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Development for the CAREC region
"**

TRADE FACILITATION, INFRASTRUCTURE AND INTERNATIONAL TRADE IN CENTRAL ASIAN COUNTRIES

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ADB

BACKGROUND

- Infrastructure is important factor for increasing international trade flows
- Increasing role of soft infrastructure along with the hard infrastructure
 - Significance of the quality of infrastructure and logistics for trade facilitation
 - “Border costs”
- Central Asia is a remote region that suffers from comparatively poor transport logistics.
- Large investments in infrastructure have been made over the past decade
- Soft infrastructure that addresses the slow flow and high costs of inbound and outbound international trade across the region is also critical to achieving greater trade facilitation.
- Only a limited number of such studies focus on Central Asian countries



Empirical studies on Central Asia

- There are only a few studies on Central Asian countries
 - Given the landlockedness of these countries improvement of border crossings is important and positively affects international trade flows in the region (Raballand, 2003; Grigoriou, 2007; Tanabe, Shibasaki, and Kato, 2016)
 - Studies using CPMM by ADB
 - [Kim, Mariano and Abesamis \(2022\)](#) - positive impact of reduction of time at the inbound border on trade among CAREC countries;
 - [Kim, Abesamis and Ardaniel \(2022\)](#) - mobility restrictions during the COVID-19 mostly affected the outbound border crossing points (BCPs) than the inbound;
 - [Karymshakov and Sulaimanova \(2021\)](#) - infrastructure development has had a positive but diminishing effect on international trade of three CA countries;
 - [Samad, Masood and Ahmed \(2023\)](#) - the structural and spatial gravity models approach
 - [Sharafeyeva \(2023\)](#) - uncertainties in exporting time negatively impact on exports of perishable agricultural products, whereas high export costs are significant for textile and apparel commodities.



OBJECTIVE

- What is the impact of infrastructure and trade facilitation on international trade of Central Asian countries (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan) with other CAREC member countries?
- It sheds light on the complementarity of physical infrastructure development and efforts to facilitate trade
- Contribution to earlier limited empirical evidence on Central Asian countries

DATA

- Empirical analysis is based on the panel data for five Central Asian countries with other CAREC countries as trade partners for the period of 2010-2020 years.
- Data sources:
 - Direction of Trade Statistics - IMF
 - CEPII (Le Centre d'études prospectives et d'informations internationales)
 - Asian Development Bank
 - World Bank
 - Publications of the national statistical authorities



Infrastructure index

- Following Francois & Manchin (2013) principal component analysis is used based on:
 - fixed broadband subscriptions (per 100 people)
 - mobile cellular subscriptions (per 100 people)
 - Heavy railway routes (kilometers)

One of the main components of the infrastructure is roads. However, due to data limitations roads or paved roads are not included in the index.

Table 1: Infrastructure Index—Principal Components with Weighting Factors

<i>Infrastructure in countries of origin—Five Central Asian countries studied^a</i>	
Fixed broadband subscriptions (per 100 people)	0.5754
Mobile cellular subscriptions (per 100 people)	0.4891
Heavy railway routes (kilometers)	0.6555
Eigenvalue	2.0137
Cumulative proportion	0.6712

<i>Infrastructure in destination countries—Six other CAREC countries^b</i>	
Fixed broadband subscriptions (per 100 people)	0.5754
Mobile cellular subscriptions (per 100 people)	0.4891
Heavy railway routes (kilometers)	0.6555
Eigenvalue	1.61526
Cumulative proportion	0.5384

^a Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan.

