EXTENDED ABSTRACT

Title: Unequal Response to Mobility Restrictions: Evidence from COVID-19 Lockdown in the City of Bogotá.

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Desigualdad y cohesion social de los territorios

Abstract: *(minimum1500 words)*

Larger and denser cities allow for increased interaction among individuals. While these interactions are the source of productivity-enhancing agglomeration economies, they also increase the risk of disease contagion. The coronavirus disease (COVID-19) pandemic represents one example, as well as an exogenous shock of great magnitude, with a dramatic impact on global health and profound socio-economic and political consequences. In contrast with more highly localized epidemics, such as Ebola, COVID-19 quickly acquired a global status, affecting industrialized and developing countries alike. In response to the pandemic, Governments worldwide implemented several non-pharmaceutical interventions (NPIs), including mobility restrictions, to curb the spread of contagions and, in some cases, improve the resilience of the health infrastructure.

This paper examines the efficacy of mobility restrictions and direct subsidies on curbing urban mobility. The evidence provided illustrates the unequal response to these policies across different areas of the same city and how this response relates to socio-economic differences across locations within the city. Mobility reduction has been one of the main objectives of NPIs and one of the most effective ways to reduce the spread of cases (Glaeser et al., 2020). Consequently, the ability to comply with lockdowns

largely affects who remains shielded from contagion. This paper analyses NPIs implemented in Bogotá, Colombia from 20 March to 30 August 2020 during the first wave of the COVID-19 pandemic and estimates the extent to which different areas in the city reacted to these policies. It then explores the role of spatial differences in socio-economic factors in explaining this unequal response. While the pandemic's evolution and its diverse and profound consequences are still under way, understanding the heterogeneous impact of measures implemented to date to reduce contagion is essential in order to guide policy responses in the future.

The pandemic has severely impacted Latin America and the Caribbean and exacerbated inequality in the region (Alderson & Doran, 2014; Villareal-Villamar & Castells-Quintana, 2020). Multiple reports have raised alarms about the severity of the situation (ECLAC & PAHO, 2020). Countries in Latin America and the Caribbean implemented several NPIs as the primary tool to contain the COVID-19 pandemic. Governments have banned public gatherings, closed restaurants and instructed residents to stay at home to reduce the virus's contagion speed by reducing mobility and social interaction. As a result, the pandemic has also brought about unprecedented social and economic shocks. The drop in economic activity is of such magnitude that gross domestic product per capita in Latin America and the Caribbean is expected to experience a 10-year setback by the end of 2020. According to the Colombian National Department of Statistics [Departamento Administrativo Nacional de Estadística] (DANE), approximately 4 million people had lost their jobs in Colombia by July 2020, increasing unemployment to 20.2 percent. Almost 100,000 companies went into bankruptcy despite government payroll subsidies and expansion of credit.

Heterogeneous reactions to NPIs can occur as mobility reductions impose a more substantial burden on some households than others. According to Wright et al. (2020), low-income families might experience more difficulty transitioning to teleworking, and lower access to credit and availability of savings might hamper compliance with even short lockdown periods. For households in the informal sector, safety nets are limited and compliance is even more costly. Consequently, mobility restrictions may have lower compliance and more profound economic consequences in developing countries, where incomes are lower and informality is higher. In Colombia, informality has been persistent, with 47 percent of the population classified as informal as of 2019. The service sector has a high concentration of informal jobs that are more difficult to perform from home. According to DANE, informal workers' job loss represents approximately 52 percent of the total fall in employment during the pandemic as of June 2020 (DANE, 2020). Similarly, households with higher incomes, more access to financial services and whose members work in formal sectors and can telecommute are likely to have more options to adjust to confinement measures (Bick et al., 2020; Dingel & Neiman, 2020). These economic realities predict that households of different income levels will have different reactions to NPIs. In a segregated city, this is reflected in spatial heterogeneity.

