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Subnational fiscal accounts under pressure: the effects of COVID-19 in a developing country

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Abstract

The consequences of the most generalized lockdowns in the recent history promptly brought the deepest falls in consumption, production and employment, and the consequent increase in poverty. So far, almost all literature has focused on the effects of the lockdowns in the private sector and the national level of the public sector, while analyses on subnational governments' finances have been overlooked, especially in developing countries. This paper's main purpose is to fill this gap by analyzing the particular case of Colombia with its two levels of local governments, departments and municipalities. In particular, using a difference in differences approach and a quarterly panel dataset, we identify the extent at which lockdowns affected revenues, expenditures, investments and debt service of subnational governments. The results show that local public finances faced a strong turn down, especially regarding revenues. For municipalities, the industry and commerce tax, and the property tax were reduced substantially while for departments beer, wine and liquor tax, and vehicle tax were the most affected. The effects on the expenditures are weaker and less evident, while investment showed a clear sectoral heterogeneity.

Key words: subnational public finances, COVID-19, regional economics
JEL Classification JEL: H12, H7, R10

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Las cuentas fiscales subnacionales bajo presión: efectos del COVID-19 en un país en desarrollo[♣]

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Resumen

Las consecuencias de los mayores aislamientos preventivos en la historia se tradujeron en las mayores reducciones del consumo, la producción y el empleo, con el consecuente aumento en la pobreza. Hasta ahora la mayor parte de la literatura se ha enfocado en los efectos sobre el sector privado y el nivel nacional del sector público, mientras que los análisis de las finanzas de los gobiernos subnacionales han sido pasados por alto, especialmente en países en desarrollo. El propósito de este documento es llenar ese vacío analizando el caso particular de Colombia con sus dos niveles de gobierno local, departamentos y municipios. En particular, haciendo uso de diferencia en diferencias con datos de panel trimestrales, identificamos en qué medida los aislamientos afectaron los ingresos, gastos, inversión y servicio de deuda de los gobiernos subnacionales. Los resultados muestran que las finanzas públicas locales sufrieron un duro revés, especialmente en sus ingresos. En los municipios la mayor caída estuvo en el impuesto de industria y comercio y en el predial, mientras que para los departamentos fueron los impuestos al vino, cerveza y licores y el de vehículos automotores. Los efectos sobre el gasto son menos evidentes, mientras que el gasto de inversión muestra una clara heterogeneidad entre sectores económicos.

Palabras clave: finanzas públicas subnacionales, COVID-19, economía regional
Clasificación JEL: H12, H7, R10

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1. Introduction

The COVID-19 pandemic has represented one of the most disruptive shocks on record for almost all countries, where the generalized lockdowns and the massive closure of companies of all sectors and sizes, promptly brought about one of the deepest falls on record in production and employment, with devastating effects in terms of job losses, unemployment, deprivation and the consequent increases in poverty and extreme poverty (Decerf *et al*., 2021; Gupta *et al*, 2021; Bargain and Aminjonov, 2021; Dang and Nguyen, 2020; Kong and Prinz (2020)). The question of whether these effects are being temporary or long lasting is still to be answered, in particular because the pandemic is far from over and some productive sectors in many countries are still under recovery.

The literature has been dynamic in looking for the effects of the lockdowns on almost every aspect affecting social, economic and financial indicators (Auray and Eyquem, 2020; Gutierrez and Ahamed, 2021; Stubbs *et al*., 2021; Kansiime *et al*., 2021). However, we found scarce literature analyzing the relationship between the pandemic and the subnational public finances. The existing research has focused on the coordination across levels of governments to mitigate the effects of the COVID-19 pandemic (Dougherty *et al*., 2020; Abrucio *et al*., 2020; Khan *et al*., 2021), the health decentralization across different waves of the pandemic (de Biase and Dougherty, 2021; Acharya *et al*., 2021), and the social expenditures and their relationship with fiscal variables (Schuknecht and Zemanek, 2021). Nevertheless, fewer studies have focused on the particular case of the effects of the COVID-19 on local governments, and only for developed countries (Chernick *et al*., 2020; Clemens and Veuger, 2020; Gordon *et al*., 2020).

This paper's main purpose is to fill this gap by using the particular case of Colombia, a developing Latin American country with two levels of local governments, departments and municipalities. In particular, our purpose is to answer the following questions: i) to what extent the lockdowns implemented to prevent the spread of the COVID-19 affected the revenues, expenditures, investments and debt services of subnational governments? ii) are these effects heterogeneous across levels of local governments? iii) in the case of subnational investments, is there any evidence of heterogeneity across sectors? The main contribution to

the literature is that, to the best of the authors' knowledge, this is the first time the causal effect of the lockdowns on local governments' public finances is analyzed.

In order to answer these questions, we use a difference in differences strategy within a quarterly panel database for both, municipalities (departments' capitals only) and departments.[1] The period of time covered goes from 2014:1 for departments and from 2015:1 for the capitals, through 2021:1, where the post pandemic period begins in 2020:2. The identification strategy exploits the variation in the economic structure of the subnational governments and the level of exposition and economic vulnerability brought about by the lockdowns to prevent the spread of the COVID-19. From the sectoral production structure in every department and capital municipality, we identify the sectors with the highest participation. Then, based on the recent literature (Bonet *et al*., 2020; Mejía, 2020) we identified the most affected sectors in the economy as a whole, and picked up those territories which are intensive (with production participations over the corresponding median) on the vulnerable sectors previously identified. The control group is made up for those departments and municipalities of the remaining territorial entities.

The results are revealing in showing that local public finances for both levels of subnational governments faced a strong turn down, especially revenues. For municipalities, the industry and commerce tax, and the property tax substantially reduced because of the lockdowns. The same effect was evident for the departments' main revenues, beer tax, wine and liquor tax, and vehicle tax. The effects on the expenditure accounts, functioning in particular, are weaker and less evident. Investment shows a strong heterogeneity, where the two main targeted sectors, health and education, were not affected during the lockdowns. These results are consistent with the fact that the funding of these two sectors is already guaranteed from the national transfers fund, and are not affected by the local governments' own revenues. It is important to highlight that these results could have been worse whether the current subnational fiscal rules would have not been in operation. These fiscal discipline measures started to be implemented at the end of the nineties with the purpose of building up more stable and sustainable subnational public finances (Pérez *et al*., 2021).

[1] We only consider capital municipalities given data availability issues, not only from the fiscal and financial side, but also the economic and sectoral structure of all municipalities.