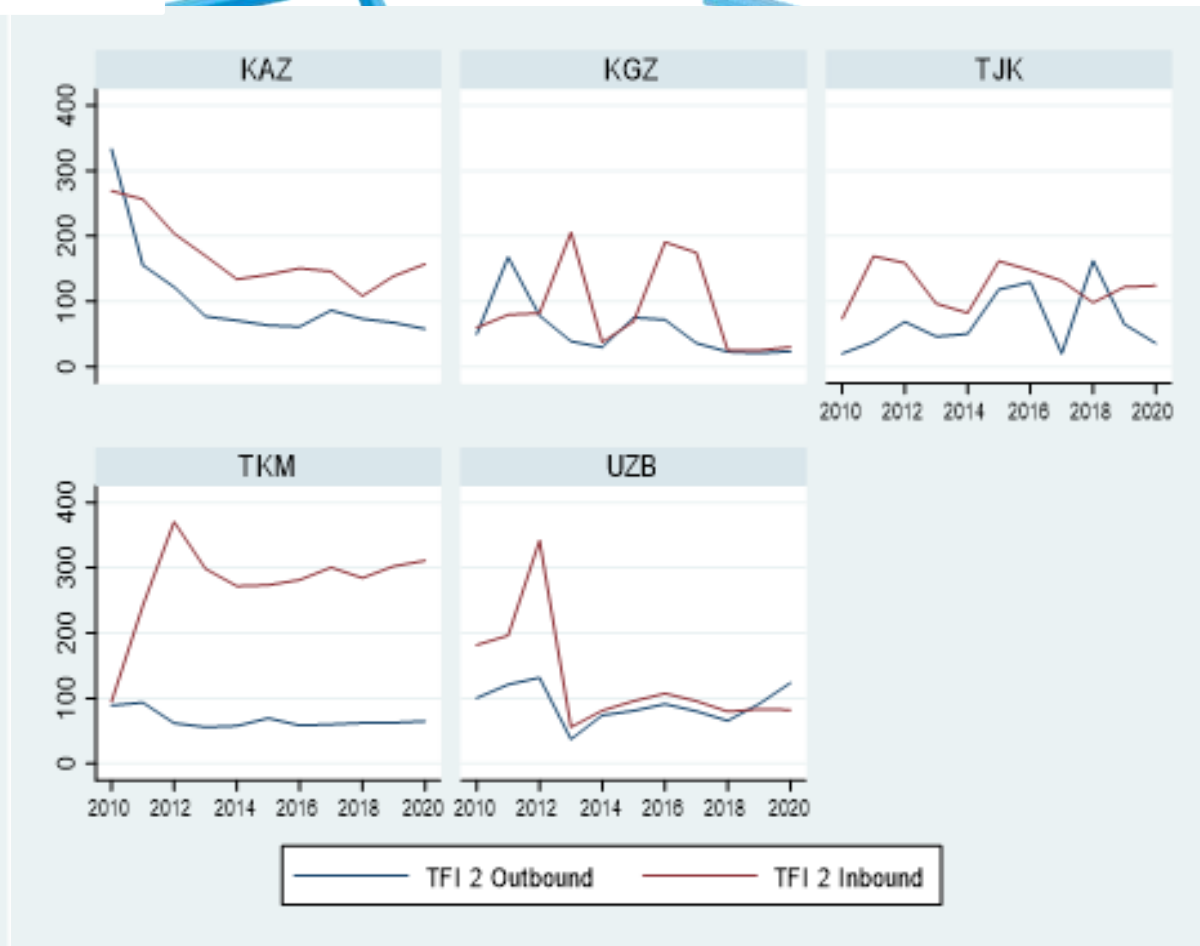
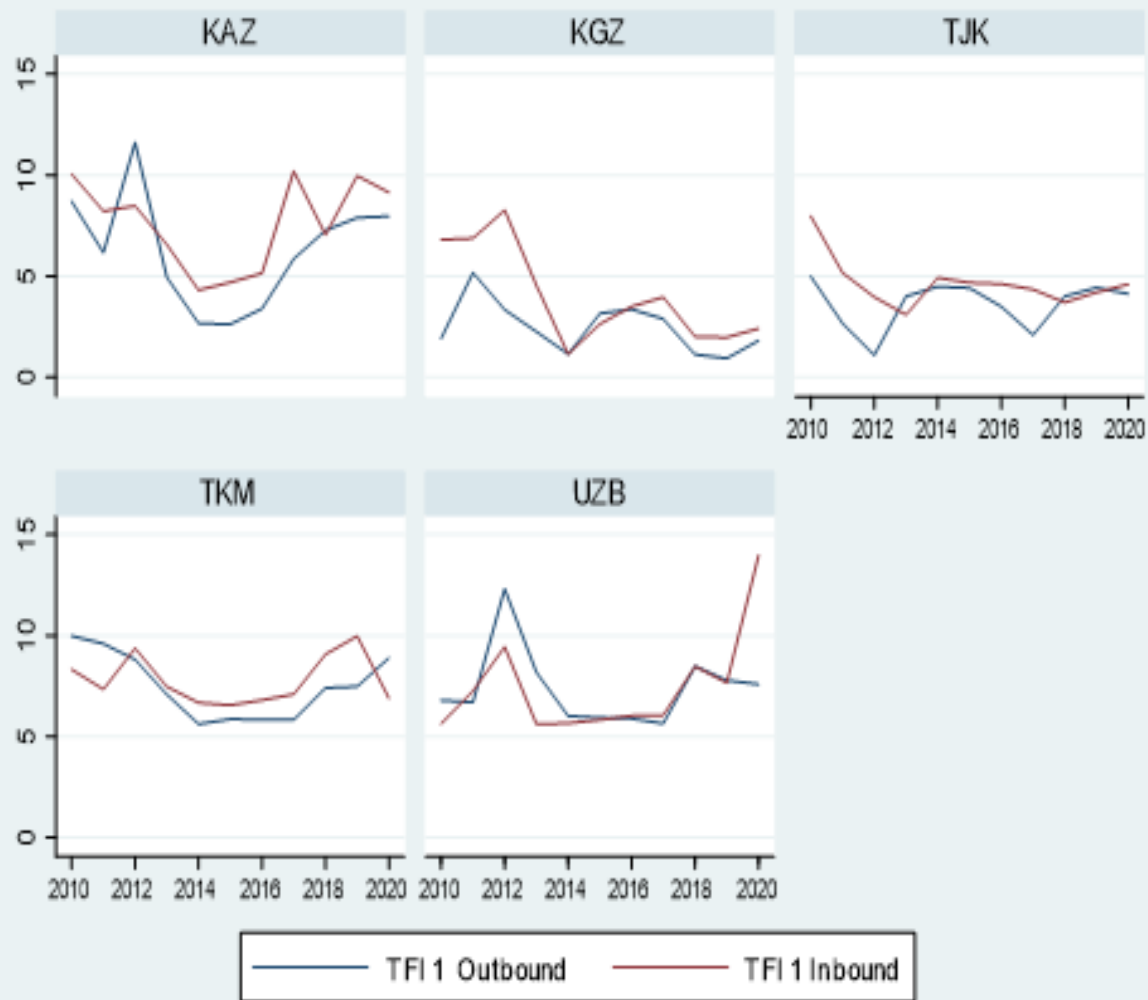
^b Afghanistan, Azerbaijan, Georgia, Mongolia, Pakistan, and the People's Republic of China.

