MITMA Mobility Data June 2020

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Description of MITMA data

We consider the data regarding Spain travels related to city areas ('municipios'). They are divided into two datasets:

- **Maestra1** gives travel-specific information through the following attributes:

  day — *hour* — *origin* — *destination* — *range* — *travels* — *km*

  where *range* specifies the range of km (0.5-2, 2-5, 5-10, 10-50, 50-100 or 100+), *travels* the number of such travels registered in the specified *date* and *hour* and *km* the number of total km.

- **Maestra2** gives daily information about the number of people who traveled to or from each city divided in categories w.r.t. how many travels they did during that day (0,1,2,2+).

Maestra2

Firstly, Figure 1 gives a summary about how the population is distributed (on average) into the 4 categories of number of daily travels (0,1,2,2+), differentiating between weekend or not. It is necessary to make such a distinction, as it is clear from Figure 3 that the travelling behaviour changes radically during the weekends.

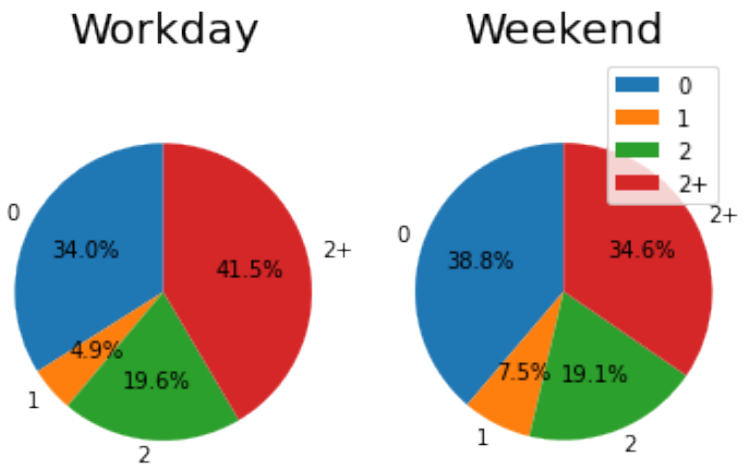

Figure 1: Pie chart of the average proportion of people in the 4 categories.

The variability of such data can also be informative, as the boxplots in Figure 2 show. Note in particular that the variability of the number of people staying at home during the weekends is much higher, since Saturday and Sunday have different behaviours.

Figure 3 shows the daily number of people belonging to each category, ignoring the city attribute. Note that the total population considered is about 46.5 millions (mlns).

To better understand the travelling behaviour throughout the month, in Figure 4 we plot the time series of the number of people staying at home each day, decomposed in trend and seasonal component (period=7 days) using python function *seasonal_decompose* from *statsmodels* library:

