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THE EFFECT ON MOBILITY TRENDS DURING THE PANDEMIC

Key Words
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Transport
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Abstract

As mobile device location data becomes more available, new analyzes reveal significant changes in the way you move when an unplanned event occurs. With different control policies from local and state government, the outbreak of Covid-19 has dramatically changed movement behavior in affected cities. Many countries have closed their borders and imposed curfews in sharp reductions in transport demand also on regional and continental level. Different countries have dealt with these challenging circumstances in different ways - and, in some cases, the directives vary from city to city. Cities in developing countries and emerging economies face bigger challenges than ever before. At the beginning of the Coronavirus Pandemic (Covid-19) google and apple started to collect detailed statistics on the movement of people using location data from mobile devices. The paper analyzes the data obtained and shows the results for various areas of movement such as shops, recreation areas, parks, public transport and other. A comparison was made of the collected data in the Republic of Croatia and Republic of Serbia, which had a solid measure, and Kingdom of Sweden which had very mild measures during a pandemic. Therefore, a study was made on how measures affected the mobility of people in individual countries with different measures.

1. INTRODUCTION

The Coronavirus Pandemic has a significant impact on countries around the world and many states have introduced restrictions to transport. Different countries have dealt with these challenging circumstances in different ways, in some cases, the directives vary from city to city. How effective these policies have been in reducing people's movement can be seen from the data that Google present in their Covid-19 mobility reports. Using anonymous data provided by apps like Google Maps, the company has created a regularly updated dataset that shows how people's movements changed during a pandemic [1].

This mobility data may provide helpful insights to local governments and health authorities and may also be used as a foundation for new public policies by showing the change in volume of people mobility in their communities.

2. METHODOLOGY AND RESOURCES

We can learn about this from the data that Google presents in community mobility report. United Nations and other organizations sources and categorized the data into the following categories: Social distancing, Movement restrictions, Public health measures, Social and economic measures and Lockdowns [2].

Table 1. Policy measures considered in the analysis

Category	Measure	Description
Social distancing	Limit public gatherings	Cancelation of public events. Limit to the number of people that can meet in public and private spaces.
	Public services closure	Public services and facilities are closing access to the public. In some countries, services are available online.
	Changes in prison policies	Change in policies around prisons to mitigate the spread of the disease. This may include early release but also suspension of day-release programs, suspension of visits etc.
	Schools closure	Authorities have closed schools.
Lockdown	Partial lockdown	Partial lockdown includes: 1. The population cannot leave their houses apart for specific reasons that they have to communicate to the authorities. 2. All stores that are not related to alimentation or pharmacies are not open.
	Full lockdown	Full lockdown includes: 1. The population cannot leave their houses apart for specific reasons that they have to communicate to the authorities. 2. All non-essential services closed and production stops.
	Lockdown of refugee camps	Limitations to the population living in camps and/or camp like conditions.

Google released community mobility reports that show movement trends by region, across different categories of places. For each category in a region, reports show the changes in two different ways. Compares mobility for the report date to the baseline day. Calculated for the report date and reported as a positive or negative percentage. The reports chart movement trends over time by geography, across different categories of places such as retail and recreation, groceries and pharmacies, parks, transit stations, workplaces, and residential.

Table 2. Description of mobility reports categories

Category	Description	Data Source
Retail and recreation	Restaurants, cafes, shopping centres, theme parks, museums, libraries, and movie theatres.	Google
Grocery and pharmacy	Grocery markets, food warehouses, farmers markets, specialty food shops, drug stores, and pharmacies.	Google
Parks	National parks, public beaches, marinas, dog parks, plazas, and public gardens.	Google
Transit stations	Public transport hubs such as subway, bus, and train stations.	Google
Workplace	Places of work.	Google
Residential	Places of residence.	Google

3. RESEARCH RESULTS

Using anonymous data provided by apps like Google Map, the company has created a regularly updated dataset that shows how people's movements changed during a pandemic. This data set measures the number of visitors to certain categories of places on a daily basis and compares this change to the starting day before the outbreak. Baseline days represent the normal value for that day of the week, which is given as the average over five weeks from January 3 to February 6, 2020. To make this easier to understand, we converted the raw data, from January 17, 2020 to August 17, 2021, to the current average of seven days as shown in the data in the following graphs.