Sources: ADB and World Bank; authors' calculations.



Trade facilitation indicators

- Trade facilitation measures are from the CPMM:
- Corridor Performance Measurement and Monitoring (CPMM) - designed by the CAREC Program to assess and track the time and cost of moving goods across borders and along the transport corridors, spanning the 11 participating countries—Afghanistan, Azerbaijan, the People’s Republic of China (PRC), Georgia, Kazakhstan, the Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan
 - TFI1 - Time taken to clear a border crossing points
 - TFI2- Cost incurred at border crossing clearance
 - TFI4 - Speed to travel along CAREC Corridors
 - Time (TFI1) and costs (TFI2) measures at inbound and outbound BCPs are included in the models separately
 - CPMM data are used in annual terms - due to annual frequency of other explanatory variables in the model
 - Because of the missing values on rail TFI the road trade facilitation indicators is used



Generally, both TFI 1 and 2 have decreasing trend since 2010 in five Central Asian countries. However, exception is in Kazakhstan since 2015 with increasing time spent at BCPs both at the inbound and outbound process. Also, in Uzbekistan there is an evidence of longer time at inbound process since 2018.

EMPIRICAL MODEL

- Gravity model with the Poisson pseudo-maximum-likelihood (PPML) estimation method is applied (Silva and Tenreyro, 2006; Anderson and Van Wincoop, 2003)

$$Export_{ijt} = \exp\left[\beta_0 + \beta_1 GDP_{jt} + \beta_2 GDP_{jt} + \beta_3 Dist_{ijt} + \beta_4 INFRA_{it} + \beta_5 INFRA_{it}^2 + \beta_6 Trade\ facilitation_{ijt} \right] * \delta_t * c_{ij} * \varepsilon_{ijt} \quad (1)$$

$$Import_{ijt} = \exp\left[\beta_0 + \beta_1 GDP_{jt} + \beta_2 GDP_{jt} + \beta_3 Dist_{ijt} + \beta_4 INFRA_{it} + \beta_5 INFRA_{it}^2 + \beta_6 Trade\ facilitation_{ijt} \right] * \delta_t * c_{ij} * \varepsilon_{ijt} \quad (2)$$

EMPIRICAL RESULTS



Impact on exports

	(1)	(2)	(3)	(4)	(5)	(6)
Ln GDP, five Central Asian countries	0.1700 (0.2101)	0.1627 (0.3043)	0.0704 (0.3913)	0.1895 (0.2913)	0.0374 (0.2638)	0.0547 (0.2875)
Ln GDP, six trading partners	0.7240*** (0.0352)	0.7240*** (0.0353)	0.7242*** (0.0357)	0.7241*** (0.0355)	0.7238*** (0.0351)	0.7250*** (0.0353)
Ln Distance (km)	-1.1011** (0.5159)	-1.1012** (0.5156)	-1.1000** (0.5161)	-1.1014** (0.5159)	-1.1028** (0.5156)	-1.1014** (0.5169)
Infrastructure index, five Central Asian countries	0.3690*** (0.0879)	0.3721*** (0.1108)	0.3850*** (0.0906)	0.4091*** (0.0918)	0.3864*** (0.0940)	0.4973*** (0.0913)
Square of infrastructure index, five Central Asian countries	-0.1296** (0.0634)	-0.1304* (0.0791)	-0.0962* (0.0556)	-0.1760*** (0.0555)	-0.1163 (0.0759)	-0.1557*** (0.0429)
Infrastructure index, six trading partners	0.3023*** (0.1019)	0.3023*** (0.1020)	0.3012*** (0.1023)	0.3027*** (0.1020)	0.3026*** (0.1022)	0.3017*** (0.1024)
Square of infrastructure index, six trading partners	-0.0620*** (0.0213)	-0.0619*** (0.0215)	-0.0618*** (0.0215)	-0.0621*** (0.0216)	-0.0616*** (0.0212)	-0.0624*** (0.0214)
TFI1 inbound	0.0016 (0.0372)					0.0262 (0.0311)
TFI1 outbound		0.0026 (0.0313)				0.0427 (0.0355)
TFI2 inbound			0.0016** (0.0007)			0.0021*** (0.0008)
TFI2 outbound				-0.0020* (0.0011)		-0.0038** (0.0019)
Log TFI4					1.2925* (0.7132)	0.8014 (0.5103)

Findings

- Infrastructure development both from the side of countries of origin and destination are important for increasing trade flows in Central Asia.
- However, nonlinear impact of infrastructure - positive impact of infrastructure development declines over time
- Increase in the cost of outbound border clearance decrease exports from Central Asian countries
- Speed to travel along CAREC corridors – positive, though the effect is not statistically strong
 - This finding reflects that CAREC corridors are important in promoting the export of CAREC countries, and not only the transit of goods.