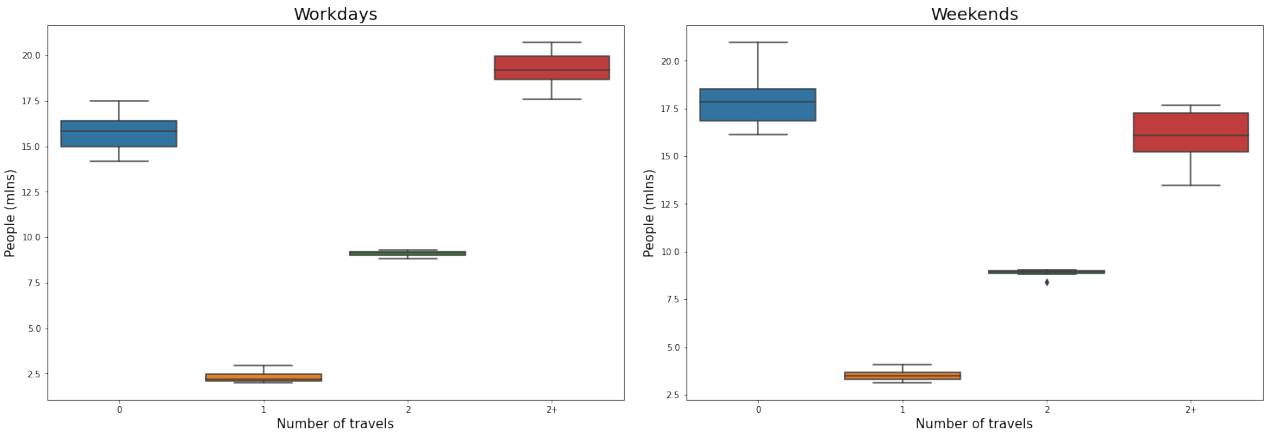

Figure 2: Boxplots of number of people travelling in each category.

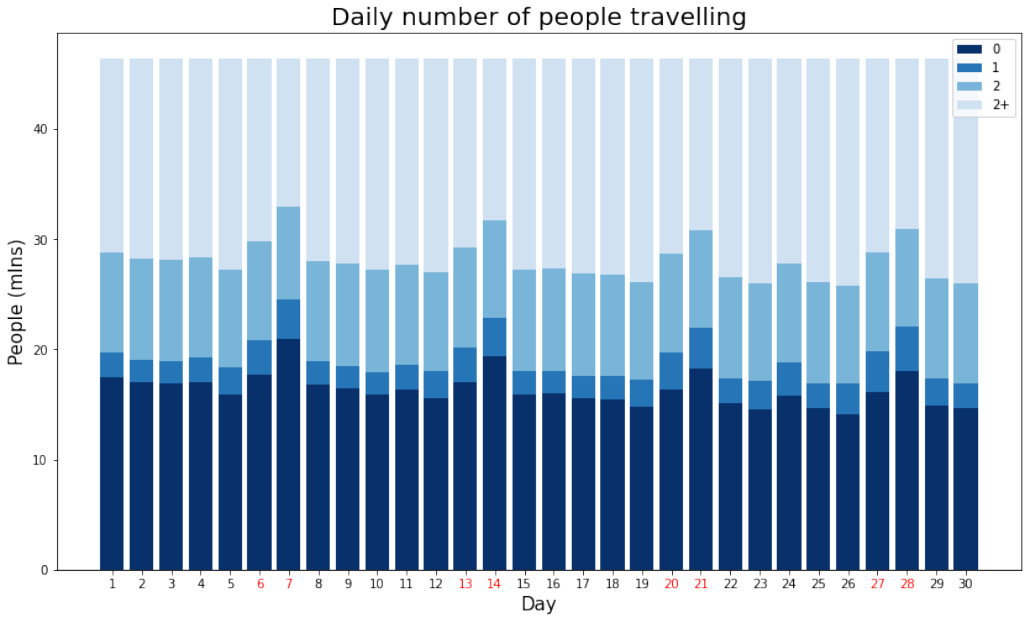

Figure 3: Daily number of people traveling 0,1,2,2+ times. Weekends are in red.

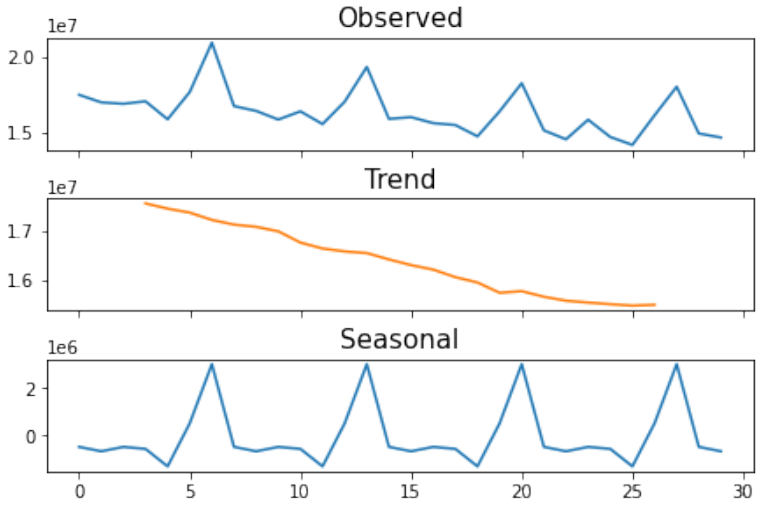

Figure 4: Daily number of people travelling 0 times.

