Impact of COVID-19 on Chile's Internal Migration

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Abstract

So far, most research regarding mobility and COVID-19 has focused either on studying day-to-day mobility to understand and measure the efficacy of lockdowns, on correlating mobility and socioeconomic factors bearing on new cases and deaths, or on building origin-destination matrices to inform epidemiological models [2]. The present report addresses a less-studied phenomenon of general mobility, namely, the patterns of permanent (or at least long-term) relocation within a country during the pandemic. The phenomenon of permanent relocation can be studied as a special kind of voluntary migration, where people leave their homes looking to improve their quality of life rather than forced migration (e.g., fleeing famine or political persecution) [1].

We focus on the Metropolitan Region (MR) of Santiago, Chile. Despite occupying a relatively small area, this region hosts a population of over eight million inhabitants, considering the projections of the 2017 census[1]. This makes it comparable in sheer numbers to other major metropolitan areas such as Hong Kong, Baghdad, or New York City. The MR is administratively divided into six provinces and 52 comunas[2]. We approach the study of this voluntary relocation phenomenon by quantifying how the population of each comuna of Santiago migrated out of the city and how they were distributed to the other regions of Chile. To understand the potential impact of the pandemic, we compare the migration patterns against the year 2017.

For each year (i.e., 2017 and 2020), we analyzed eight months (March 1 until November 30) of eXtended Detail Records (or XDRs) for approximately 1.3M devices in Santiago. These XDRs can be thought of as a tuple $< n, A, d >$, where n is an anonymized (hashed) mobile phone number that connects to a cell tower at latitude/longitude A on the day and time d. Each device was assigned a home antenna in one of the administrative areas (i.e., comunas) using those records between 7 pm and 7 am during weekdays [3]. We use the week of March 9 until March 15, 2020, taken as the business-as-usual week before the implementation of lockdowns (March 16) and full quarantines (May 16). Since classes had started the week before, we assume that most people would be at their primary

[1] `http://www.censo2017.cl/`
[2] `https://en.wikipedia.org/wiki/Santiago_Metropolitan_Region`

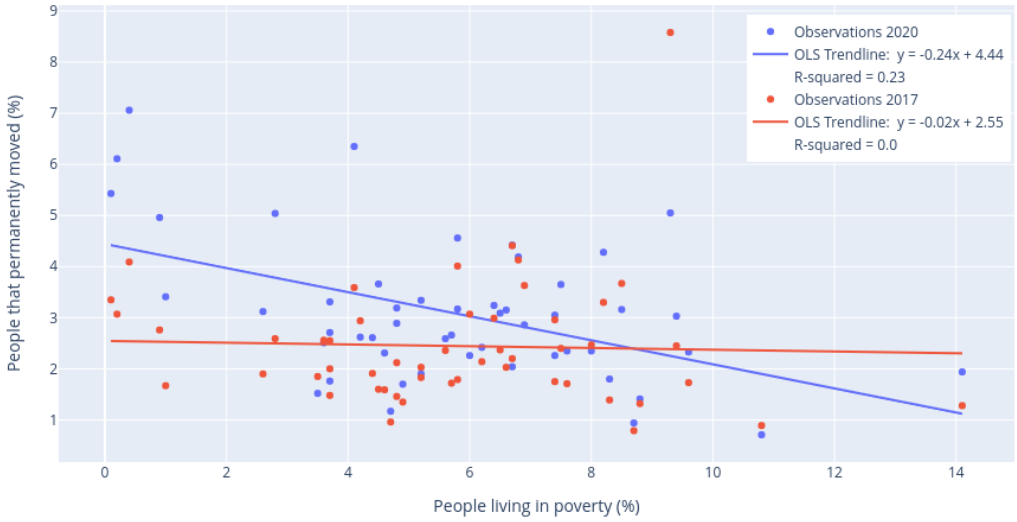

Figure 1: Emigration per comuna from the Metropolitan Region in 2017 (red) and 2020 (blue).

residence. We operationalized permanent migration as follows: for each device, we calculated home location per week after the baseline (i.e., 03/16/2020) until November 30, 2020, and if the statistical model of home in the four weeks of November was outside the Metropolitan Region, we assumed that the device had moved permanently. Correspondingly, we apply the same methodology to 2017. To validate our operationalization of migration, we compare our measurements from 2017 against the corresponding information from the national census conducted in Chile that same year. We found that our model of migration based on mobile data can be used to approximate the distribution of movement from the MR to other regions in Chile according to the census results ($r(13) = .93, p < .001$).