The remaining of this paper is organized as follows: Section 2 presents the context of the lockdowns and shows the importance of the subnational governments on the consolidated public sector in Colombia. Section 3 describes the data used and presents the methodological approach. Section 4 analyses the main results of the causal effects of the lockdowns of the local governments' main fiscal accounts, as well as explores the heterogeneities brought about by the pandemic from the second quarter of 2020. Section 5 concludes.

2. The context of the lockdowns and the subnational public finances in Colombia

Colombia is characterized by having a long-term macroeconomic stability with a low inflation under an inflation targeting regime, a mild but persistent economic growth and a responsible monetary policy (Gómez, 2006; Vargas, 2008; Jalil and Mahadeva, 2010; Gómez and Ojeda, 2015). These factors seem to have contributed to the way in which Colombia successfully managed to overcome the two major financial crises in 1998 and in 2008, with different characteristics and implications for the whole economy (Gómez and Kiefer, 2006; Lozano, 2010; Ocampo, 2009; Coelho and Gallagher, 2010). A third, unimaginable and globally deeper crisis was about to happen. In 2019, just before the COVID-19 pandemic, the economy in Colombia was having a relatively good performance, with a GDP growth of 3,3% compared with the 0,1% for the Latin American average, and with a 2020 perspective of growing even faster, at 3,5% (Bonet *et al*., 2020; Cepal, 2020; Pérez and Bonet, 2018).

At the beginning of 2020 the world started to face the unexpected consequences of a new virus that quickly turned into a global pandemic. As a consequence, the countries started to announce, first locally focused and then general lockdowns. In Colombia, the chronology of the pandemic and the lockdowns started on March 12th when the national sanitary emergency was declared until the 30th of May (Resolution 385/March 12th 2020). Under this regulation, the government, through the Ministry of Health and Social Protection, prohibited the organization of public and private events of more than 500 people. Then, the 18th of March it is declared the first mandatory isolation for population over 70 years old (Resolution 464/March 18th 2020). Few days after, the 22nd of March, more generalized measures were adopted throughout the mandatory lockdown for the whole population from 25th of March to 13th of April (Resolution 454/March 22nd 2020). This lockdown considered exceptions for

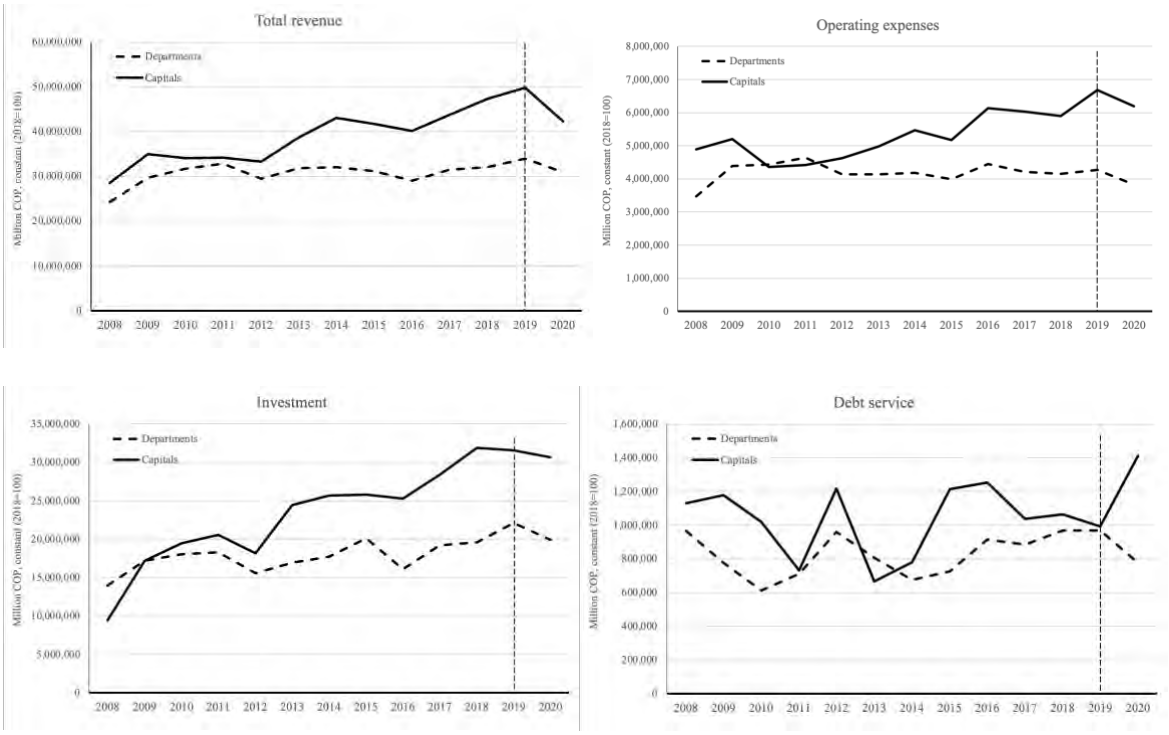
people involved in the supply and operation of essential public services such as health, water and electricity supply, assistance and care of children and senior people, communications, and banking and finance services, among others. Later, these restrictions were extended several times and exceptions were gradually modified (Decree 593/April 24 2020; Decree 636/May 2020).

It is worth mentioning that Colombia is the unitary country with the highest decentralization in Latin America, where subnational governments participate with the 38% of the total public expenditures representing over 10% of the GDP. From the revenue side, departments and municipalities altogether collect 20% of the public national tax revenues. This participation has been increasing over time, from 1.8% in 1994 to 3.2% in 2018 as a proportion of the GDP (Pérez *et al*., 2021).

To put the fiscal position of the subnational governments in context, it is worth mentioning that during the first half of the nineties Colombia faced a deep decentralization process where departments and municipalities' commitments and the economic resources were both increased without restrictions or rules in terms of fiscal sustainability. The consequences did not take long to appear, with steep increases in expenditures, debt and deficit (Pérez *et al*., 2016). Since this sequence of events put at risk the national government's fiscal sustainability too, in 1997 a set of subnational fiscal rules started to be issued with the main purpose of putting back on track departments and municipalities' public finances (Pérez *et al*., 2021). The rigorous compliance of these fiscal discipline measures, and the close monitoring and support of the Ministry of Finance (through the Fiscal Support Office (DAF by its acronym in Spanish)), National Planning Department (DNP by its acronym in Spanish) and other national authorities, led the subnational governments to achieve and preserve in the long run their fiscal health (Pérez and Bonet, 2018).