Impact on imports

	(1)	(2)	(3)	(4)	(5)	(6)
Ln GDP, five Central Asian countries	0.1661 (0.4260)	0.1528 (0.4585)	0.1481 (0.4645)	0.1445 (0.4496)	-0.0891 (0.2943)	-0.0736 (0.2819)
Ln GDP, six trading partners	0.7828*** (0.0803)	0.7826*** (0.0806)	0.7822*** (0.0807)	0.7822*** (0.0807)	0.7785*** (0.0808)	0.7800*** (0.0802)
Ln Distance (km)	-1.6209*** (0.1090)	-1.6212*** (0.1094)	-1.6206*** (0.1095)	-1.6208*** (0.1093)	-1.6225*** (0.1099)	-1.6246*** (0.1091)
Infrastructure index, five Central Asian countries	0.1000* (0.0598)	0.1175 (0.0725)	0.1091* (0.0621)	0.1065* (0.0587)	0.1581*** (0.0461)	0.1554*** (0.0563)
Square of infrastructure index, five Central Asian countries	0.0410*** (0.0099)	0.0415*** (0.0114)	0.0414** (0.0172)	0.0392** (0.0164)	0.0484*** (0.0112)	0.0627** (0.0246)
Infrastructure index, six trading partners	0.8593*** (0.2377)	0.8599*** (0.2380)	0.8594*** (0.2380)	0.8596*** (0.2379)	0.8623*** (0.2380)	0.8627*** (0.2378)
Square of infrastructure index, six trading partners	-0.1693*** (0.0646)	-0.1693*** (0.0642)	-0.1690*** (0.0643)	-0.1690*** (0.0643)	-0.1671*** (0.0644)	-0.1679*** (0.0644)
TFI1 inbound	0.0060 (0.0108)					0.0274** (0.0131)
TFI1 outbound		0.0123 (0.0112)				0.0141 (0.0230)
TFI2 inbound			0.0002 (0.0008)			-0.0003 (0.0006)
TFI2 outbound				0.0000 (0.0004)		0.0000 (0.0004)
Log TFI4					1.0147*** (0.2225)	1.4172*** (0.2374)

Findings

- Infrastructure of Central Asia countries shows statistically significant positive impact on import volume.
 - Interestingly, square of the infrastructure index shows positive impact, suggesting that it is not non-linear, but rather infrastructure development over time promotes import of goods.
 - Infrastructure index of trading partner CAREC countries demonstrate expected positive and non-linear effect.
- The speed of movement along the CAREC corridors (TFI4) has a statistically strong influence on Central Asian countries' imports

Policy Implications

- Findings suggest that complementarity of physical infrastructure development and trade facilitation measures are important
 - Development of infrastructure itself may not provide with improved international trade unless trade facilitation measures are considered.
- Infrastructure development both of countries of origin and destination are important for increasing trade flows
 - Difference in infrastructure development may pose challenges in the cooperation of CAREC economies and intensification of trade flows among them.
 - Regional cooperation on infrastructure development.
- Presence of trade agreements between Central Asian countries may not imply trade improvement, but rather other barriers including non-tariff measures may play important role in practice
- Central Asia as being dominantly landlocked region needs diversified development of the infrastructure
 - Reliance and use of the dominantly one type of transport infrastructure is not beneficial for the sustainability cooperation trends.

Limitations

- Due to the data limitations in the infrastructure measurement roads are not included. Though, roads are dominant type of transportation in the landlocked countries
- Despite the available quarterly data of the CPMM, within the gravity model and necessary variables we used the annual data. Although, analysis at higher frequency based on quarterly data may provide more detailed insights
- CPMM provides with detailed information on time and costs collected directly from the participants of the trade process it does not explicitly measure about other non-tariff measures, which are important in understanding trade barriers
 - Case studies using the CPMM data with analysis of the relevant government trade regulation policy in some countries might be helpful in understanding trade dynamics
 - Analysis by category of goods policy regulations and not-tariff measures may differ depending on the category of trading goods. Studies further elaborating trade flows by category of goods would be interesting to examine potential divergent impact of trade facilitation measures



Questions and comments are welcome

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