

Analysis of the impact of trade costs on exports of final and intermediate goods at the sectoral level in post-Soviet Central Asia and the CAREC region

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Trade Facilitation in CAREC: A 10-year CPMM Perspective

Objective

- To estimate the impact of trade costs on exports in Central Asia using a structural gravity model approach with a CPMM dataset of trade costs.
 - The impact of time-to-export and cost-to-export is calculated for intermediate, final and total exports of aggregated and sector-specific goods in Central Asia and the entire CAREC region.

Rationale

- Landlockedness and remoteness from global markets TRADITIONALLY identified as key impediments to international trade in Central Asia
- However, the CENTRAL POSITION of a country could be AN ADVANTAGE when the economies around it are strong
- Central Asian logistics infrastructure is inefficient and expensive and not affordable for small exporters
- Inadequate soft infrastructure: lengthy border delays due to customs inefficiencies, red tape, etc
- Costs-to-trade, both in money and time terms, are particularly high for perishable commodities
- Lack of literature on the impact of trade costs on cross-border trade in the Central Asian region
- The CAREC CPMM dataset creates an opportunity to close this gap

Structural gravity model

$$X_{ijt} = F_{it}F_{jt}t_{ijt}^{-\theta} e_{ijt} \quad (1)$$

Where:

- X_{ijt} is exports from country i to country j in year t
- $F_{it} F_{jt}$ are exporter-year and importer-year fixed effects
- t is trade costs
- θ is a parameter capturing the sensitivity of demand to cost
- e is an error term satisfying standard assumptions.

$$t_{ijt} = b_1 time_{ijt} + b_2 cost_{ijt} + D_{ij} * t \quad (2)$$

Where:

- $time_{ijt}, cost_{ijt}$ are the key cost and time-to-export variables, respectively
- D terms are country-pair fixed effects interacted with a time trend.

Data

Export flows (X_{ijt}) from the Eora26 multi-region input-output table

- Reported in US dollar by total trade, intermediate and final goods
- Contains data on intra-national trade
- Detailed by 26 aggregated sectors

CAREC CPMM Trade cost variables (t_{ijt})

- Total duration of shipment (transit + activities) in hours
- Total cost of shipment (transit + activities) in US dollar terms
- Detailed by sectors

Results: Baseline model with constructed CPMM dataset for Central Asia

Table 1. Impact of trade costs on aggregated exports in Central Asia

| | (1) | (2) | (3) | (4) | (5) | (6) |
|----------------------------|------------|------------|------------|------------|------------|------------|
| | Total | Final | Intermed | Total | Final | Intermed |
| Time-to-export | -0.030 ** | -0.029 *** | -0.026 * | | | |
| | (0.012) | (0.009) | (0.015) | | | |
| Cost-to-export | | | | -0.051 ** | -0.054 *** | -0.051 ** |
| | | | | (0.020) | (0.019) | (0.024) |
| Constant | 22.962 *** | 21.260 *** | 22.775 *** | 22.964 *** | 21.263 *** | 22.777 *** |
| | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) |
| Observations | 245 | 245 | 245 | 245 | 245 | 245 |
| pseudoR² | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

Fixed Effects: Exporter-Year, Importer-Year, Pair-Year

- Dependent variable: exports
 - Regressors: time- and cost-to-export indicators from the constructed CPMM dataset
 - Countries in the sample: Central Asian countries, Russia and China
- Estimation results statistically significant, with expected signs
 - Exports are more sensitive to cost-to-export than to time-to-export
 - 1% increase in time to export --> 0.03% decline in exports value
 - 1% increase in cost to export --> 0.05% in exports value

Results: Changed fixed effects sensitivity test

Table 2. Baseline model results (from the previous slide)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Total | Final | Intermed | Total | Final | Intermed. |
| Time-to-export | -0.030 ** (0.012) | -0.029 *** (0.009) | -0.026 * (0.015) | | | |
| Cost-to-export | | | | -0.051 ** (0.020) | -0.054 *** (0.019) | -0.051 ** (0.024) |
| Constant | 22.962 *** (0.000) | 21.260 *** (0.000) | 22.775 *** (0.001) | 22.964 *** (0.001) | 21.263 *** (0.001) | 22.177 *** (0.001) |
| Observations | 245 | 245 | 245 | 245 | 245 | 245 |
| pseudoR² | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