Everything was going well for departments and municipalities' public finances, until the beginning of the generalized lockdowns to prevent the COVID-19 pandemic, where almost all fiscal accounts for both, departments and municipalities, were hit hard in 2020 with the corresponding negative consequences (Figure 1).

Figure 1. Subnational fiscal accounts in Colombia, 2008-2020



Source: National Accountant Office (CGR for its acronym in Spanish) – Finance and Public Information Consolidator (CHIP for its acronym in Spanish).

We observe a deep fall in the main fiscal accounts in 2020, with the only exception in debt service for capital municipalities which ended up the year with a steep increase. Total revenues of both departments and capitals were hit the hardest, with the deepest reductions during the second quarter, about 12% for departments and 8% for municipalities. Operating expenses had also significant reductions over the 2020 quarters, between 9% and 13% for departments, and between 8% and 14% for capitals. Investments on the other hand affected departments the most, with reduction between 8% and 10% between the third and fourth quarters of 2020, while for capitals such reduction were around 3% and 4%. Debt service had a particular and opposite response to the lockdowns among departments and capitals. While departments showed a deep decrease between 20% and 25% during the third and fourth quarters, capital municipalities on the other hand showed reductions between 1% and 2% in the second and third quarters, but a significant increase of 42% during the fourth quarter. One possible explanation is that capital municipalities took advantage of the temporary

flexibilization of the subnational fiscal rules related to indebtedness operations. In particular, during 2020 and 2021 territorial entities were able to sign up treasury credits without the limits of sustainability and payment capacity established by Law 358/1997, expenditures limits of the Law 617/2000 or the risk evaluation established in the Law 819/2003 (Pérez *et al*., 2021). In the case of the departments, they might not have taken full advantage of these measures because of their weaker revenues' sources and the corresponding lower indebtedness capacity (Bonet *et al*., 2016).

These results are consistent with Pérez *et al*. (2021) for subnational governments, and with Bonet *et al*. (2020) for the Colombian economy as a whole. In terms of the international literature, few studies have focused on the consequences of the lockdowns in the subnational finances, in particular in developing countries. For the U.S. economy, analyzing the 150 cities, Chernick *et al*. (2020) predicted an average shortfall in revenues between 5.5% and 9%, with the most vulnerable cities facing 15% revenue losses. Another research, analyzing the implications of the lockdowns on state government sales and income tax revenues, found shortfalls during the third quarter of 2020 equivalent to 0.5% of the GDP and 11.5% of the pre-pandemic sales and income tax (Clemens and Veuger, 2020). These results are in line with Gordon *et al*. (2020), who also found the enormous pressure put by the COVID-19 on the two accounts that represent about 60% of the own-source revenues for state and local governments (personal income and sales tax revenues).

3. Empirical approach and data

3.1. Empirical approach

We use difference-in-differences to explore the causal effects of the pandemic's lockdowns on the fiscal accounts of subnational governments in Colombia, in particular revenues, expenses, investments and debt service. The identification strategy exploits the variation in the economic structure of the subnational governments and the level of exposition and economic vulnerability brought about by the lockdowns to prevent the spread of the COVID-19. In particular, how the most affected sectors relate to the economic and productive structure of the territories. Based on previous literature (Bonet *et al*., 2020; Mejía, 2020) we identified the group of the most affected sectors in the economy as a whole. Based on the economic structure of each department and capital, we are able to identify which of them are

the most dependent on vulnerable economic activities (those for which the relative shares of the GDP in vulnerable sectors are above the median value, within the group of departments and municipalities).[2] Then, the treatment groups (vulnerable territories) are made up of 16 capitals, and 16 departments. As expected, most of them are territorially coincident to each other due to their high economic dependence. Control groups in each case are made up of the remaining (less vulnerable) capitals and departments (Figure 2).[3]

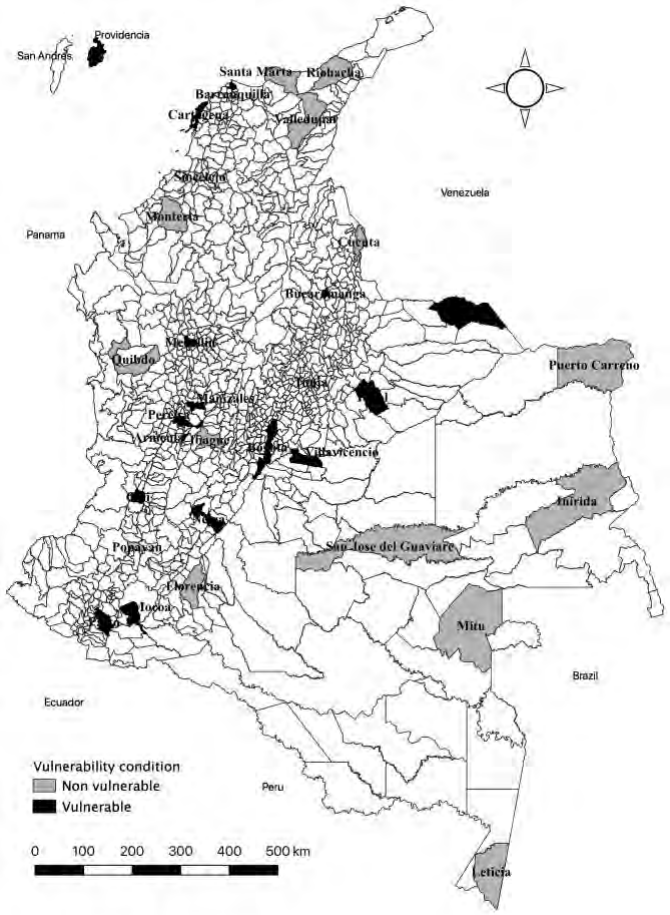
[2] Subnational sectoral economic activities were taken from Terridata, a data system supported by the National Planning Department (DNP by its acronym in Spanish). From this dataset we identified the following activities as the most vulnerable: agriculture, livestock, hunting, forestry and fishing; retail trade, repair, restaurants and hotels; construction; financial and insurance services; mining and quarrying; manufacturing; transportation, storing and communications. On the other hand, the group of activities considered not vulnerable are: electricity, gas and water supply; and social and personal services.

[3] There are few exceptions: Cesar (vulnerable) and its capital Valledupar (not vulnerable); Boyacá (vulnerable) and its capital Tunja (not vulnerable); La Guajira (vulnerable) and Riohacha (not vulnerable); Tolima (vulnerable) and its capital Ibagué (not vulnerable); Putumayo (not vulnerable) and its capital Mocoa (vulnerable).