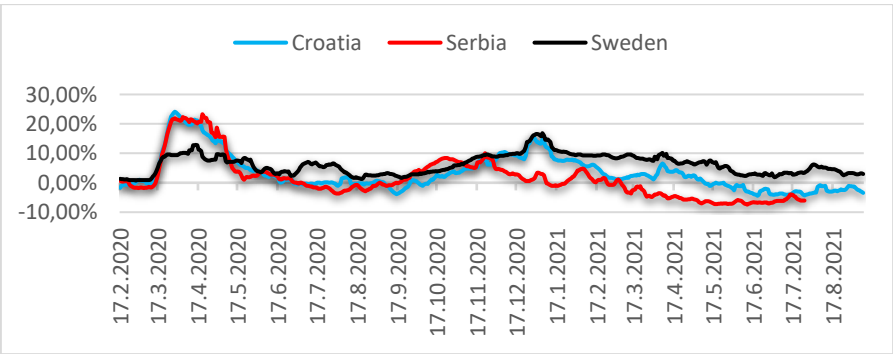

Figure 1. Mobility Trends to residential areas [4]

Data in the Figure 1 displays mobility trends to residential areas according to which a significant increase in the number of visitors to residential areas is visible after March 11, 2020 when the World Health Organization declared the outbreak of a new coronavirus (Covid-19) a global pandemic. Sweden's strategy to manage the spread of Covid-19 did not include any form of locking, unlike the approach adopted by most other countries like Serbia and Croatia. Which is evident in the first few months towards mobility to residential areas compared to other countries. Instead, the strategy is largely based on strong recommendations for society. Although Sweden did not have any form of locking, the Covid-19 pandemic over a relatively short period of time brought about changes in society, significantly disrupting daily life.

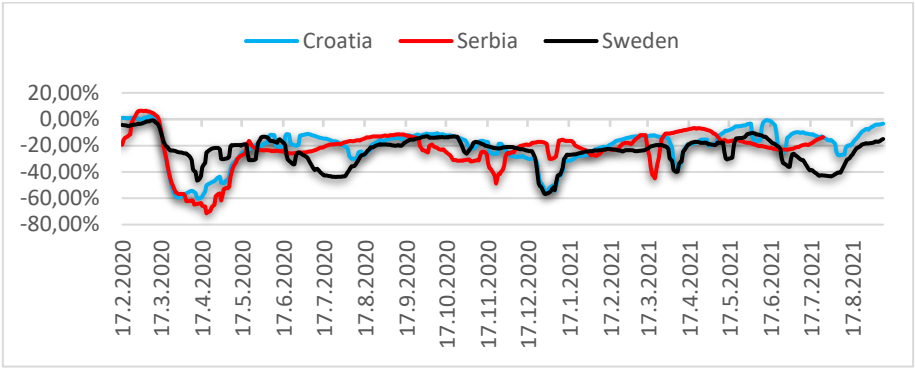

Figure 2. Mobility Trends to workplace areas [4]

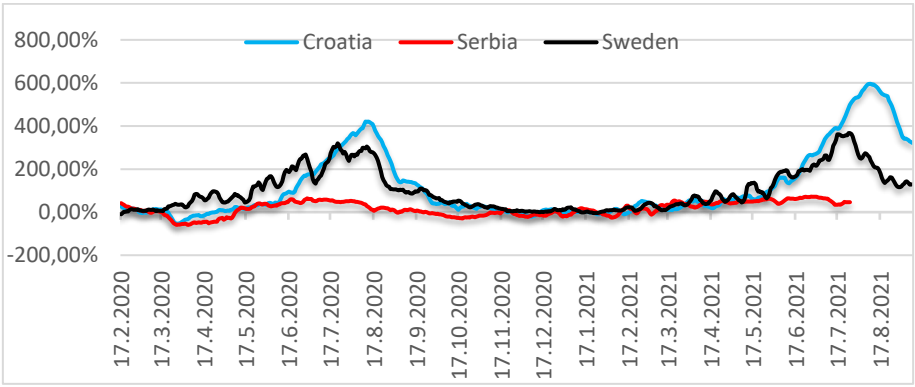

Figure 3. Mobility Trends to parks and outdoor areas [4]

People increase their activity at home and reduce their mobility in workplaces in the early months. Results confirm the conjecture and show that, in the early stage of the pandemic, workers in the subsectors reduce their activities in workplaces and increase their activities at home when the number of new daily cases increases. This suggests that people tend to increase their activities at home and reduce their

activities in the workplace. Until the pandemic, housework was generally considered a non-standard, flexible work arrangement, where the workplace was the employer's place. Of course, during the pandemic, employees worked from home out of necessity rather than by choice, and the formalized flexible work requirement regime fell to some extent. Many employers are also considering a long-term reduction in office space and moving to hybrid work, allowing employees to split their time between working from home and working in the office.

Previously mentioned reduction of epidemiological measures leading to increased mobility of driving and walking which reaches its maximum in August 2020 and 2021 due to the large number of tourists. At the end of September and the beginning of October 2020, the number of infected people will increase, so measures will be reintroduced, such as the suspension of classes in schools and colleges, restaurants and cafes will be closed, and restrict the public events, which leads to a sharp decrease in mobility shown in the chart.

