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The COVID-19 pandemic, daily mobility and household welfare: Evidence from Tajikistan

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ABSTRACT

The COVID-19 pandemic has posed severe restrictions on daily mobility for people globally. We use a monthly household panel dataset that covers a period both before and after the outbreak began to examine the impact of COVID-19 on daily mobility and household welfare in Tajikistan. The feature of our dataset is that it contains information on daily mobility for those traveling by vehicle along with their travel purposes. We provide several new findings. First, the impact of the pandemic on daily mobility was limited in Tajikistan, in contrast with the evidence from other countries. The pandemic discouraged motorized travel for family-related purposes in all income groups while keeping other vehicle travel intact for reasons such as work and shopping under the country’s lenient travel restrictions. Second, the effects of concerns about the pandemic were not uniform across all vehicle travel when different purposes are taken into account. People who were very concerned about the pandemic were more likely to refrain from motorized travel for family-related purposes. Third, refraining from travel for family purposes exacerbated food insecurity, implying that the safety net provided by family members and relatives was hampered by the limited ability to travel during the pandemic.

Introduction

Daily mobility is essential to complete ordinary daily activities, manage economic opportunities, maintain family and social networks, and enhance human capital. In order to facilitate such activities, many efforts have been devoted to ensuring substantial public investment to develop road and transport infrastructure. This is especially the case for developing countries, which are more dependent on motorized mobility in the form of informal vehicle transport such as minibuses and shared taxis, given the underdeveloped infrastructure of other transport modes such as railways.

Tajikistan, a landlocked and mountainous country located in the Central Asia, is no exception in that it requires the development of better quality transport infrastructure to maintain economic activities (employment, shopping, sales), family and social networks (weddings, funerals, and visits to relatives) and human capital investment (schools and hospitals). In these cases, the outbreak of the Coronavirus disease 19 (COVID-19) pandemic has affected economic, social and human capital activities through possible changes in daily mobility.

This study provides new evidence regarding the impact of the COVID-19 pandemic on vehicle travel and its consequences for household welfare in Tajikistan. Since the impact is plausibly heterogeneous across travel purposes, we carefully examine the impact of any travel restrictions on household welfare by travel motivation, an area that has hitherto not been well explored. To do so, we use a high-frequency household panel dataset that covers the period both before and after the outbreak. A feature of our dataset is that it contains information on daily mobility in terms of travel modes and their purposes. We link these travel-related variables to a variety of household and individual demographics along with their living areas, which enables us to examine the socioeconomic factors associated with motorized travel. Next, we detect any changes caused by the COVID-19 pandemic and explore consequences for household welfare.

Tajikistan officially confirmed its first case of COVID-19 at the end of April, much later than in surrounding countries. The government was reluctant to take strong measures to circumvent the pandemic. Compared to other Central Asian countries that introduced lockdowns, such as Kazakhstan, Mongolia and Uzbekistan, Tajikistan did not send...
cities into lockdown, allowing people to continue commuting to their places of employment. They were also permitted to undertake errands and household tasks, although staying at home and remote work were generally recommended. The country also imposed fewer strict restrictions on movement across its international borders. As a result, Tajikistan is classified as the second-lowest among the six Central Asian countries in terms of the responsiveness of its policies against the COVID-19 pandemic (OECD, 2020, Table 1).

Even after the first case was officially declared at the end of April, Tajikistan did not impose a total lockdown but instead pursued a more relaxed approach. The cumulative number of confirmed cases and the number of reported deaths as of the end of 2020 were much smaller than other Central Asian countries, although they are considered to be underestimated. However, the relatively small number of confirmed cases and the lenient restrictions on travel do not indicate that Tajik people were unaffected by the pandemic from the viewpoint of daily mobility. It is reported that the pandemic was detrimental to vulnerable groups such as women, youth, migrant laborers, and people with disabilities and the negative effect of social factors on women’s mobility, education, and skills was exacerbated after the outbreak began (UNDP, 2020). In this study, we provide new evidence on the impact of COVID-19 on daily mobility in Tajikistan, focusing on vehicle mobility. We aim to contribute to the literature by adding new insights empowered by our unique dataset.