Figure 2. Vulnerable and non-vulnerable subnational governments in Colombia, 2015

a. Departments

b. Capitals

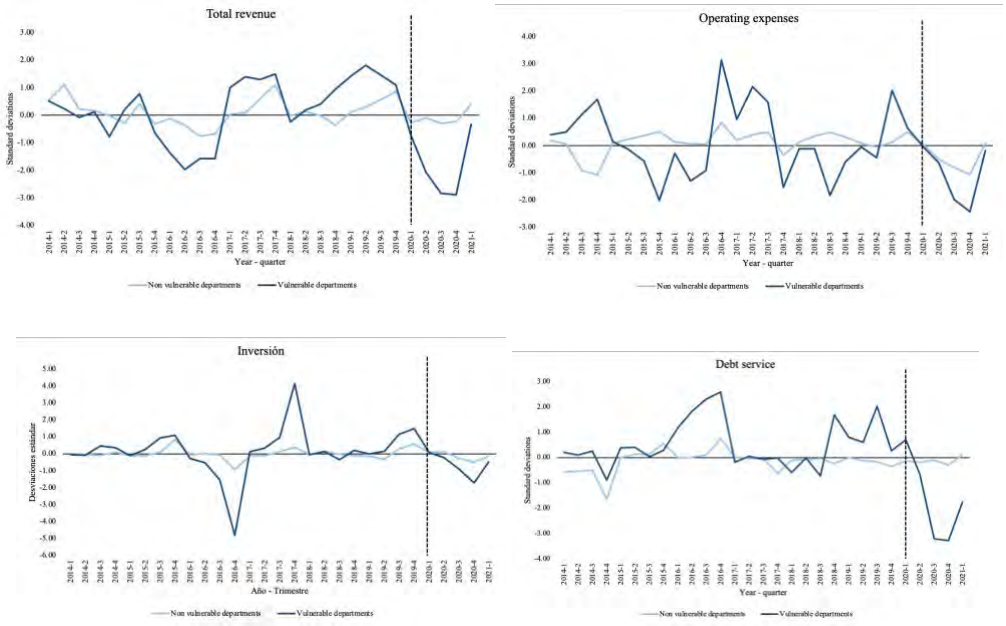


Source: National Planning Department (DNP) – Terridata, and the National Statistics Department (DANE). Authors' calculations.
Note: Vulnerability condition of every department and capital is based on the relative participation of previously identified vulnerable sectors (Bonet *et al*., 2020; Mejía, 2020) on the total GDP. Vulnerable territories are those for which vulnerable sectors participate above the median value within the corresponding group of departments and municipalities.

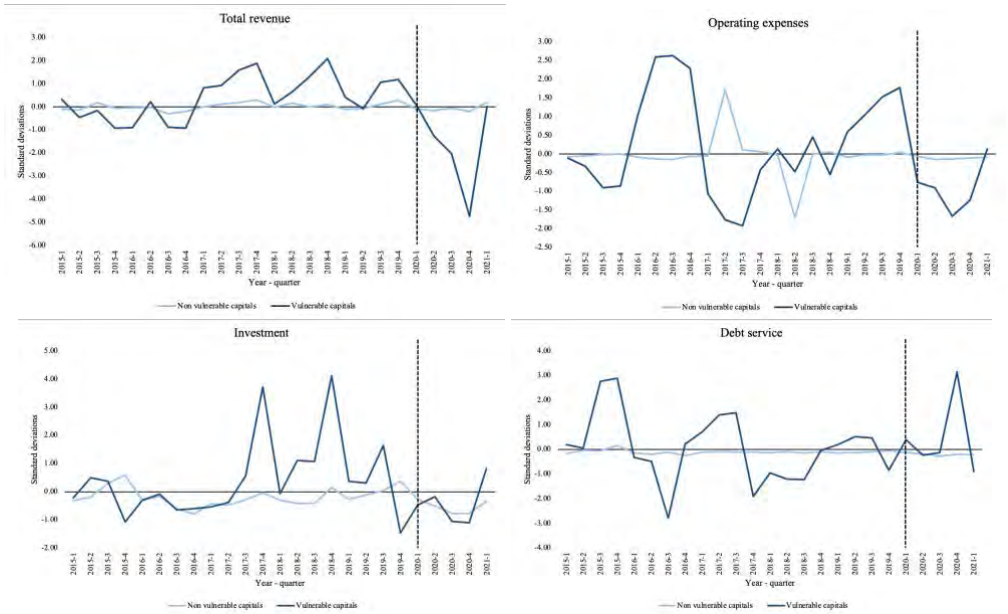
According to this identification, the evolution of the quarterly year to year variations of the main fiscal accounts shows a clear-cut structural change of every account, for both departments and municipalities, starting at the second quarter of 2020 (Figure 3).

Figure 3. Evolution of the main fiscal accounts for vulnerable and non-vulnerable territories (Standardized quarterly year to year variations)

a. Departments



b. Capital municipalities



Source: National Accountant Office (CGR for its acronym in Spanish) – Finance and Public Information Consolidator (CHIP for its acronym in Spanish).

The only exception is investments for capital municipalities, where there is not an evident upward or downward trend coincident with the beginning or the evolution of the lockdowns. Another atypical behavior is that of the debt service for capital municipalities where, as shown also in Figure 1, last quarter of 2020 showed a steep increase (of almost three standard deviations), opposite to the pattern of the other financial accounts. For the remaining cases we observe significant reductions in revenues, operating expenses, investments and debt service, which developed quarter by quarter of 2020 until the first quarter of 2021 where a clear-cut recovery was evident. The other particular characteristic is that the deepest falls took place in total revenues for both departments and municipalities. Within total revenues, own-source revenues, and in particular tax revenues and its components, are of special interest since the lockdowns restricted almost all economic activities from which departments and municipalities take their resources from. Municipalities' tax revenues come from property tax and industry and commerce tax (ICA for its acronym in Spanish). On the departments' side, tax revenue sources are more varied where the most representative are: registry; cigarettes and tobacco; vehicles; liquor and wine; and beer.

In order to determine whether the lockdowns to prevent the COVID-19 pandemic affected the fiscal position of the subnational governments in Colombia, we estimate the following difference in differences specification:

$$Y_{i,t} = \beta_i + \beta_t + \beta_1(Vulnerable_i * PostCOVID_t) + \beta_2 X_{i,t} + u_{i,t}, \quad (1)$$

where $Y_{i,t}$ are revenues, operational expenses, public investment, and debt service; β_i and β_t are department/municipality and period fixed effects; β_1 is the coefficient of interest which identifies the average effect in vulnerable departments/municipalities compared with the non-vulnerable after 2020:2. $X_{i,t}$ is a set of covariates for local characteristics.