It is clear from the figure that people tend to stay at home during the weekends, but during the month of June the trend of the series is decreasing. This is probably due to the easing of Covid restrictions/beginning of the

holidays.

We now consider the 10 most populated cities (municipios) in Figure 5; the population is calculated using the data of the 1st of June and converting the city code to the name of the city using QGIS map software.

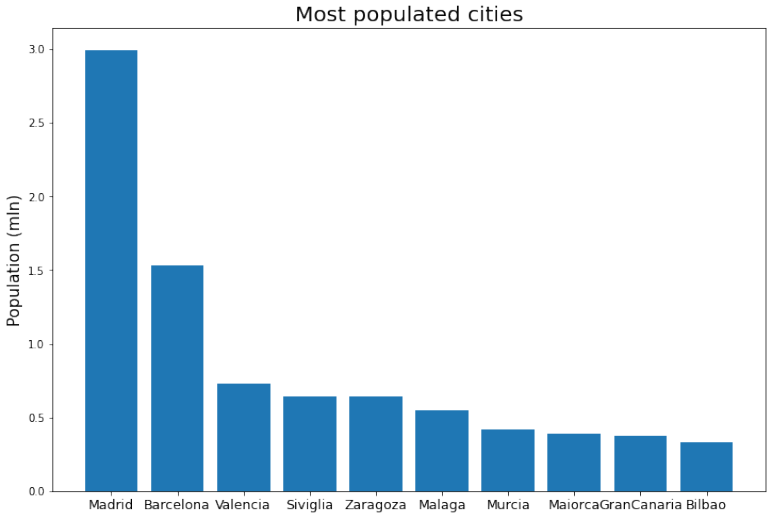

Figure 5: Most populated 'municipios'.

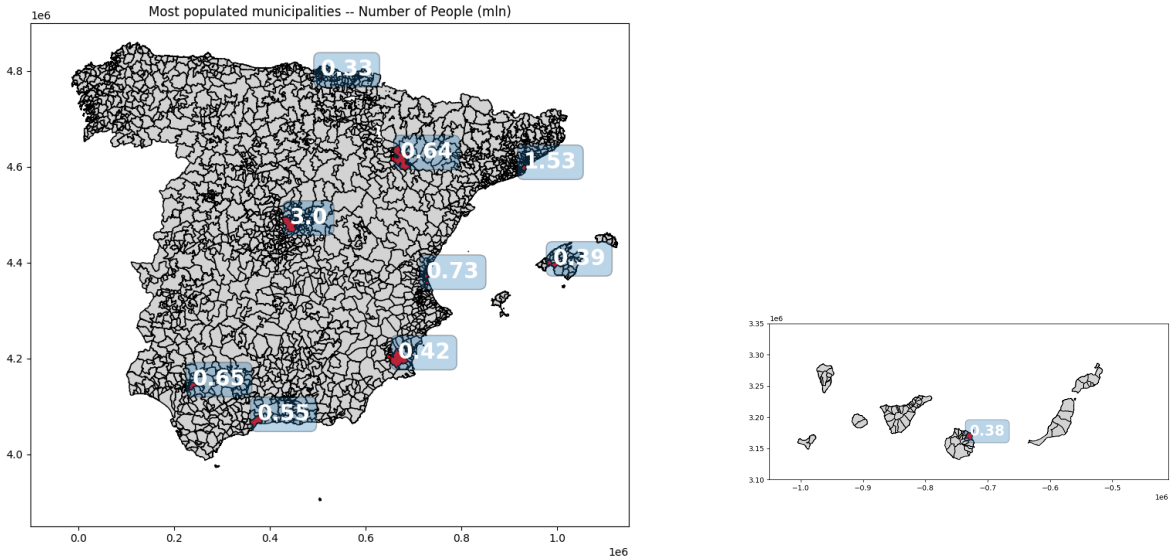

Figure 6: Most populated 'municipios' map.

