# Box 2.2

The Relationship Between Vaccination, Mobility and Card Spending: A Regional Analysis

As of 1 June, vaccination rates for the first and second doses were 19.7% and 14.9 %, respectively, compared to the total population in Turkey, while these rates reached 64.4% and 55.2% on 14 October. On a regional basis, the vaccination rate of the population remains high, especially in highly-populated provinces (Chart 1). Progress in vaccination is expected to support economic activity along with increased mobility. As a matter of fact, data at the regional level for Turkey point to a positive relationship between accelerated vaccination and increased mobility (Chart 2).
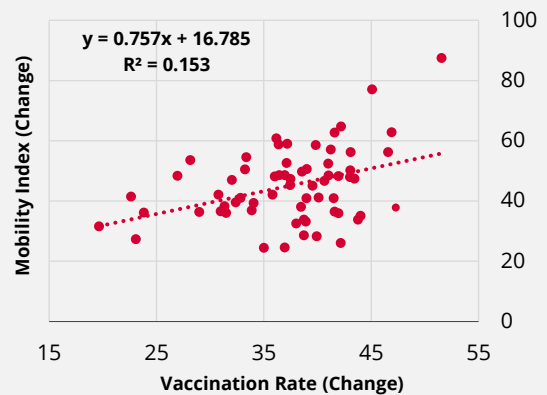
Chart 1: Vaccination Rate* (%)
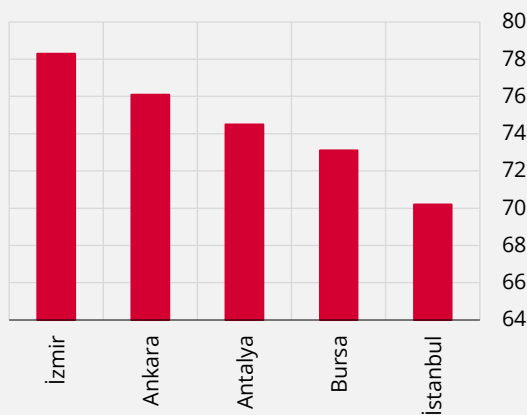
Source: Ministry of Health.
* Percentage of population aged 18 years and above who had at least two doses administered as of 14 October 2021. The five provinces with the highest population are shown in the chart.

Chart 2: Relationship between Vaccination and Mobility*
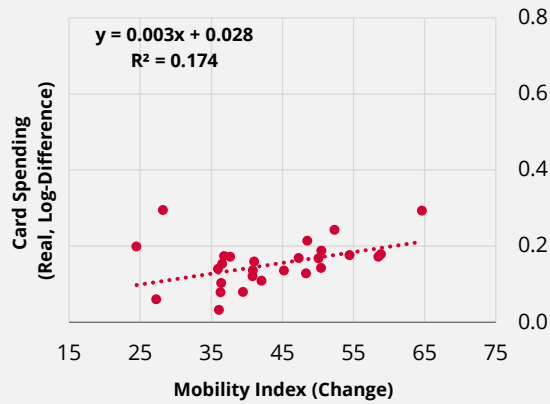

$y = 0.757x + 16.785$
$R^2 = 0.153$

Source: Ministry of Health, Google.
* The mobility sub-indices for 81 provinces and one dose of vaccines administered as a percentage of the population are compared for the June-September and the January-May periods of 2021.

In the third quarter of 2021, the positive performance in the vaccination rollout and the increase in mobility led by the reopening brought about a faster recovery in the services items that were most severely affected by the pandemic. In this context, a co-analysis of mobility and card spending data at a provincial level indicates that card spending increased more strongly in regions where added value from services is relatively higher (Charts 3 and 4).

Chart 3: Mobility and Card Spending in Provinces with Relatively Low Services Value Added*

y = 0.003x + 0.028
R² = 0.174

Card Spending (Real, Log-Difference)

Mobility Index (Change)

Chart 4: Mobility and Card Spending in Provinces with Relatively High Services Value Added*

y = 0.009x - 0.227
R² = 0.617

Card Spending (Real, Log-Difference)

Mobility Index (Change)

Source: CBRT, Google.

Source: CBRT, Google.

* Changes in mobility and real card spending between June-September and January-May in provinces where the ratio of service added value to gross provincial product is below or above the median value of all 81 provinces. Vertical axis ranges are kept the same to allow for comparison.
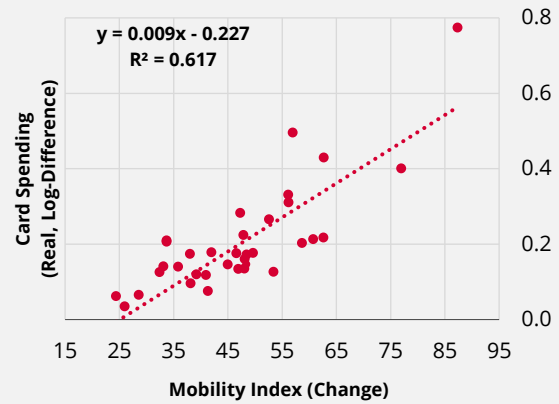
This box aims to quantify the extent to which the relationship between card spending and mobility differs depending on the weight of the service sector in the economy. In this context, the determinants of the change in card spending for Turkey in the January-September period of 2021 are estimated with the model (1) using the monthly number of cases, doses of vaccines administered and mobility indicators at the provincial level.