First, we provide new evidence on the impact of the pandemic on mobility and resultant household welfare in a country with a lenient lockdown policy in Central Asia, an area that has not previously been well explored. Despite the growing body of literature on the impact of lockdown policies during the COVID-19 pandemic, there are wide differences in the volume of the literature on specific regions, with few studies so far on COVID-19-related mobility and welfare policies in Central Asia.

Second, our study uses household-level monthly panel data that covers a period both before and after the outbreak began to examine the “with COVID” period up to the second quarter of 2021. We explore the impact of COVID-19 on daily travel by detecting any changes in seasonal patterns for a variety of outcomes caused by the new pandemic. To our knowledge, there has been a small volume of research that examines the effect of the pandemic using a dataset collected both before and after the outbreak began (Bhaduri et al., 2020; Mogaji, 2020; Shamshirpour et al., 2020; Bonaccorsi et al., 2020; de Haas et al., 2020). Moreover, the high frequency improves the efficiency of econometric estimates by correcting unobserved factors and addressing endogeneity using exogenous shocks to households.

Third, our survey data hold some salient features that are absent from typical datasets used in the transportation literature. Our dataset is advantageous over large-scale datasets generated by machines, such as mobile phones, which have been used in studies such as Lee et al. (2020) and Sadowski et al. (2021), since our data can capture important attributes of households and individuals. Moreover, our dataset is comprised of high-frequency panel data able to collect both location information and household/individual attributes at multiple times. These features are advantageous over person-trip research data typically used in making urban master plans, as it combines precise location information with the attributes of households and individuals. We are able to link travel modes and purposes with household attributes and welfare variables, and we can examine the impact of behavioral changes in travel on household welfare while controlling for household attributes.

This paper comprised of the following sections. Section 2 provides a brief literature review of similar relevant studies. Section 3 presents the materials and methods used in this study, Section 4 presents and discusses the estimation results. Section 5 offers some conclusions, limitations of the current study, and possible areas for future research.

**Literature review**

There have been many studies on the impact of a various shocks on daily mobility. These are connected to regular habits and reproducible patterns (Bohte et al., 2009) but may be affected by restrictive measures such as a growing perception of disease risk (Law, 2006; Abdulkareem et al., 2020). In addition, it has been documented that the determinants of travel behaviors vary in relation to the purpose of travel (Dargay and Clark, 2012; Eldér, 2014), suggesting that daily travel patterns following a shock may differ according to the purpose of travel. In the case of the COVID-19 pandemic, social distancing may alter daily travel patterns, such as lowering demand for travel and decreasing the use of public transport, while walking and cycling may also be important measures to maintain health and well-being (De Vos, 2020).

Many papers have provided evidence on changes in mobility behavior during the pandemic. Some papers used datasets collected soon after the outbreak to show that primary travel significantly changed during the pandemic, and there was a significant shift from public transport to private transport and non-motorized modes (Abdullah et al., 2020, Barbieri et al., 2021). Socioeconomic inequality and morbidity are also related to the perceived risks of using transport modes (Barbieri et al., 2021). Lee et al. (2020) show that people voluntarily started to reduce mobility before many governments introduced an official mandate to stay home. Abdullah et al. (2021a) showed that females tend to rely more on public transport than males, even during the pandemic in Pakistan. Abdullah (2021b) is another example from Pakistan that investigated the determinants of the decision to use public transport during the pandemic. Some papers have focused on specific countries, comparing mobility before and after the outbreak of the pandemic to associate any changes in mobility to socioeconomic factors. Such studies were undertaken in India (Bhaduri et al., 2020), Nigeria (Mogaji, 2020), and the U.S. (Shamshirpour et al., 2020). However, most of these studies used a dataset collected retrospectively by asking the respondents how mobility was altered after the outbreak of the pandemic, an approach that is susceptible to some measurement issues (Hipp et al., 2020).