For each city we computed the daily average number of people moving in each of the 4 categories (0,1,2,2+ travels). Figure 7 shows the proportion of people belonging to each category w.r.t. the total population in each city:

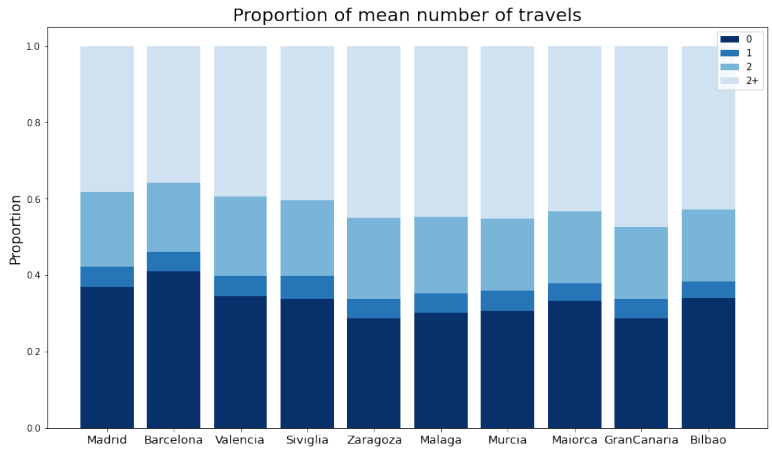

Figure 7: Proportion of the number of people in each category (number of travels).

We define the 'laziest' city in June as the city with the highest average proportion of people who did not go out of home. From Figure 7 it seems to be Barcelona; it may also be either that holidays started earlier in Catalunya or stricter restrictions were in place during June.

Maestra1

The data in Maestra1 are more specific and give information about for example the hourly travelling behaviour. Figure 8 shows the distribution of the average number of travels and km during the day, again differentiating between weekend or not. It is clear that, in agreement with the results of the previous section, the number of travels decreases a lot during the weekends, especially in the morning. It is only slightly higher during late hours.

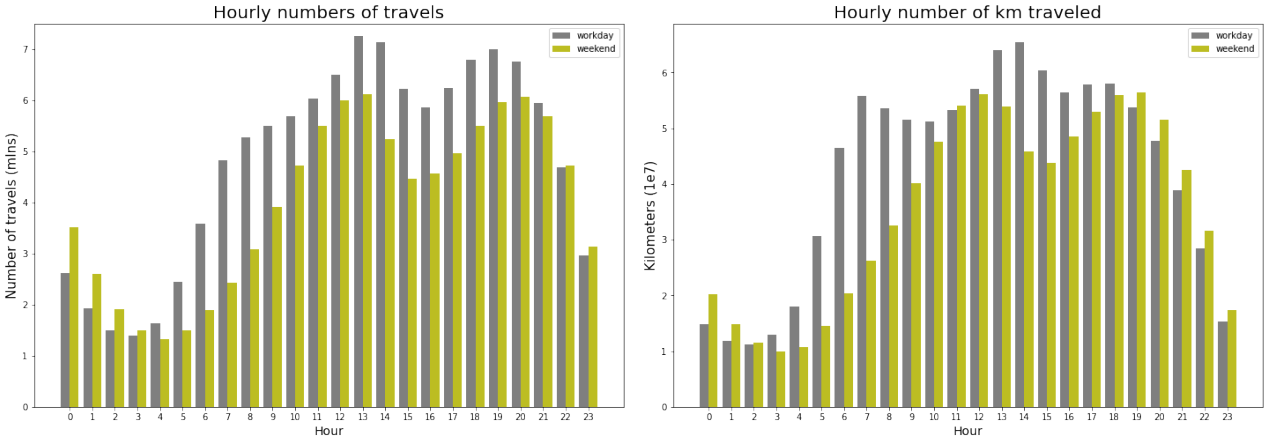

Figure 8: Average number of travels (left) and km travelled (right) during each hour in June 2020.