Fixed Effects: Exporter-Year, Importer-Year, **Pair-Year**

Table 3. Sensitivity test of the CPMM TFIs to the changing fixed effects specification

| | (1) | (2) | (3) | (4) | (5) | (6) |
|----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Total | Final | Intermed. | Total | Final | Intermed. |
| Time-to-export | -0.808 ** (0.389) | -0.853 * (0.436) | -0.889 ** (0.359) | | | |
| Cost-to-export | | | | -0.926 *** (0.257) | -0.818 *** (0.234) | -0.958 *** (0.277) |
| Distance | 0.245 (0.225) | 0.130 (0.211) | 0.271 (0.245) | -0.143 (0.243) | -0.135 (0.269) | -0.100 (0.234) |
| Constant | 22.996 *** (0.001) | 21.300 *** (0.002) | 22.807 *** (0.001) | 22.997*** (0.002) | 21.300 *** (0.002) | 22.809 *** (0.002) |
| Observations | 245 | 245 | 245 | 245 | 245 | 245 |
| pseudoR² | 0.999 | 0.999 | 0.999 | 0.999 | 0.999 | 0.999 |

Fixed Effects: Exporter-Year, Importer-Year, **No pair-year**

- CPMM trade costs variables very sensitive to the “relaxed” estimation techniques
- ‘Capture’ other factors that impact the exports
- On average, as compared to the baseline model
 - the coefficients for time-to-export are 30 times higher
 - and cost-to-export indicators are 20 times higher
- Therefore, along with export data it is important to have the domestic trade data to use full set of fixed-effects in gravity model
- In the past, some policy recommendations were made based on the ‘over-estimated’ results

Results: CAREC exports by sectors

Table 5. CPMM TFIs and selected Eora micro sectors exports for CAREC countries

| | (1) | (2) | (3) | (4) | (5) | (6) |
|-------------------------------|----------------|--------------|-----------|----------------|-------------------|-----------|
| | Time-to-export | | | Cost-to-export | | |
| | Total | Intermediate | Final | Total | Intermediate | Final |
| Agriculture | 0.059 *** | 0.019 | 0.076 *** | 0.026 | -0.135 *** | 0.220 *** |
| | (0.015) | (0.020) | (0.015) | (0.045) | (0.036) | (0.067) |
| Food & Beverages | 0.008 | -0.020 | 0.024 | -0.055 ** | -0.085 *** | -0.043 |
| | (0.012) | (0.012) | (0.020) | (0.027) | (0.015) | (0.040) |
| Textiles & Apparel | 0.067 *** | 0.006 | 0.190 *** | -0.008 | -0.031 *** | 0.034 |
| | (0.010) | (0.008) | (0.022) | (0.020) | (0.010) | (0.044) |
| Wood and Paper | 0.130* | 0.041 | 0.141 | -0.049*** | -0.040 *** | -0.054*** |
| | (0.069) | (0.036) | (0.088) | (0.003) | (0.004) | (0.002) |
| Constant | 19.296*** | 15.934 *** | 19.331*** | 19.377*** | 16.075 *** | 19.400*** |
| | (0.025) | (0.044) | (0.026) | (0.002) | (0.010) | (0.001) |
| Observations | 3,024 | 3,024 | 3,024 | 3,024 | 3,024 | 3,024 |
| pseudoR2 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

Fixed Effects: Exporter-Year, Importer-Year, Pair-Year

Interpretation



Some of the estimates have unexpected positive signs

- An unexpected positive shock to trade creates congestion on the route, which increases reported data
- Therefore, there can be a positive correlation between trade and the observed time
- High std.deviation of the time-to-export—>high uncertainty



Perishable commodities have stronger impact from the cost-to-export

- 10% increase in cost-to-export could reduce the exports of intermediate (raw, unprocessed) agricultural produce by 1.35%
- Whereas for intermediate commodities, e.g. cotton, wool or any other type of fibre in the textiles and apparel industry, the same increase would cost only 0.31%

Conclusion

Key findings

- Time-series nature of the CPMM indicators makes it possible to quantitatively estimate the impact of time- and cost-to-export in Central Asian nations.
- The estimates at the aggregated exports level confirmed the suitability of the CPMM indicators for use in the analysis of trade facilitation in Central Asia.
- At the same time, positive results for time-to-export coefficients at the disaggregated exports level suggest a need for careful examination and interpretation of the outcomes.
- Exports of perishable agricultural products were confirmed to be more sensitive to higher trade costs than other commodity groups.
- The CPMM indicators are sensitive to the changing estimation techniques, such as the country-pair fixed effects, which warns researchers to follow the most recent advances in gravity modelling.

Final comments and for future research

- While the potential gains from trade facilitation are undoubtedly significant, the findings of this research suggest that they are not so large compared to the conclusions of similar studies.
- This indicates that policymakers should consider a diversified approach with budget allocations in trade facilitation programs.
- There is a need for better quality data in-country, not only for trade cost indicators but also for internal trade, allowing researchers to apply the best gravity model techniques.
- There is a need for more studies to investigate individual trade facilitation policies on trade performance for specific sectors or commodities.
- Trade facilitation research needs to be extended to analyse general equilibrium response and agglomeration effects on wellbeing in the CAREC region.