In addition, a few studies have examined the impact of lockdown policies on mobility using data covering both the pre- and post-outbreak periods. Using real-time human mobility data in Italy, the impact on mobility was stronger in municipalities with higher fiscal capacity, higher inequality, and lower income per capita (Bonaccorsi et al., 2020). Utilizing household-level panel data (the Netherlands Mobility Panel), it

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1 See Centre for Humanitarian Data (2021).
2 In Central Asia, Kazakhstan, Mongolia and Uzbekistan responded swiftly to the crisis, implementing strict confinement measures, closing borders and designing large support packages. They implemented further sanitary and fiscal measures as the crisis grew worse before progressively lifting them during the summer. Afghanistan and Kyrgyzstan reacted after a delay, partly due to their limited public capacities and slower, more complex policy processes. The scale of the response has been limited by the countries’ narrow fiscal space along with fast deteriorating public accounts and the amplified need for international emergency support. Turkmenistan reported few or no cases of COVID-19, and at the start of the pandemic, designed limited, focused policy measures before progressively developing more substantial measures over time, thereby following a similar path to Tajikistan.
3 UNDP (2020) also report that incomes from self-employment, migrant labor, and non-registered jobs largely declined as a result of the COVID-19 pandemic.
4 There are strands of studies investigating the impact of mobility restrictions on the development of the pandemic in the country. Sadowski et al. (2021) is an example that uses cross-country datasets from Google Mobility and Johns Hopkins University.
was found that 80% of people reduced their outdoor activities, 44% of workers increased working hours at home, and 30% had more remote meetings in the spring of 2020 (de Haas et al., 2020). Moreover, the number of trips and distance traveled dropped by 55% and 68%, respectively, and people became more positive towards traveling by car and far more negative towards public transport (de Haas et al., 2020). To the best of our knowledge, however, detailed accounts on the impact of the pandemic in relation to travel for different purposes are missing from the current literature. Restrictions due to the COVID-19 pandemic tend to only examine people’s travel patterns to determine whether it is essential or non-essential. Thus, this paper is one of the first case studies in this regard.

**Materials and methods**

We use monthly household-level panel data from a phone-based survey called the Listening to Tajikistan (L2TJK) survey (JICA-RI, 2019). The data is proprietary and belongs to the World Bank, which conducted the survey and was authorized and approved to do so by the Government of Tajikistan. The first 30 rounds were compiled by the World Bank between May 2015 and November 2017, and the subsequent rounds have been financed jointly by the World Bank, UNICEF, and the JICA Ogata Research Institute. The most recent survey month is June 2021. The first round of the survey was conducted in May 2015 and the JICA Ogata Research Institute. The most recent survey month is June 2021. The first round of the survey was conducted in May 2015 through face-to-face interviews using long questionnaires on household and individual characteristics. Frequent follow-ups were carried out afterward by telephone using a shorter questionnaire. These were administered by trained enumerators using CATI (Computer Assisted Telephone Interviews).

The sample of the survey is 800 households that were randomly drawn from a nationally representative survey consisting of 3,000 households in 2015. In each round, the respondents were asked to provide information on a variety of household characteristics and their perception of food security and economic well-being. Note that most of the variables are collected at the household level, not at the individual level.

The feature of our dataset is that it has contained information on daily mobility since July 2017 and on the COVID-19 pandemic since April 2020. A respondent was asked whether any member of the household had used a motorized vehicle to go somewhere. Then, if any members undertook vehicle travel, the respondent was asked about the travel to the farthest destination, as well as its cost and purpose. The respondent was required to choose the purpose from "work", "visiting relatives", "leisure", or "other". Since a non-negligible share of purpose can be categorized as "other" along with a verbal description, we re-categorized the travel purposes into the following categories: family-related, market, hospital, work, administrative, leisure, migration, schooling, and other. Note that the question does not distinguish between the use of a privately owned car and informal public transport services such as minibuses or shared taxis. The questionnaire also covers the distance of the farthest travel on foot and the incidence of travel by train. However, we focus on vehicle travel in this paper because there was no discernible change in foot or train travel before or after the pandemic began.