Mobility in Spain increased during June 2020. We now want to know which 'type' of mobility increased the most, that is if the increment regards long, medium or short travels. First, in Figure **??** we plot how the values in Figure 8 (left, number of travels) are distributed across the km range categories, which are 0.5-2, 2-5, 5-10, 10-50, 50-100 or 100+ km.

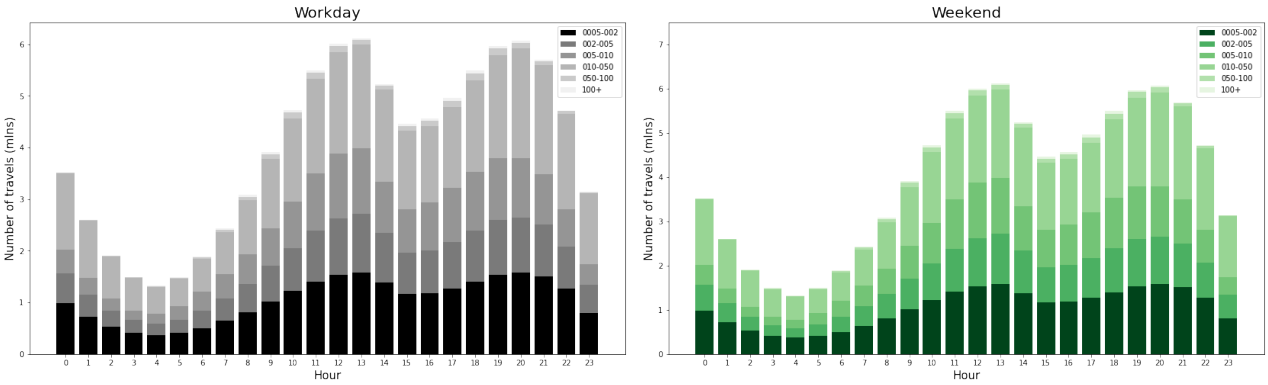

Figure 9: Average number of travels during each hour, divided per categories during workdays (left) and weekends (right).

In Figure 10 we plot the daily number of travels in each category:

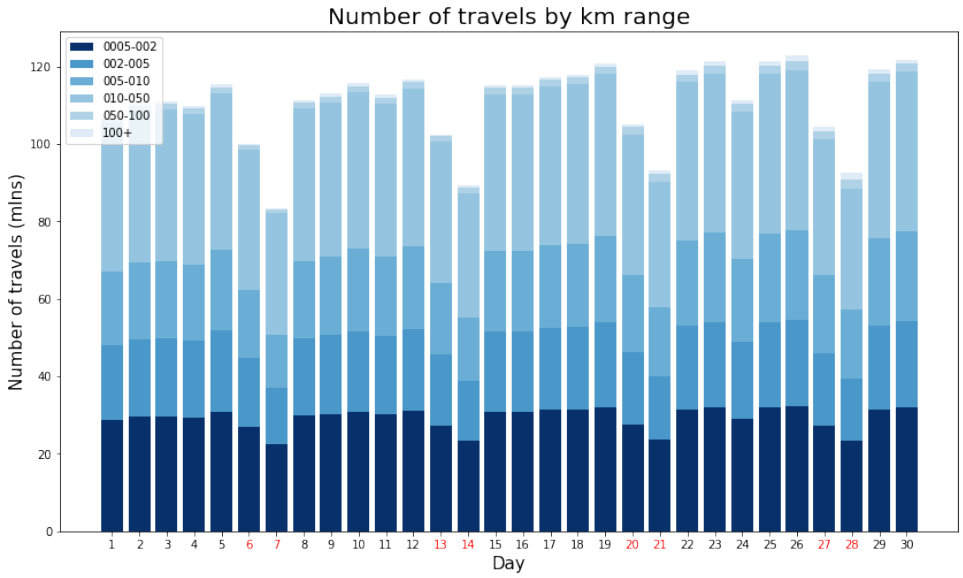

Figure 10: Daily number of travels in each range of distances in km. Weekends are in red.