We also estimate an extended version of the model with the purpose of identifying the quarter-by-quarter dynamics of the main fiscal accounts previous and after the lockdowns. In other words, we are able to establish whether the effect of being vulnerable increases or declines over time. This specification also allows us to test the parallel trends assumption.

$$Y_{i,t} = \beta_i + \beta_t + \sum_{t=2014-1}^{2021-1} \beta_{1t} * Vulnerable_{i,t} + u_{i,t} \quad (2)$$

The coefficients of interest β_{1t} which denote the effect of being vulnerable every quarter. Before 2020:2 the fact of being a vulnerable department/municipality work as placebos where there was no treatment, and the effects should not be statistically significant. On the other hand, from 2020:2 onward the fact of being vulnerable affect the main fiscal outcomes and we expect the coefficients to be significant.

3.2. Data

The source of the subnational public finances' data is the Treasury and Public Information Consolidator (CHIP by its Spanish acronym) – The Unique Territorial Form (FUT by its Spanish acronym), which is part of the National Accounting Office. FUT is an administrative financial balance sheet through which every public entity is required to report to. This detailed dataset publishes quarterly fiscal and financial information for every municipality (1,100) and department (32). For the purpose of this paper, we use data for the 32 departments and, due to restrictions on the economic and productive structure of municipalities, we only use the 31 corresponding to the departments' capitals.[4] The data for some financial accounts are available since 2008, but given some restrictions most of them are available starting in 2014:1 for departments and in 2015:1 for capital municipalities.

The gross domestic product (GDP) at subnational level comes from the National Statistics Office (DANE for its acronym in Spanish). Also, at sectoral level for both departments' GDP and municipalities' added value we use the Territata portal from the National Planning Department (DNP for its acronym in Spanish). Departments and municipalities' categories come from the National Accounting Office.[5]

4. Results

4.1 General difference in differences results

[4] We use 31 instead of 32 capitals since there is a significant lack of information on Arauca.

[5] Departments and municipalities are classified according to their population and current revenues. The former group is classified into five categories: special, 1st, 2nd, 3rd and 4th. Municipalities on the other hand group into seven categories: special, and from the 1st to the 6th. In both cases, the lower the category the more populated the territory and the higher their current revenues.

Table 1 shows the effects of the lockdowns to prevent the COVID-19 on the main fiscal accounts of subnational governments.[6] For vulnerable departments there was a clear significant reduction in total revenues, operating expenses, investment and debt service after the lockdowns. Similar results are those in the case of capital municipalities, except for investment and debt service where no significant changes were found. A second characteristic has to do with the relative size of the effects, where it is evident that revenues, for both departments and capitals, were hit the hardest. In particular, being a vulnerable department/capital reduced the total revenues in 0.90/0.78 standard deviations (sd) after the lockdowns with respect to the non-vulnerable subnational governments.

Table 1. The effect of the COVID-19 lockdowns on the main subnational fiscal accounts

a. Departments

	Total revenue	Operating expenses	Investment	Debt service
Vulnerable*Post	-0.906***	-0.336**	-0.341***	-0.538**
	(-0.21)	(-0.154)	(-0.114)	(-0.234)
Category (reference = Special)				
1st and 2nd	-1.175***	0.045	-0.241	0.889*
	(-0.426)	(-0.72)	(-0.565)	(-0.472)
3rd and 4th	-0.642	0.11	-0.27	0.892*
	(-0.476)	(-0.738)	(-0.576)	(-0.486)
Constant	0.881**	-0.049	0.257	-0.765*
	(-0.415)	(-0.682)	(-0.528)	(-0.426)
R-squared	0.203	0.081	0.149	0.09
Time FE	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes
Total observations	926	896	923	779
Average (no vulnerable)	0.0388	0.0113	-0.0112	-0.0554
Periods	29	29	29	29
Departments	32	31	32	30

b. Capital municipalities

	Total revenue	Operating expenses	Investment	Debt service
Vulnerable*Post	-0.78**	-0.29*	-0.10	0.14
	(-0.39)	(-0.16)	(-0.15)	(-0.24)
Category (reference = Special & 1st)				
2nd, 3rd and 4th	0.07	0.11**	0.01	-0.12
	(-0.06)	(-0.05)	(-0.08)	(-0.08)

[6] Since the variables are standardized, and in order to give an idea of the monetary magnitude of the effect, Table A1 in the Appendix shows the main descriptive statistics of the outcomes.

5th and 6th	-0.06	0.01	-0.15*	-0.11
	(-0.09)	(-0.06)	(-0.09)	(-0.12)
Constant	0.06	0,00	-0.04	-0.01
	(-0.04)	(-0.05)	(-0.05)	(-0.05)
R-squared	0.08	0.04	0.28	0.06
Time FE	Yes	Yes	Yes	Yes
Capital FE	Yes	Yes	Yes	Yes
Total observations	771	767	770	693
Average (no vulnerable)	-0.0034	-0.0136	-0.0752	-0.0372
Periods	25	25	25	25
Departments	31	31	31	30

Note: Difference in differences estimations. The variables in the model were standardized. Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.
Source: Treasury and Public Information Consolidator (CHIP by its Spanish acronym) – The Unique Territorial Form (FUT by its Spanish acronym) for the fiscal accounts database. The National Accounting Office for the categories of departments and municipalities. Authors' calculations.

Table 1 also shows that for departments there is evidence of heterogeneous effects across the different categories. For example, those within the intermediate categories (1st and 2nd) significantly reduced their total revenues in comparison to the group of the biggest departments (special category). Debt service on the other hand show opposite and weaker heterogeneous effects for the group of the smallest and least able departments (1st and 2nd, and 3rd and 4th) with respect to the special category. In this case, after the lockdowns the debt service for the smallest departments seems to have increased around 0.8 sd after the lockdowns with respect to the group of the biggest and more able departments.

4.2 Heterogeneities on tax revenues' components and sectoral investments

Considering the importance of revenues as one of the most affected fiscal accounts we explore the potential heterogeneous effects on the subgroup of revenues directly related to the day-to-day operation of departments and municipalities, the tax revenues (Table 2).