To analyse the heterogeneous impact of NPIs, a unique data set was built by combining information on mobility and socio-economic characteristics at a disaggregated spatial level with data on NPIs, including lockdown and cash subsidies, as well as the evolution of COVID-19 cases. The focus is on Bogotá, one of the largest and densest cities in Latin America. Bogotá is well suited for this study. First, it implemented a city-wide lockdown with uniform enforcement throughout the city for over seven weeks. While Colombia was known for having one of the longest lockdowns globally, lasting from 24 March to 31 August, Bogotá began its lockdown a few days earlier, on 20 March. After the general lockdown, some economic sectors were allowed to restart operations. Subsequently, the city implemented mobility restrictions in specific within-city areas according to the evolution of cases. This paper estimates and

compares the impact of the city-wide coordinated lockdown with that of localized measures. Second, cash grants or subsidies were distributed for some poor households to help them stay at home. The role of these subsidies on mobility restriction compliance is also analysed. Third, the city presents significant income segregation over space (Castells-Quintana, 2019), which increases the expected unequal response to the lockdown across households and locations in the city.

The literature on NPIs, mobility and COVID-19 has increased exponentially. A significant majority of papers to date have focused on industrialized countries (Dave et al., 2020) and on cross-city or cross-country comparisons (see Brodeur et al., 2020, for a survey). Barnett-Howell and Mobarak (2020) discuss the differences in trade-offs between the benefits and costs of social distancing experienced by developing and industrialized countries, highlighting the benefits of studying countries of different income levels to fully understand dynamics and policy consequences. This paper extends this analysis by analysing locations of different income levels within a developing city. One strand of the literature has analysed the socio-economic determinants of lockdown compliance on a large scale by comparing regions of industrialized and developing countries (Bargain & Aminjonov, 2020; Askitas et al., 2020), counties in the United States (Wright et al., 2020) and cities (Ruiz-Euler et al., 2020; Garcia-Lopez & Puga, 2020) with low- and high-income levels. Maire (2020) studies the role of income in influencing compliance with mobility restrictions and shows that these restrictions are more effective in higher-income countries. This paper contributes to the literature by evaluating the unequal response to mobility restrictions across neighbourhoods within a large city in the developing world and by providing an analysis of the potential socio-economic factors behind this unequal response. In addition to income levels, it examines other factors including housing infrastructure, overcrowding, education and demographics. The analysis of the sectoral composition of the workforce also contributes to the literature connecting teleworking capabilities and lockdown compliance (Papanikolaou & Schmidt, 2020). Lastly, further contributions are made to the literature by analysing the role of cash subsidies in enhancing lockdown compliance. Cash subsidy programmes were implemented in many countries and cities but have been less commonly studied. One exception is the study by Baker et al. (2020), which finds that the 2020 Coronavirus Aid, Relief and Economic Security Act (CARES Act) quickly accelerated household spending in the United States. This was particularly strong for households with either lower incomes and/or greater income drops due to the pandemic, which highlights the importance of studying such programmes in lower-income areas. Arndt et al. (2020) show how these types of subsidies have even determined who experiences nutritional problems due to lack of food access in South Africa. Wright et al. (2020) find that local stimulus injections have a significant impact on increased social distancing. The theoretical foundation that they provide for this result hinges on the relative higher cost for lower income households to stay at home and forego income as a result of compliance. They find that, for every additional dollar per capita a county received in the United States, mobility temporarily declined by over 1 percent.

The findings in this paper suggest that the general lockdown had a significant impact on mobility, with an average reduction of over 40pp (percentage points). By contrast, the effect of location-specific restrictions on mobility decline is less than one tenth of the generalized lockdown impact. No evidence was found to indicate that the implemented subsidies programme was sufficient to improve compliance with lockdown measures. Across neighbourhoods, considerable heterogeneity was found in responses to mobility restrictions, which is explained by key neighbourhood characteristics. In particular, neighbourhoods with lower incomes, higher population density and high informality rates tend to be less compliant. Overcrowding, measured as

households per unit and persons per room, is also associated with lower compliance with mobility restrictions.

Keywords: *(maximum 6 words)*
mobility, development, inequality, COVID-19, place-based policies

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