It seems that the number of travels in each category is increasing throughout the month, meaning an overall easing of Covid restrictions. In particular, the category 10-50 km seems stationary while the travels between 50 and 100 km are increasing a lot. In figure 11 we plot the time series of the number of 50-100 km travels, decomposed in trend and seasonal components as before:

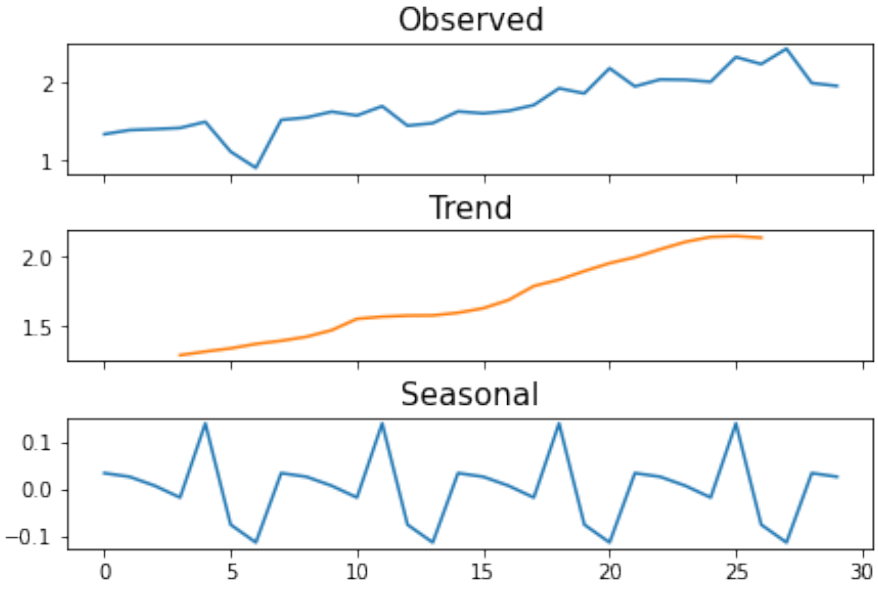

Figure 11: Daily number of travels between 50 and 100 km decomposed using *seasonal_decompose* function.

Finally, we would like to check whether holiday travels increased during June. We divide the travels in internal and external depending on origin and destination being the same or not. We plot the time series in Figure 12: it is evident an increasing in the number of external travels.

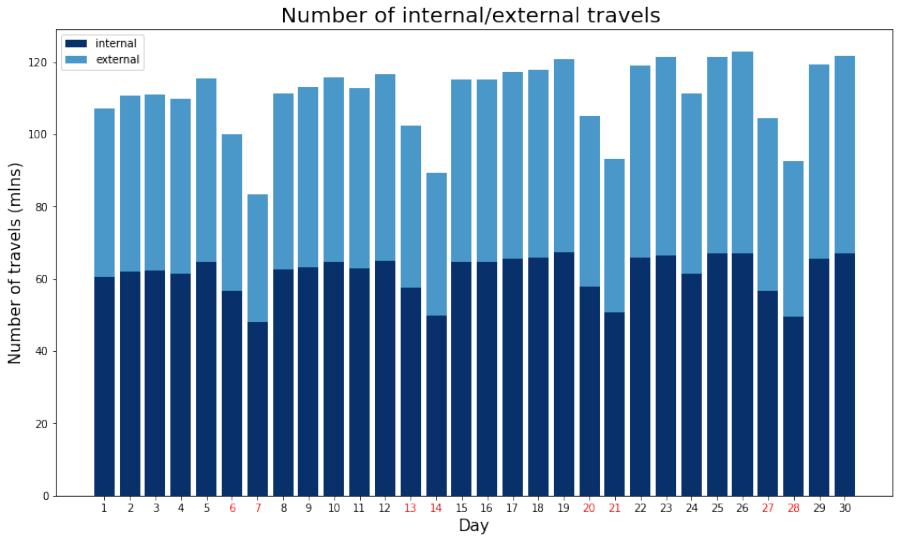

Figure 12: Daily number of travels between 50 and 100 km decomposed using *seasonal_decompose* function.