Our research question focuses on how the COVID-19 pandemic adversely affected daily vehicle travel and household welfare by examining travel purpose, which has not previously been well-explored but is indispensable to a careful examination of household welfare. We perform three sets of regression analyses. We employ a standard empirical strategy to examine the impact of an exogenous shock while controlling for seasonal patterns before the shock took place. First, we formally confirm any impact of the COVID-19 pandemic on vehicle travel depending on its purpose. We employ the following specification to detect any changes in the seasonal pattern compared to regular years after the second quarter of 2020 when the pandemic started:

\[
y_{jt} = \sum_{C=0}^{1} \beta_C C_t + \sum_{n=1}^{12} \delta_n + \beta_{\text{Year2019}} + \mu_j + \epsilon_{jt} \tag{1}
\]

where \(y_{jt}\) is the outcome variable to take 1 if household \(j\) undertook a trip by vehicle in a round \(t\) (which falls in month \(m\)) and 0 otherwise. \(C\) indicates whether \(t\) is in a quarter from the first quarter of 2020 to the second quarter of 2021. \(\delta_n\) is a dummy variable for month \(m\), a fixed effect for month \(m\), to control for common seasonality across years. \(\mu_j\) is the household-level fixed effect. \(\text{Year2019}\) a dummy variable to take 1 for any observations in 2019. In Tajikistan, vehicle registrations have been rapidly increasing\(^6\). In the absence of major events that might plausibly affect vehicle use before 2020, it is reasonable to assume that the trend has continued until 2019. Thus, we include a year 2019 dummy in order to control for this trend effect.

Second, we focus on why households were less likely to travel by vehicle. We examine any factors related to COVID-19 that are associated with a lower frequency of motorized travel. We employ the following specification to explore these factors:

\[
y_j = \beta_1 \text{concern}_{jt} + \beta_2 \text{familiar}_{jt} + \beta_3 \text{contact}_{jt} + \beta_4 \text{closure}_{jt} + \lambda_i + \mu_j + \epsilon_j \tag{2}
\]

where \(y_j\) is the outcome variable to take 1 if household \(j\) undertook a trip by vehicle in a round round 0 otherwise. The main independent variables are perceptions of respondents in our survey. The first four covariates that had been collected since May 2020 are indicators to take 1 for households who are very concerned about the COVID-19 pandemic and 0 otherwise (concern\(_t\)), to take 1 for households who were very familiar with the details of COVID-19 and 0 otherwise (familiar\(_t\)), to take 1 for households whose family members had close contact with COVID-19 patients and 0 otherwise (contact\(_t\)), and to take 1 for households whose children’s school was closed and 0 otherwise (closure\(_t\)). We also included a time fixed effect \(\lambda_i\) to control for the common effect specific to round \(t\) (Year-Month). \(\mu_j\) and \(\epsilon_j\) are the parameters to be estimated.

Third, we examine the relationship between reduced motorized travel for family-related purposes and household-level outcomes, such as food security and subjective economic status, so that we can obtain indicative evidence on the welfare impact of travel reductions under the COVID-19 pandemic. Among the vehicle travel for different purposes, only travel for family-related purposes declined sharply after the outbreak. The network of family and relatives is important for households in developing countries to cope with shocks (Patchamps and Lund, 2003). This is also the case for Tajikistan, where a majority of households rely on family and relatives for financing in emergencies, obtaining information, and connections for livelihood strategies such as migration (JICA-RI, 2019). If the limitations on family-related travel restricted the family-relative network during the pandemic, the decline might have a negative impact on household welfare.

