution of earnings during the pandemic varies across population subgroups. In particular, earning disparities in terms of gender, educational attainment and sector of work (public vs private) have exacerbated among individuals who are not at the top of the earnings distribution.

In addition to providing a detailed description of the evolution of earnings during the pandemic, our study also contributes to the discussion on the role of fiscal policy in reducing income inequality in low- and middle-income countries. Two features of the design of personal income tax in Ecuador limit the redistributive role of personal income tax, namely the exemption of the 13th and 14th month payments from tax payment and the presence of generous deductions from personal expenditures. A simple hypothetical reform abolishing these features of personal income tax show that further redistribution could be achieved. Moreover, increased fiscal capacity could served to finance reforms to social protection programmes in view of protecting households in the event of future economic crises.

Personal income tax reforms in line of those simulated in this paper have been seriously considered recently. In fact, a major personal income tax was introduced in Ecuador in 2022 with the aim to increase the progressivity of the tax system. As part of the reform, deductions for personal expenditures have been significantly reduced. On the contrary, discussions about reforms to enhance social protection have lagged behind despite evidence on the limited role of social policies in protecting households during the pandemic in Ecuador, and the absence of social assistance programmes acting as automatic stabilizers due to their design as proxy means-tested benefits.

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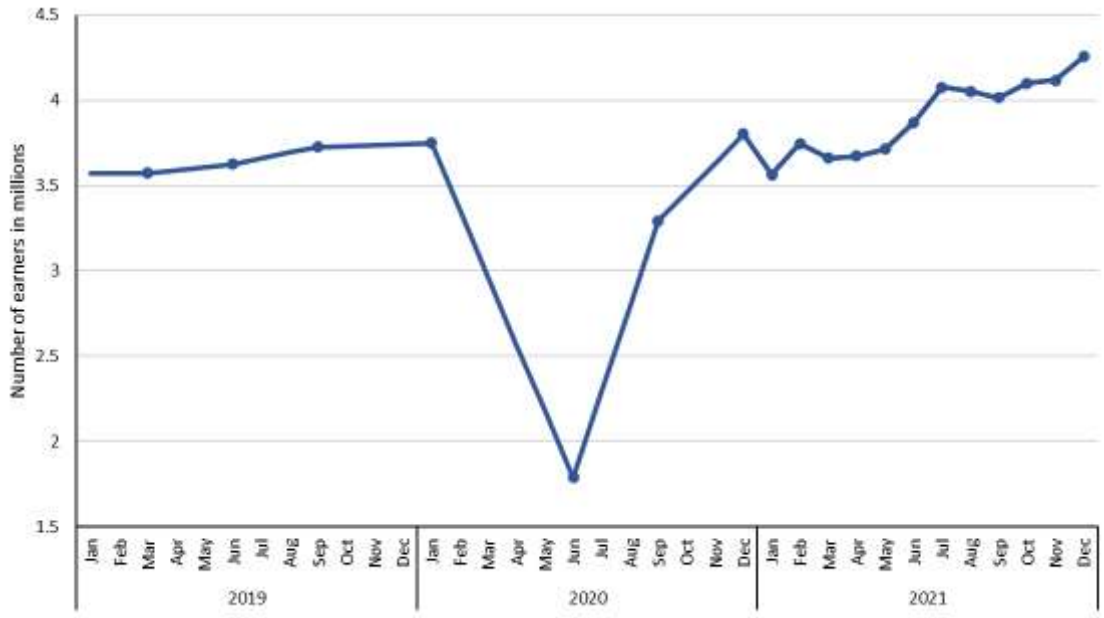
Appendix

Table A1. Descriptive statistics (averages of each year)

	2019	2020	2021
Women	42.1%	39.3%	36.2%
Employment income only	82.6%	81.9%	82.3%
Self-employment income only	17.4%	18.1%	17.7%
Public sector	17.5%	17.8%	17.1%
Tertiary education	18.6%	19.9%	20.3%
Agriculture & Fishing	5.4%	4.9%	4.5%
Mining, manufacture and utilities	11.2%	10.2%	9.4%
Wholesale and retail trade, hotels and restaurants	2.3%	1.8%	1.7%
Construction	15.7%	13.9%	12.6%
Transport and communication	5.1%	4.6%	4.1%
Financial intermediation, real estate, and professional services	6.2%	5.7%	5.3%
Public administration and defence, education, health and social work	18.8%	18.1%	16.9%
Other activities	35.4%	40.7%	45.5%
Mean number of observations per month	3,715,413	3,531,842	3,606,404

Figure A1. Number of earners not affiliated to social security (2019-2021)



Source: Author's elaboration based on ENEMDU.