Table 2. The effect of the COVID-19 lockdowns on the tax revenue's components

a. Departments

	Tax revenue	Registry tax	Cigarettes and tobacco	Vehicles tax	Liquor and wine	Beer tax
Vulnerable*Post	-1.260***	-1.690***	-0.702*	-0.502**	-0.110	-1.333***
	(0.236)	(0.320)	(0.390)	(0.205)	(0.134)	(0.283)
Category (reference = Special)						
1st and 2nd	0.142	-0.120	-0.939***	0.638	-0.355	0.537*
	(0.527)	(0.556)	(0.290)	(0.742)	(0.461)	(0.289)
3rd and 4th	0.297	-0.212	-0.777**	0.377	-0.305	0.705**
	(0.565)	(0.570)	(0.310)	(0.834)	(0.478)	(0.322)
Constant	-0.139	0.242	0.820***	-0.436	0.305	-0.502*
	(0.499)	(0.518)	(0.281)	(0.698)	(0.439)	(0.279)

R-squared	0.205	0.225	0.161	0.181	0.091	0.361
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes
Total observations	926	926	924	877	912	926
Average (no vulnerable)	0.00197	0.0313	-0.0577	-0.106	-0.00164	0.0983
Periods	29	29	29	29	29	29
Departments	32	32	32	31	32	32

b. Capital municipalities

	Tax revenue	Property tax	Industry and commerce tax
Vulnerable*Post	-1.33**	-0.84*	-1.09**
	(0.54)	(0.51)	(0.53)
Category (reference = Special & 1st)			
2nd, 3rd and 4th	0.07	0.05	0.06
	(0.06)	(0.05)	(0.06)
5th and 6th	0.09	0.03	0.12
	(0.09)	(0.09)	(0.08)
Constant	0.04	0.03	0.02
	(0.03)	(0.04)	(0.03)
R-squared	0.12	0.07	0.09
Time FE	Yes	Yes	Yes
Capital FE	Yes	Yes	Yes
Total observations	771	767	771
Average (no vulnerable)	0.00501	-0.0182	0.0191
Periods	25	25	25
Departments	31	31	31

Note: Difference in differences estimations. The variables in the model were standardized. Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.
Source: Treasury and Public Information Consolidator (CHIP by its Spanish acronym) – The Unique Territorial Form (FUT by its Spanish acronym) for the fiscal accounts database. The National Accounting Office for the categories of departments and municipalities. Authors' calculations.

Results show that the disaggregation pays off, since this group of own-source revenues is certainly a key part of the total revenues decrease within the groups of vulnerable departments and capital municipalities. For departments, with the exception of the liquor and wine tax, all tax revenue sources ended up falling off as a result of the lockdowns. The deepest and strongest decreases occurred in registry (1.69 sd) and beer (1.33 sd) taxes, while the smallest and weakest reductions took place in cigarettes and tobacco (0.70 sd), and vehicles (0.50 sd) taxes. Additional heterogeneous effects by category are also present for cigarettes and tobacco and beer taxes. In this case, cigarettes and tobacco figures show that after the lockdowns the groups of vulnerable small departments (1st and 2nd, and 3rd and 4th categories) decreased their collection between 0.77 sd and 0.93 sd with respect to the special category. Opposite figures are shown for the beer tax for the same groups of departments,

with increases in their collection (between 0.53 sd and 0.70 sd) with respect to the special category.

Table 3. The effect of the COVID-19 lockdowns on the investment's components

a. Departments

	Education	Health	Recreation and sports	Culture	Assistance to vulnerable population	Transport	Institutional strengthening
Vulnerable*Post	-0.031	0.092	-0.955***	-1.243***	-0.322*	-0.807***	-0.015
	(0.230)	(0.287)	(0.290)	(0.376)	(0.169)	(0.246)	(0.145)
Category (reference = Special)							
1st and 2nd	-0.019	-0.370	-0.038	1.640*	-0.035	-0.070	5.953**
	(0.713)	(0.727)	(0.980)	(0.986)	(0.170)	(0.157)	-2.327
3rd and 4th	0.041	-0.406	0.133	1.692*	0.400*	0.516	6.316***
	(0.732)	(0.737)	(1.004)	(0.993)	(0.220)	(0.328)	(2.333)
Constant	-0.009	0.349	0.005	-1.451	-0.155	-0.168	-5.590***
	(0.669)	(0.668)	(0.931)	(0.905)	(0.170)	(0.198)	(2.119)
R-squared	0.104	0.150	0.106	0.204	0.136	0.215	0.230
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total observations	894	894	894	894	894	894	894
Average (no vulnerable)	-0.0546	-0.0430	0.0114	0.00725	-0.0231	0.0162	0.0137
Periods	28	28	28	28	28	28	28
Departments	32	32	32	32	32	32	32

b. Capital municipalities

	Education	Health	Basic sanitation	Recreation and sports	Culture	Assistance and prevention of disasters	Assistance to vulnerable population	Transport	Institutional strengthening
Vulnerable*Post	0.51	0.30	-0.80*	-0.65*	-1.20***	0.62**	-0.82*	-0.15	-0.38
	(0.31)	(0.35)	(0.42)	(0.34)	(0.46)	(0.31)	(0.43)	(0.16)	(0.45)
Category (reference=Special & 1st)									
2nd, 3rd and 4th	-0.07	0.25***	-0.02	0.15**	0.13*	-0.23**	0.07	0.05	0.12**
	(0.08)	(0.09)	(0.10)	(0.06)	(0.07)	(0.10)	(0.06)	(0.13)	(0.06)
5th and 6th	-0.22*	0.39*	0.06	-0.01	0.21	-0.02	0.26**	-0.02	-0.05
	(0.12)	(0.21)	(0.13)	(0.12)	(0.13)	(0.13)	(0.12)	(0.15)	(0.11)
Constant	0.03	-0.15**	0.04	0.01	-0.00	0.01	-0.03	0.01	0.01
	(0.05)	(0.07)	(0.05)	(0.04)	(0.04)	(0.05)	(0.03)	(0.07)	(0.04)
R-squared	0.12	0.10	0.07	0.07	0.13	0.20	0.07	0.05	0.09
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capital FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total observations	740	740	740	740	740	740	740	740	740
Average (no vulnerable)	-0.0495	-0.0587	-0.0266	0.0238	0.00324	-0.114	-0.0143	0.0081	-0.0298
Periods	24	24	24	24	24	24	24	24	24
Departments	31	31	31	31	31	31	31	31	31

Note: Difference in differences estimations. The variables in the model were standardized. Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.
Source: Treasury and Public Information Consolidator (CHIP by its Spanish acronym) – The Unique Territorial Form (FUT by its Spanish acronym) for the fiscal accounts database. The National Accounting Office for the categories of departments and municipalities. Authors' calculations.