Since the survey asked respondents only the purpose of the farthest trip once a month, a month-by-month comparison showing the incidence of travel may not allow us to correctly capture whether family purpose travel declined from the previous month. Thus, we aggregate the household-level travel observations into a longer period before and after the outbreak began. We measure the change in the frequency of travel for family purposes before and after the outbreak of the pandemic using the ratio of the months reporting travel for family purposes during the pre-COVID-19 period (January 2018 to March 2020) and during the with-COVID-19 period (April 2020 to June 2021). We employ the

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\(^6\) The number grew from 289,000 in 2010 to 434,000 in 2015 (Asian Development Bank, 2018).
following specification to examine the impact:

\[ y_j = \alpha + \beta \Delta M_j + \theta y_{j0} + \gamma X_j + \epsilon_j \]  

(3)

where \( y_j \) is the outcome variables that are the share of months among all survey months that a household answered affirmatively to the following items; (1) whether a household was hungry but did not eat because there was not enough money or resources for food, (2) whether a household went without eating for a whole day because of the lack of money or other resources, (3) whether a household reduced health expenditures, and (4) whether a household perceived their own household as poor. The first two variables are related to food security, while the last two are associated with health and subjective economic condition. The main independent variable \( \Delta M_j \) is the change in the proportion of months with vehicle travel for family-related purposes before and after the beginning of the COVID-19 pandemic in the same household. In addition, we include some variables to stand for basic household characteristics to control for heterogeneity across households. \( X_j \) refers to a set of covariates measured in the pre-COVID-19 period to control for household characteristics such as gender, age, and educational attainment (secondary or above) of the head of household and the incidence of any migration as well as the number of college graduates among household members and dummy variables for each region. 

Results and discussion

Before commencing the regression analyses, we observe the trends of motorized travel before and after the pandemic. Figs. 1 to 4 depict the three-month average of the proportion of households that undertook vehicle travel in the past ten days across four categories of purpose (family-related, market, hospital or work) since the proportion is negligible for the other categories (administrative, leisure, migration, schooling and other). The proportion is shown across three income groups: the poorest (\(<25\%\)), the middle (25% to 75%), and the richest (75% or above). Before the outbreak of the pandemic, Tajikistan enjoyed stable economic growth as reflected by the upward trend in travel for market, work, or hospital purposes. The trend for market purposes shows a jump in the middle of 2019. While it is difficult to pin down the reasons for this jump, we confirmed that our main results are intact if we exclude the data from these three peak months.

Fig. 1 shows the proportion of motorized travel for family-related purposes, including visiting relatives, weddings/funerals, and for other occasions to meet family/relative members. We observe a distinct drop in vehicle travel at the beginning of the pandemic (May-July 2020). We should note that the drop is observed regardless of income level. We also observe a sharp recovery in the proportion of vehicle mobility for family-related purposes in the second half of 2020, and the recovery is

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7 There are five regions in Tajikistan; Urban, DRS, Khatlon, Sugd and Region GBAO.

8 According to the World Bank, Tajikistan kept stable GDP growth per capita of over 4% between 2016 and 2019.
higher for rich income groups without any clear changes after the outbreak of 2020 when the pandemic started. We observe that the proportion is stagnant in subsequent months. The reduced and lower proportion may be attributed to the outbreak of the pandemic. However, even under these lenient restrictions, households were less likely to undertake vehicle travel for family-related purposes. The decline may be reflective of increased health anxiety as well as social pressures to avoid “non-essential” travel, which is regarded as less urgent than the need to travel for employment, daily necessities, or medical emergencies.

Now, we turn to the regression analyses. Table 1 (A) reports the summary statistics of the variables used in the first analysis to examine the impact of the pandemic on mobility by vehicle controlling for the seasonal pattern prior to the outbreak. The proportion of households that undertook travel by motorized vehicle in the past 10 days is 54%. By purpose, the largest proportion is found in work purpose (17%), followed by family-related purpose (15%) and market purpose (11%). The share of hospital purpose is 7%.

Fig. 5 reports the share of purpose in vehicle travel by income category.

Fig. 5. Share of purpose in vehicle travel by income category.