Our preliminary results show that about 173.8K people (2.17% of the projected 8.1M population) permanently left the MR in 2020. In contrast, an estimated 110.7K moved in the same period of 2017. However, the preferences of destinations stayed relatively stable. The main difference was in the Valparaíso region (a neighboring region and a popular vacation destination), which saw a significant increase in immigration from the MR. Another relevant difference during the pandemic compared to 2017 is the comunas of origin for the people who moved. The average socioeconomic level appears to be critical in explaining migration patterns during the pandemic. While for the 2017 dataset, this feature does not show any correlation with the percentage of the population migrating from each comuna, in 2020, the "percentage of people living in poverty"[3] alone explains 23% of the variance for the modeled variable (see Figure 1).

Regarding the destination, some regions saw significant differences in the distribution of the origin of the immigration. Figure 2 shows the normalized percentage difference by destination between 2017 and 2020. For example, of the total number of people who migrated to Los Lagos in 2020, 11.34% came from Las Condes (one of the wealthiest comunas in the MR), compared to 3.71% in 2017, for an increase of 7.63% (z-score=4.70). In contrast, for the same region in 2020, only 2.23% came from San José de Maipo (a middle-class comuna), compared to 4.95% in 2017, for a decrease of 2.72% (z-score=-2.15). Once again, the results suggest that the socioeconomic status of the comunas of origin played an essential role in the movement during the pandemic. Richer comunas like Las Condes and Providencia significantly increased their contribution to multiple regions.

[3] `www.comunidadescolar.cl/wp-content/uploads/2019/10/I%CC%81NDICE-DE-POBREZA-POR-COMUNA-2017.pdf`

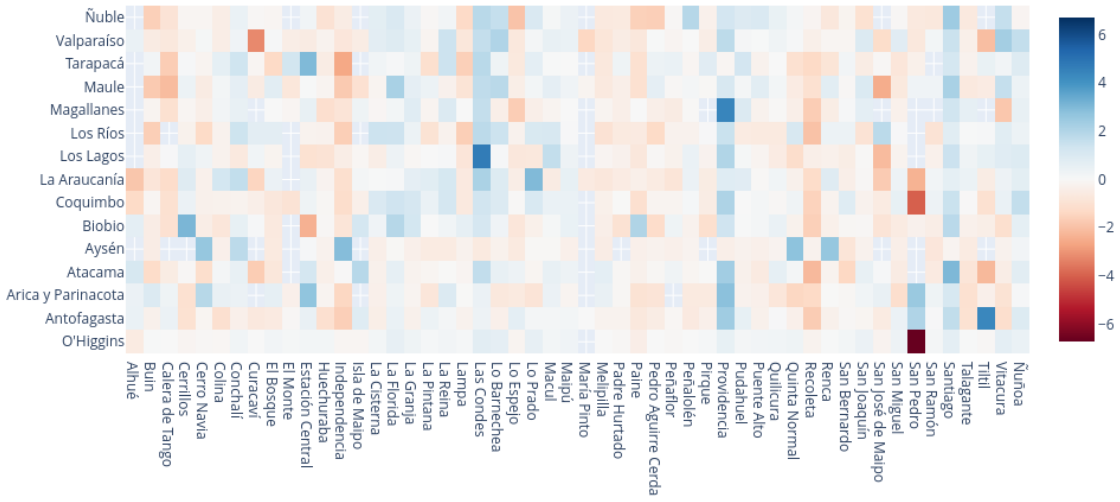

Figure 2: Percentage difference on the destination regions per origin comuna 2017 - 2020 (z-score normalization).

For 2020, We also calculate the difference between origin and destination for a combined index that represents the relative quality of life in urban areas (ICVU[4]). Although some comunas with a better quality of life necessarily had to cede when moving, we found that not everyone was willing to sacrifice in the same way. For example, Providencia (second in the ranking) conceded more than expected, while Vitacura (first in the ranking) was considerably more conservative, staying well below the trend. A similar tendency can be seen in the difference in the percentage of poverty between the origin and destination. People tended to move to communes with similar levels of poverty. Regarding migration from urban to rural areas, people predominantly stayed in urban comunas. Only poorer comunas showed a small percentage ($< 10\%$) of the migrants moving to rural areas.

Although the decision to migrate is complex and multifaceted, our findings suggest that during the COVID-19 pandemic, an advantageous socioeconomic status might have facilitated relocation. This gap in access to migration during periods of crises based on socioeconomic factors is a serious problem and requires further study to understand its underlying mechanisms better.

References

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