In Figure 13 are shown the average daily proportions of internal/external travels in the 10 most populated cities. We consider the proportion of external travels as an indicator of the holidays/lighter Covid restriction. Note that in Barcelona the proportion of external travels is high (the 3rd one from the highest); this is in agreement with the high percentage of people staying at home in Figure 7. Note also the two opposite behaviours of Barcelona and Valencia: in both the cities there is a high percentage of external travels, meaning lighter restrictions/holidays were in place; however in Valencia many people decided to go out from the city (higher percentage of external travels), while in Barcelona many people decided to stay at home.

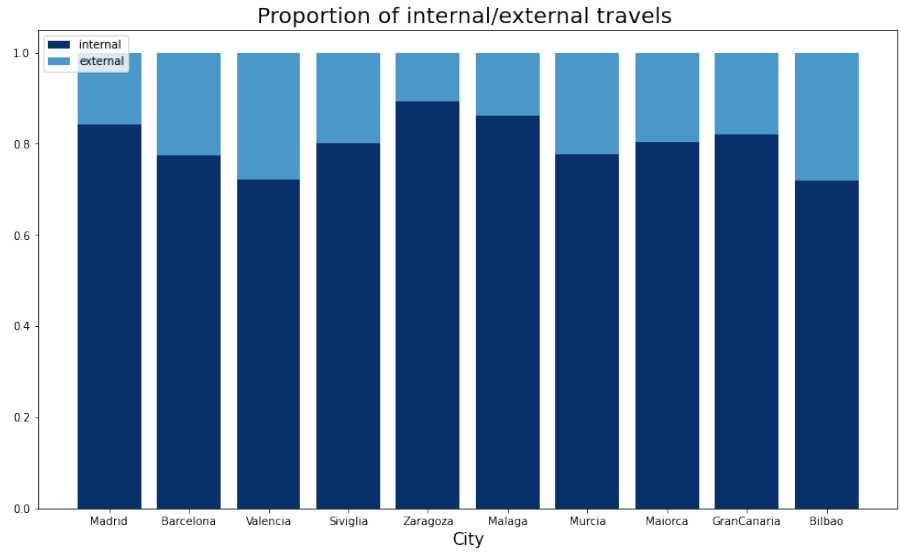

Figure 13: Average daily proportion of internal/external travels in the most populated cities.

Eventually, we show how the external mobility regarding long travels (50+ km) changed in **Madrid** from the first weekend (6-7 June) to the last one (27-28 June).

The figures 14 show the n most popular destinations from Madrid during the two weekends considered, with $n = 10, 30, 50$. The box labels indicate the rounded number of travels (thousands) for the 4 highest ones. We can see how the most travelled municipalities are the same but many more people travelled there during the second weekend. In the weekend of the 27,28 June seems also that many more places west to Madrid were more visited than before.

Conclusions

In this brief report we described the evolution of the mobility in Spain during June 2020, which generally increased throughout the month, especially concerning long-distance travels. We also compared the mobility of the 10 most populated cities using average indicators such as the mean daily proportion of people staying at home and the mean daily percentage of external travels. The results show that in Barcelona there was a tendency to stay at home which may be the consequence of the beginning of holidays and a stricter internal Covid policy. We also compared the average mobility by hour, differentiating by weekend or not: in the weekends' mornings and afternoons millions of people did few travels or did not travel at all.