What we have found so far is that the impact of the pandemic on motorized mobility is not uniform but dependent on the travel purpose. Next, we explore any factors associated with vehicle travel under the pandemic using Specification (2). Table 2 (A) reports the summary statistics of the variables used in the analysis. The proportion of households that were very concerned about the COVID-19 pandemic is close to half and that of households familiar with the COVID-19 pandemic is close to 60%. While a substantial proportion of households have a perception and knowledge of the negative impact of the pandemic, the proportion of households whose family members had any close contact with those infected with COVID is negligible at just 1% throughout the period after May 2020. In reality, most households did not encounter COVID-19 patients in their surroundings. However, social restrictions on daily life have become more common, as is evident in the higher incidence of school closures.

Table 2 (B) reports the estimation results of regression analyses using specification (2). Column (1) shows the result for vehicle travel for all purposes. It shows that households who are “very concerned about
COVID-19 are 10% less likely to undertake vehicle travel and households who are “very familiar with COVID-19” are 4.4% less likely to undertake motorized travel. Columns (2) to (5) report the estimation results by travel purpose. Columns (2) and (4) show that household who are “very concerned about COVID-19” are 2.7% less likely to undertake vehicle trips for family-related purposes and market purposes. Columns (3) and (5) that those households did not reduce travels for hospital purpose or work purpose. Moreover, household who are “familiar with the COVID-19 pandemic” are less likely to make motored trips only significant for work purpose.

In sum, we observe that households who are very concerned about the pandemic are less likely to undertake vehicle travel for family-
Table 3  
Impact of family-related vehicle travel on household welfare.

(A) Summary Statistics

| Variables                                      | Before COVID-19 | After COVID-19 |
|-----------------------------------------------|-----------------|----------------|
|                                               | N               | mean           | s.d.   | N               | mean           | s.d.   |
| **Mobility Variables**                        |                 |                |        |                 |                |        |
| ratio of months with travel                   | 597             | 0.589          | 0.253  | 597             | 0.552          | 0.309  |
| ratio of months with family travel            | 597             | 0.182          | 0.125  | 597             | 0.132          | 0.149  |
| ratio of months with work travel              | 597             | 0.168          | 0.184  | 597             | 0.187          | 0.243  |
| ratio of months with market travel            | 597             | 0.120          | 0.132  | 597             | 0.124          | 0.173  |
| ratio of months with hospital travel          | 597             | 0.0831         | 0.106  | 597             | 0.0713         | 0.113  |
| ratio of months with schooling travel         | 597             | 0.0151         | 0.0494 | 597             | 0.0144         | 0.0591 |
| **Welfare Variables**                         |                 |                |        |                 |                |        |
| Hungry but did not eat because there was not enough money or resources for food? | 597             | 0.0830         | 0.124  | 597             | 0.0470         | 0.114  |
| Went without eating for a whole day because of a lack of money or other resources? | 597             | 0.0686         | 0.111  | 597             | 0.0298         | 0.0872 |
| Reduced healthcare expenditure                | 597             | 0.211          | 0.183  | 597             | 0.330          | 0.359  |
| Perceives own HH as poor                      | 597             | 0.316          | 0.280  | 597             | 0.449          | 0.364  |

(B) Regression analyses (Food security)

| Variables                                      | (1) Hungry but did not eat | (2) Hungry but did not eat | (3) Hungry but did not eat | (4) Without eating for a whole day | (5) Without eating for a whole day | (6) Without eating for a whole day |
|-----------------------------------------------|---------------------------|---------------------------|---------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
|                                               | 0.0964**                  | 0.0809*                   | 0.128**                   | 0.101**                           | 0.0901***                        | 0.116***                         |
|                                               | (0.0433)                   | (0.0456)                  | (0.0497)                  | (0.0325)                          | (0.0344)                         | (0.0392)                         |
| Decline X Bottom 25%                          |                           |                           |                           |                                   |                                   |                                   |
|                                               | 0.233                      | 0.434*                    | 0.434*                    |                                   |                                   |                                   |
|                                               | (0.278)                    | (0.239)                   | (0.239)                   |                                   |                                   |                                   |
| Decline X Upper 75%                           |                           |                           |                           |                                   |                                   |                                   |
|                                               |                            |                           |                           |                                   |                                   |                                   |
| Before COVID Family Travel                    |                           |                           |                           |                                   |                                   |                                   |
|                                               |                            |                           |                           |                                   |                                   |                                   |
| Constant                                      |                           |                           |                           |                                   |                                   |                                   |
|                                               |                            |                           |                           |                                   |                                   |                                   |
| Observations                                  | 597                        | 597                       | 597                       | 597                               | 597                               | 597                               |
| R-squared                                     | 0.386                      | 0.388                     | 0.389                     | 0.354                             | 0.358                             | 0.355                             |