$$\Delta Card_{it} = c + \alpha \Delta Mobility_{it} + \gamma (DSVA_t * \Delta Mobility)_{it} + \beta \Delta Vacc_{it} + \delta \Delta (Cases)_{it} + \sigma_i + \tau_t + \varepsilon_{it} \qquad (1)$$
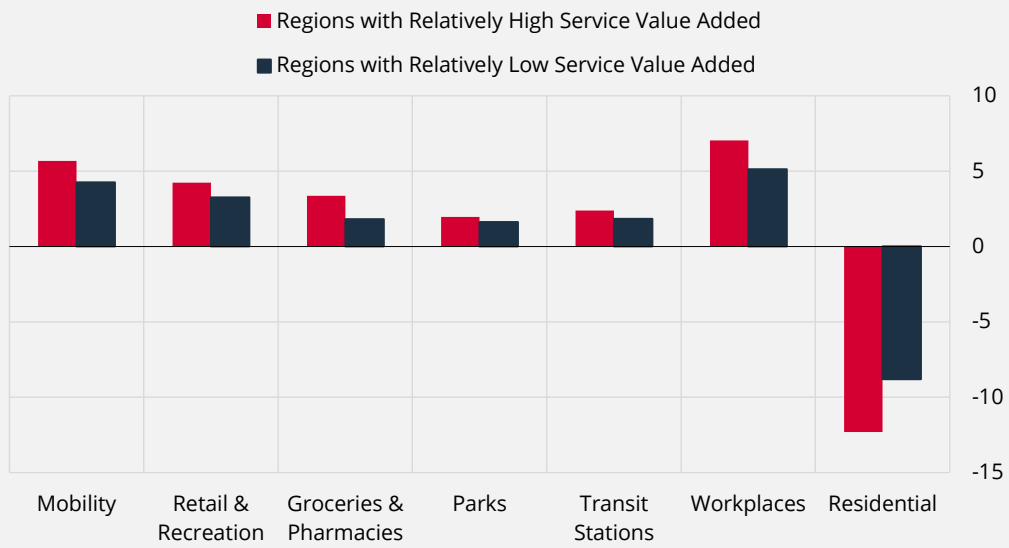
In this model, card spending (*Card*) is the dependent variable and the Google mobility index *(Mobility)*, one dose of vaccines administered by the provinces as a share of their population (*Vacc*), and the number of cases per hundred thousand people (*Cases*) are the explanatory variables. Panel unit, *i*, denotes the provinces, while time unit, *t*, stands for months. σ_i and τ_t represent the panel-fixed effects and time-fixed effects, respectively. ε_{it} is the idiosyncratic error term. The first difference (Δ) of all variables is taken, while card expenditures are transformed into logarithms. $DSVA_t$, is a dummy variable that takes the value 1 if the share of services (trade, transportation, accommodation and food service activities) value added in the gross product of the provinces is above the median value for 81 provinces, and 0 otherwise. In this framework, provinces are divided into two: regions with relatively high and low services sector value added.

Estimation results suggest that the relationship between mobility and card spending is statistically significantly stronger in regions where the services sector has a larger share (Chart 5).[1] While a 10%-increase in mobility in provinces with relatively less services value added increases real card spending by approximately 4.3% on average, a similar rise in mobility in provinces with a larger share of services-related activities in the regional economy, generally in those provinces with relatively substantial tourism and trade activities, increases the card spending by 5.7%. Findings are similar for the sub-items of the mobility indicator. The observation that a rise in residential mobility reduces the real card spending more in the provinces witha larger share of the services sector is also consistent with expectations given that the service-related expenditures are predominantly made outside residences.

Results suggest that when the progress in vaccination and the increase in mobility are evaluated together, the gains in vaccination in Turkey enhance economic activity, especially in the services-related sectors, by improving mobility. In this context, the acceleration of domestic vaccination rollout facilitates the recovery in services, tourism, and related sectors, which have been adversely affected by the pandemic, and leads to a more balanced composition in economic activity.

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[1] When evaluated according to the share of industry value added, there is no statistically significant effect.

Chart 5: The Effect of 10 Percent Increase in Mobility Indicators on Real Card Expenditures* (%)

■ Regions with Relatively High Service Value Added
■ Regions with Relatively Low Service Value Added

* The difference between the effect of mobility indicators on card expenditures in provinces with relatively high services value added and in provinces with less intensive services value added is statistically significant.