Another source of heterogeneity is examined across sectors of investment (Table 3). A first feature is that neither education nor health sectors saw their investments changed during the

COVID-19 lockdowns. This is true for both vulnerable departments and vulnerable capital municipalities. These two sectors are particular cases in Colombia in terms of their funding, since they strongly depend on the national transfers, in other words they have guaranteed the necessary resources to operate even in cases of economic crisis (Bonet *et al*., 2016).

A second characteristic is that for vulnerable departments there was a strong reduction of investments in entertainment-related sectors such as recreation and sports (0.95 sd) and culture (1.24 sd). Other two sectors affected by the lockdowns were transport (0.80 sd) and attention to vulnerable population (0.32 sd). For vulnerable capital municipalities the results are similar in terms that some of the deepest falls in investments were also in culture (1.20 sd) and recreation and sports (0.65 sd). In this case two other sectors were negatively affected, basic sanitation (0.80 sd) and attention to vulnerable population (0.82 sd). But not all sectors were negatively affected, with assistance and prevention of disasters showing a 0.62 sd. increase for capital municipalities, meaning a reorientation of resources towards those more in need. These increases can also be related to the rise in debt service shown in previous sections.

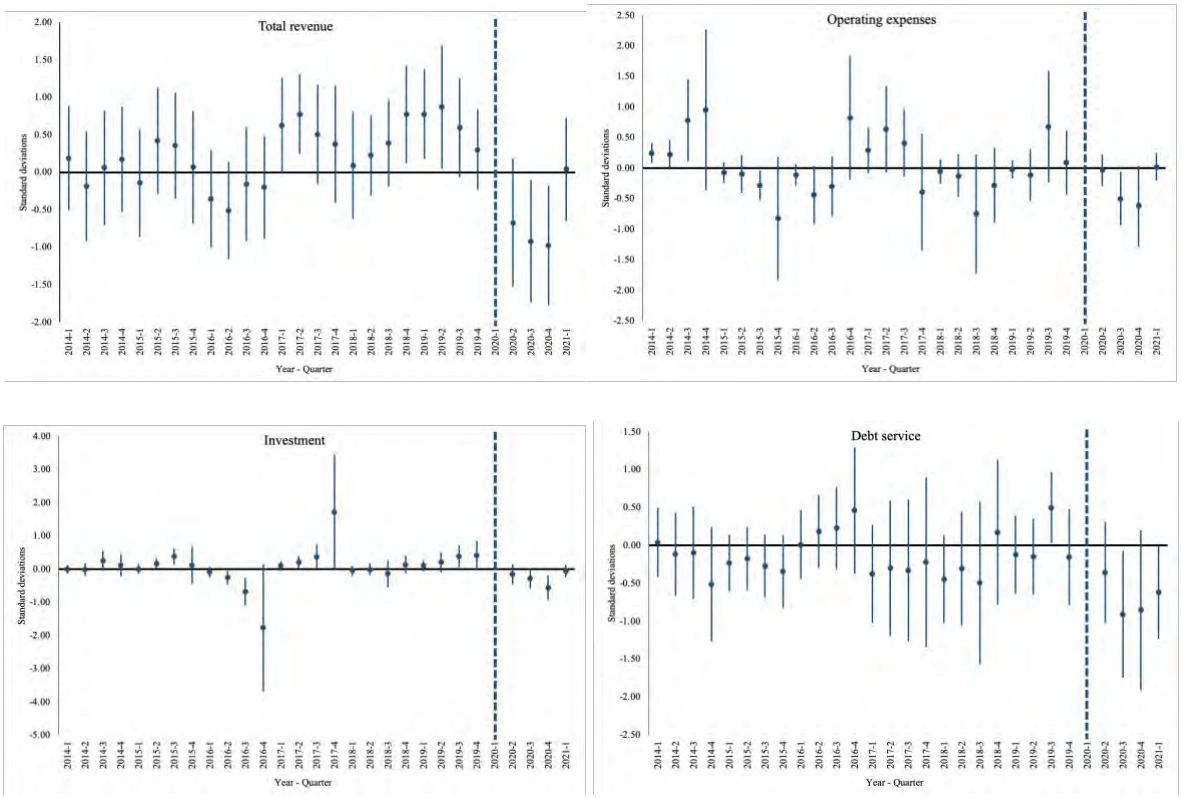
On the other hand, the sector classified as assistance and prevention of disasters disproportionally increased in the vulnerable capitals after the lockdowns compared to the non-vulnerable, consistent with the purpose this investment item was conceived for. At international level, the literature has argued as one of the mechanisms of these effects not only the restrictions imposed by the governments, but also the fear and the voluntary isolation to avoid the contagious (Goolsbee and Syverson, 2021).

4.3 The extended model

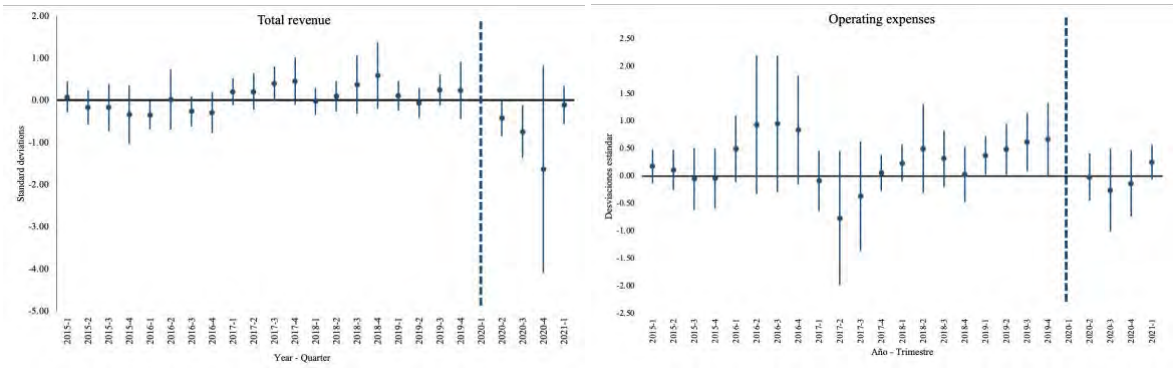
The next set of results correspond to the estimation of the parameters of interest β_{1t} in Equation 2. Figure 4 depicts these coefficients for both departments (Panel a) and capital municipalities (Panel b).