(Note) Standard errors clustered at the level of household are in parentheses. 

The control variables in Table 3(A) are included in the estimation. 

*** p < 0.01, ** p < 0.05, * p < 0.1.

(C) Regression results (Health and wellbeing perception)

| Variables                                      | (1) Reduced healthcare spending | (2) Reduced healthcare spending | (3) Reduced healthcare spending | (4) Own household as poor | (5) Own household as poor | (6) Own household as poor |
|-----------------------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------|---------------------------|---------------------------|
|                                               | 0.200                           | 0.154                           | 0.142                           | 0.202*                   | 0.301**                   | 0.168                     |
|                                               | (0.139)                         | (0.152)                         | (0.146)                         | (0.116)                  | (0.122)                   | (0.134)                   |
| Decline X Bottom 25%                          |                                 |                                 |                                 |                           |                           |                           |
|                                               |                                 |                                 |                                 |                           |                           |                           |
| Decline X Upper 75%                           |                                 |                                 |                                 |                           |                           |                           |
|                                               |                                 |                                 |                                 |                           |                           |                           |
| Before COVID Family Travel                    |                                 |                                 |                                 |                           |                           |                           |
|                                               |                                 |                                 |                                 |                           |                           |                           |
| Constant                                      |                                 |                                 |                                 |                           |                           |                           |
|                                               |                                 |                                 |                                 |                           |                           |                           |
| Observations                                  | 597                             | 597                             | 597                             | 597                       | 597                       | 597                       |
| R-squared                                     | 0.498                           | 0.499                           | 0.504                           | 0.641                     | 0.643                     | 0.641                     |
related or market purposes, while households who are very familiar with the pandemic are less likely to undertake a motorized trip for a work-related purpose. For family-related travel, the reduction is associated with both household-level health concerns and community-level restrictions and the former seems to be more pronounced.

Now, we turn to the impact of reduced vehicle travel for family-related purposes, which registered the largest decline under the pandemic, using Specification (3). Table 3 (A) reports the summary statistics of the variables used in the estimation. We redefine the variables related to vehicle mobility as the share of months in which a household undertook vehicle travel before the outbreak of the pandemic (January 2018 to March 2020) and after (April 2020 to June 2021). We recalculated the frequency of vehicle trips since our survey data record any travel by vehicle within the ten days before survey and may be susceptible to measurement errors. The basic pattern of vehicle travel is similar to Table 1 (A). Turning to the welfare variables, we examine three variables related to food security and the household’s own perception of economic conditions, which are basic for living standards, as explained above: (1) share of months in the with-COVID-19 period in which a household’s members had an experience of feeling hungry but were unable to eat because of a shortage of money, (2) share of months with an experience of going without food due to lack of money or other resources, (3) share of months that a household had to reduce healthcare expenditure, and (4) the share of months that a household described their household as “poor”. Lastly, we include some covariates in the regression using the variables collected before the outbreak. The proportion of households living in urban areas is slightly larger than 20%. We created two income groups for whose income level is the lowest quartile (<25%) and the highest quartile (top 25%). The share of households whose head is female is 12%, and the average age of the head of household is 39 years old. The proportion of households whose head attained a secondary or above education is 64%, and that of head of household is 39 years old. The proportion of households whose head undertaken a secondary or above education is 64%, and that of households with a member who graduated from college is 21%.