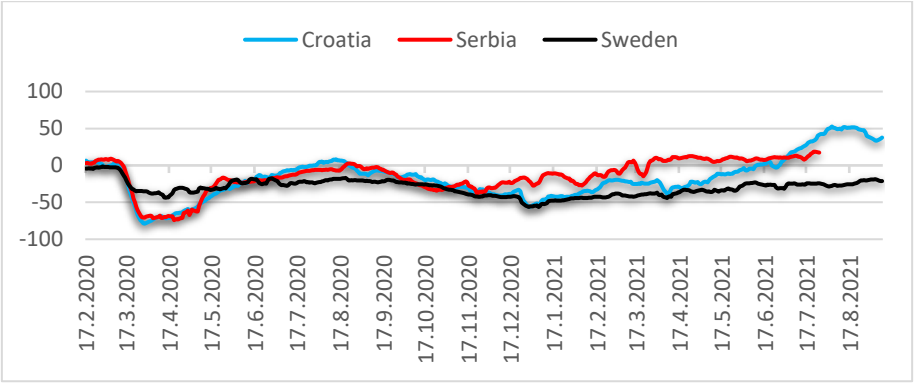

Figure 4. Mobility Trends to transport stations areas [4]

On March 21, 2020, the Croatian National Headquarters issued a decision to strictly limit detention on the streets, squares and other public places, as well as a decision to suspend public transport in order to prevent an increase in the number of infected people. Intercity lines for trains and buses are also being cut off. Public transportation in Sweden was operating and the borders to most EU countries remained open. Swedish spent less time home compared to other Europeans during the Covid-19 crisis. In Sweden, most policy measures announced by the authorities were mainly recommendations.

Comparison is made in the table below of the collected data in the Republic of Croatia, Republic of Serbia stronger restrictions and Kingdom of Sweden which had very mild measures during a pandemic [6].

Table 3. Review of absolute and relative changes in visits by all categories

Category	Country	Observed period		Absolute Change	Relative Change
		Feb 17, 2020	Sep 09, 2021		
Retail Recreation	Croatia	9.33 %	39.43 %	+30.10 %	+322 %
	Serbia	8.00 %	16.29 %	+8.29 %	+104 %
	Sweden	-4.00 %	1.86 %	+5.86 %	+146 %
Grocery & Pharmacy Stores	Croatia	3.67 %	54.71 %	+51.05 %	+1,392 %
	Serbia	-2.00 %	35.86 %	+37.86 %	+1,893 %
	Sweden	-3.33 %	6.71 %	+10.05 %	+301 %
Public transport stations	Croatia	6.33 %	37.57 %	+31.24 %	+493 %
	Serbia	3.00 %	17.29 %	+14.29 %	+476 %
	Sweden	-4.33 %	-21.29 %	-16.95 %	-391 %
Parks and outdoor spaces	Croatia	26.33 %	320.43 %	+294.10 %	+1,117 %
	Serbia	42.33 %	46.43 %	+4.10 %	+10 %
	Sweden	-10.00 %	129.14 %	+139.14 %	+1,391 %
Workplace	Croatia	1.00 %	-3.29 %	-4.29 %	-429 %
	Serbia	-19.33 %	-13.57 %	+5.76 %	+30 %
	Sweden	-4.33 %	-15.00 %	-10.67 %	-246 %
Residential	Croatia	-1.67 %	-3.43 %	-1.76 %	-106 %
	Serbia	0.67 %	-6.00 %	-6.67 %	-1,000 %
	Sweden	1.33 %	3.00 %	+1.67 %	+125 %

The analysis suggests that lockdown have the strongest causal impact on increasing presence at home and reducing visits to workplaces, public transport hubs, grocery, pharmacies, open public spaces. The impact of public services closure and schools closure is significant but of a smaller magnitude. Results indicate that the most effective COVID-19 policies for reducing mobility are the public services and facilities closures, the partial lockdown and the full lockdown.

4. CONCLUSION

During the first wave of the pandemic, mobility plummeted across Europe. The effect was stronger in countries with stricter closure policies, while countries with policy-oriented or partial closures also significantly reduced mobility. The Covid-19 disease pandemic has so far had an unprecedented impact on transport in general, but on the sector as a whole, the consequences of which are being felt in the reduced number of passengers, and thus the financial consequences. A clearly visible side effect of the Covid-19 pandemic is less need for daily mobility. This can mainly be

attributed to the expansion of teleworking, restrictions on movement imposed in countries and a declining sense of security in public transport. Long-term changes in teleworking or virtual mobility can result in temporal changes, including less frequent travel. Improving the accessibility of cycling and walking could improve traffic safety, health and the environment. During the pandemic, many cities began to expand their existing cycling and walking infrastructure, first as temporary solutions, only to gradually, wherever possible, make them permanent. Continuing the trend, many regulators will focus on environmental issues when adopting mobility guidelines. Urban mobility and, in particular, its management are going through a period of profound change to making sustainable mobility possible in towns and cities. After the COVID-19 pandemic, we valued life with better air quality and less noise. Restrictions on movement have shown us the extent to which our neighborhood streets and public spaces are essential to community cohesion. By suddenly entering the “new normality” we have learned the hard way that changing behavior at the community and individual level can happen at a much faster pace than we thought.

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