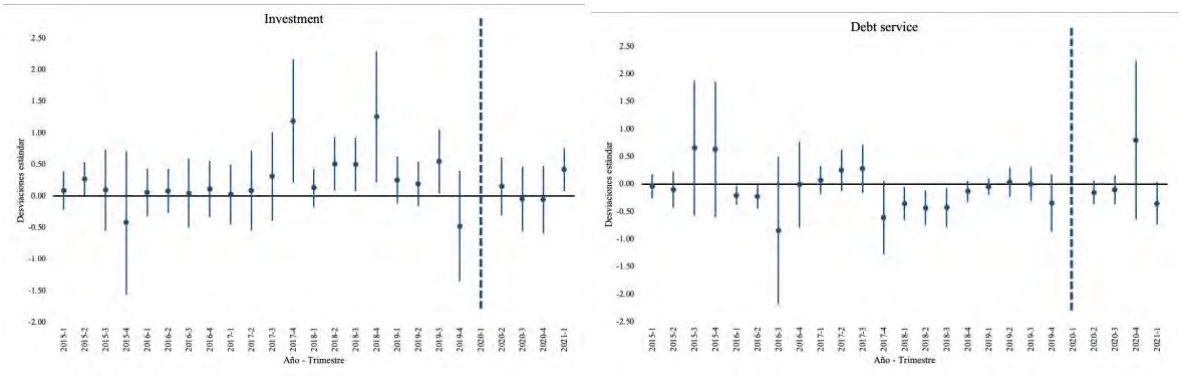
Figure 4. The effect of the COVID-19 lockdowns on the tax revenue components

a. Departments



b. Capital municipalities





Source: Treasury and Public Information Consolidator (CHIP by its Spanish acronym) – The Unique Territorial Form (FUT by its Spanish acronym) for the fiscal accounts database. Authors' calculations.

As illustrated, with few exceptions the coefficientes are not statistically significant before 2020:1, which is the excluded quarter/year dummy since it correspond to the transition period. Apart of testing the hypothesis of parallel trends for vulnerable and non-vulnerable governments these results help to understand the dynamics of the shock and how long the recovery has taken. What is evident from these results is that the deterioration of the main accounts, caused by the lockdowns, lasted between two or three quarters (2020:2 to 2020:4), with a clear recovery in 2021:1, specially in the case of departaments where the recovery is more evident. These results are consistent with international case studies (Chernick *et al*., 2020; Clemens and Veuger, 2020; Gordon *et al*., 2020), and the recovery of the Colombian economy as a whole.

5. Conclusions

This paper has contributed to the debate about the effect of the lockdowns to prevent the spread of the COVID-19 on the subnational public finances. This effect is identified by using the vulnerability condition of every department and capital municipality according to the participation of vulnerable sectors in the total production and added value. In Colombia, at the end of the 1st quarter of 2020 the government declared the national sanitary emergency and then the mandatory lockdown for the whole population. These measures implied falls in production and employment, and increases in job losses and poverty. This paper has evaluated how did the lockdowns impact the fiscal position of the local and intermediate governments in Colombia.

The difference-in-differences results indicate that both vulnerable departments and capital municipalities were strongly affected by the lockdowns by means of significant reductions

in their revenues, operating expenses, investments and debt services. The analyses also revealed significant heterogeneous dynamics across the different governments' sizes and capabilities, as well as across tax revenue components and investment sectors. In the case of departments, the registry tax and beer tax were the ones hit the hardest, and capital municipalities were affected throughout both of their tax revenues, property tax and industry and commerce tax. Another worth mentioning result indicate that the deepest falls in most of the accounts lasted between two and three quarters after which the fiscal position of local and intermediate governments began to recover during the first quarter of 2021. The results regarding the deepest falls on tax revenues are consistent with previous literature showing that they are elastic in developing countries, especially in the short-run (Dudine and Tovar, 2017). Policy implications from these results are significant since countercyclical measures should be adopted in order to strengthen revenue's sources in subnational governments when the economy is hit by a crisis.

One of the limitations in this paper is the impossibility of being able to carry out the analysis for the whole set of over one thousand municipalities, due to the lack of information either on the fiscal variables or the production and added value. Nevertheless, the 32 capitals represent a significant proportion of the 1,120 municipalities' fiscal accounts: 52.7% of total revenues, 66.5% of the tax revenues, 59.2% of the operating expenses, and 52.5% of the investment. Taking all these into account, and given the lower dependence of capital municipalities on national transfers it is expected for the lockdowns to have affected them the hardest.[7]

The results do suggest major policy implications. Although it is true that a shock like the COVID-19 has had no precedent in the world's recent history, it is also true that events like this are likely to occur again in the near future. For this reason, these results will help national and subnational governments to be able to understand their ability to react to exogenous shocks, to identify what fiscal accounts are the most vulnerable and which of the actions taken were successful, and how future growth and development can be understood and rethought (Jaimes, 2020; Leach *et al*., 2021).

[7] In 2019 national transfers' average participation on the total revenues were 38.8% for capital municipalities compared to the 56.9% in the rest of municipalities.

It is also worth mentioning the need to open the discussion to analyze the optimal balance for subnational governments between a greater decentralization and a greater dependence on own-source resources. This taking into account that the first model would imply lower fiscal volatility and uncertainty by means of the national transfers' streams in case of exogenous shocks, but at the cost of less independence. The second model would imply greater independence, with the fiscal position highly dependent on their own-source resources, but less covered by transfers in case of unexpected events. If the balance tips towards the last case, it is necessary to develop countercyclical tools, such as stabilization funds, that promotes savings in booms and increased expenses during crisis. Alternative approaches, such as the asymmetric decentralization have been underdeveloped and underused in Colombia (OECD, 2019). Strengthen these strategies would be especially useful in a country with such deep regional heterogeneities like Colombia.

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Appendix

Table A1. Descriptive statistics of the main fiscal accounts

a. Departments

	N	Mean	Median	Std. Dev.
Total revenues	926	530.59	1,534.03	136,903.09
Operating expenses	896	-604.03	155.46	23,436.51
Investment	923	8,599.66	3,816.64	152,282.9
Debt service	780	660.28	0.00	14,464.71

b. Capital municipalities

	N	Mean	Median	Std. Dev.
Total revenues	771	6,728.65	5,310.64	318,284.02
Operating expenses	767	2,026.29	254.97	97,465.46
Investment	770	14,855.34	1,850.19	160,585.57
Debt service	693	1,596.58	38.89	32,588.2

Note: Mean, meadian and estándar deviations are in millions COP.
Source: Authors' own calculations based on data from National Accountant Office (CGR for its acronym in Spanish) – Finance and Public Information Consolidator (CHIP for its acronym in Spanish).