Table 3(B) reports the estimation results for food security. We control for the lagged dependent variable, a dummy variable for households living in urban areas and dummy variables for each region for all re-
gressions. First, Columns (1) to (3) report the results on the impact of reductions of family-related travel on food security in terms of being hungry without eating. Column (1) shows that households that reduced family-related travel are more likely to be hungry without eating by 9.6%. Column (2) shows the coefficients when an interaction term between “decline” and “bottom 25%” is included. The result is comparable with Column (1). Column (3) shows the coefficients when an interaction term between “decline” and “top 25%” is included. Since the size of both coefficients is comparable, a decline in vehicle travel for a family-related purpose did not increase the portion of hungry without eating for the richest group. In other words, a decline in vehicle travel under the pandemic enhanced the probability of being hungry without eating for poorer households since those households might often receive food from relatives and friends to support their food security. A reduction in travel due to a fear of the pandemic exposed poorer households to the danger of food insecurity.

Second, Columns (4) to (6) report the results of the impact of a reduction of family-related travel on food security in terms of going without eating for a whole day. The basic pattern in the coefficients is similar to that in Columns (1) to (3). Column (4) shows that households that reduced family-related travel are more likely to go without eating for a whole day by 10% in Column (4). Columns (5) and (6) show the coefficients are intact when an interaction term between income groups is included, and a decline in vehicle travel for a family-related purpose increased the portion of those hungry without eating for a whole day. These observations on food security suggest that the support network from family and relatives might have become less functional as a result of the reduced chance of face-to-face meetings. We acknowledge that we do not causally identify the impact of the reduced travel since an unobserved decline in income or other economic resources might have caused both travel reductions and food shortages.

Third, Table 3 (C) reports the results on the impact of the reduction in health expenditures and perceptions of the household’s own economic condition. Columns (1) to (3) report that family-related travel reduction is not significantly associated with health expenditure while Columns (4) to (6) report that family-related travel reduction is negatively associated with subjective perceptions of the household economic condition to be poor except for the bottom 25% group, who were already poor before the COVID-19 pandemic started.

Conclusions

The COVID-19 pandemic has posed severe restrictions on the daily mobility of people around the world. We use a monthly household panel dataset that covers a period both before and after the outbreak began to examine the impact of COVID-19 on daily mobility and household welfare in Tajikistan. We provide several new findings. First, the impact of the pandemic on daily mobility was limited, in contrast with the evidence from other countries. The pandemic discouraged motorized travel only for family-related purposes in all income groups under the country’s lenient travel restrictions. Second, the impact of concerns about the pandemic is not uniform across vehicle travel for different purposes. People who are very concerned about the pandemic are more likely to refrain from motorized travel for family-related purposes. Third, abstaining from family-related travel exacerbated food insecurity, probably implying that safety networks through family members and relatives have been hampered by limited mobility during the pandemic.

We found a negative impact of the COVID-19 pandemic on travel and its consequences in Tajikistan where formal travel restrictions have been lenient. Our findings suggest that a prevailing perception of risk voluntarily alters travel behavior, which is coincident to the previous literature. In particular, we reveal that the travel reduction during the pandemic is associated with lower household wellbeing. We identified that daily travel for informal purposes has decreased without a strict restriction policy and has negatively affected household welfare especially for food security. Policymakers should be aware of the hidden social costs of the pandemic regardless of the strength of travel restriction policies.

At the same time, we acknowledge some limitations of this study. First, our dataset only records the farthest travel on foot and the incidence of travel by train. A more complete travel record would be useful in providing more precise estimates. Second, we proceeded with our analyses at the household level, which did not allow us to examine the impact of the pandemic at the individual level. A more nuanced investigation would be possible if it were empowered by an individual-level dataset. Third, we explored the immediate impact of the pandemic. Further research should explore the consequences of the pandemic in the longer-run so that we can inform policy makers of vulnerable groups to target in a case of large negative shocks on travel.

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CRediT authorship contribution statement

Eiji Yamada: Conceptualization, Methodology, Formal analysis.
Satoshi Shimizutani: Conceptualization, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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