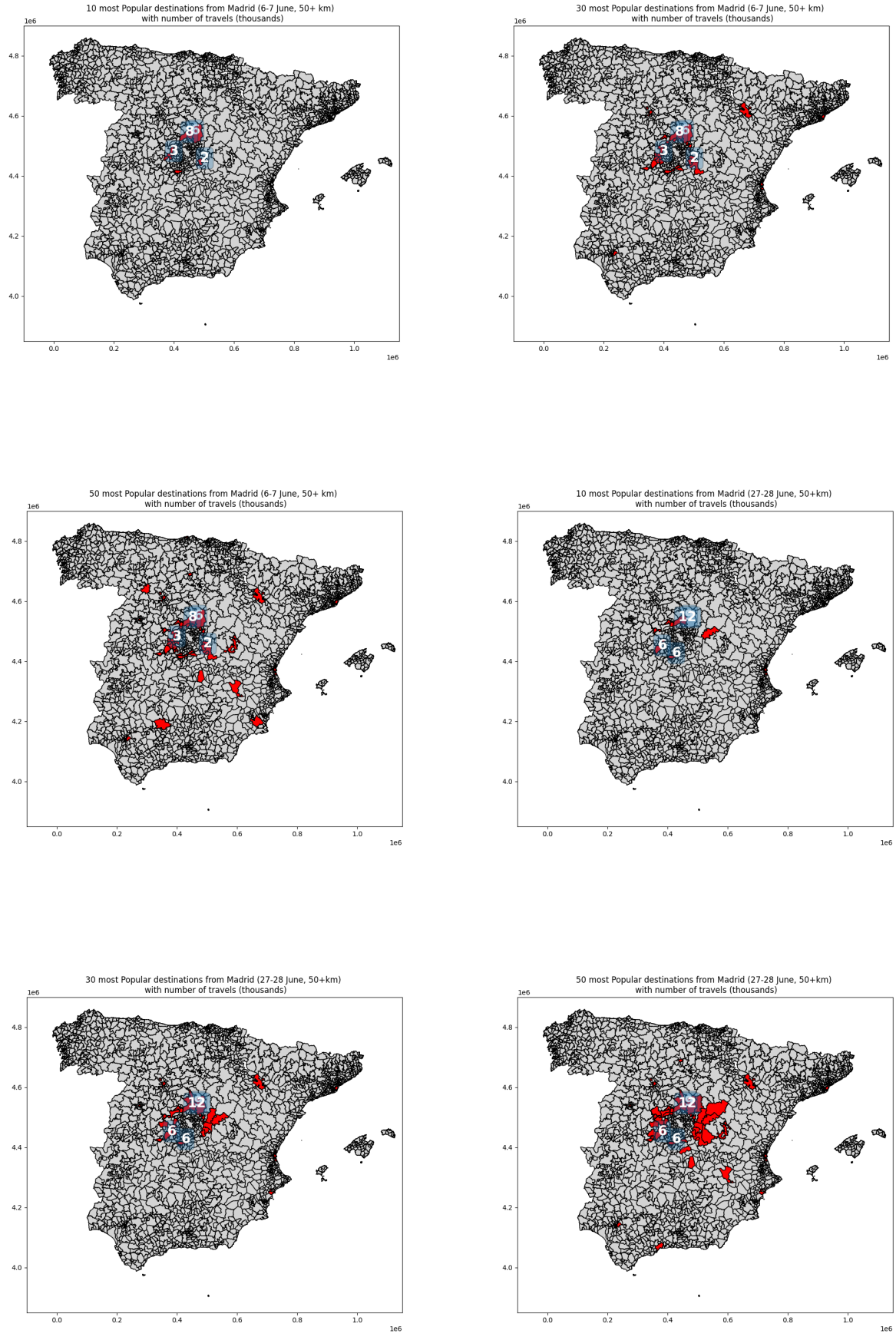

Figure 14: Average number of travels during each hour, divided per categories during workdays (left) and weekends (right).