

# **The Role of Trade Facilitation in Central Asia: A Gravity Model\***

**Utsav Kumar**

**Economics and Research Department**

**Asian Development Bank**

**ARTNeT Conference on Empirical and Policy Issues of  
Integration in Asia and the Pacific**



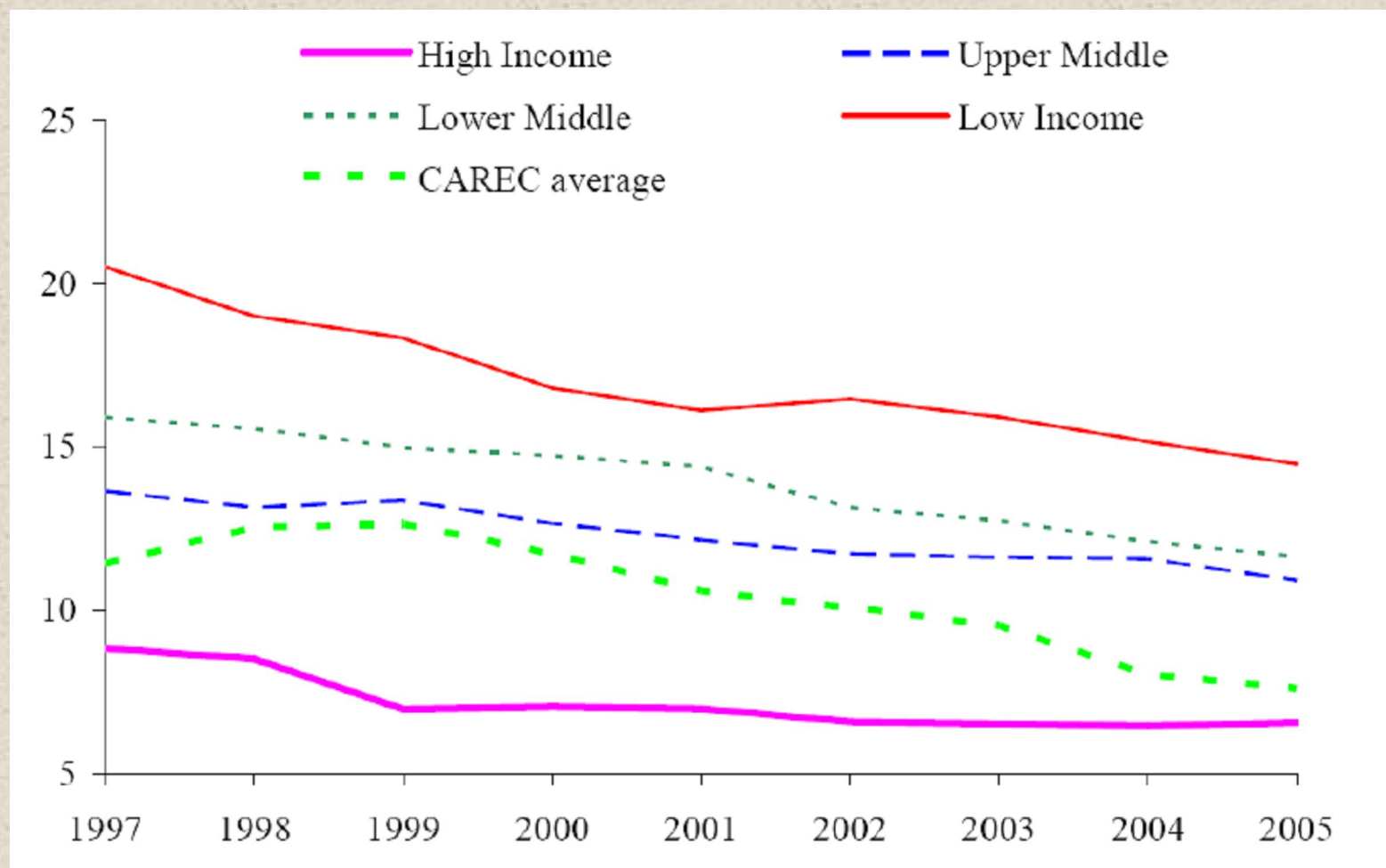
\*Joint work with Jesus Felipe. The views expressed here are those of the authors and do not represent those of the Asian Development Bank, its Executive Directors, or the countries that they represent.

# Motivation

- Different kinds of barriers to trade
- Tariff and non-tariff barriers have fallen over the past two decades
- Trade facilitation has moved up the policy agenda
- Why Central Asia?
  - Seek to diversify economic base to generate sustained long-term growth.
  - Landlocked
- In the context of Central Asian countries, transport facilitation important in facilitating trade



# Tariff barriers have fallen...average tariff rate in Central Asian countries is low

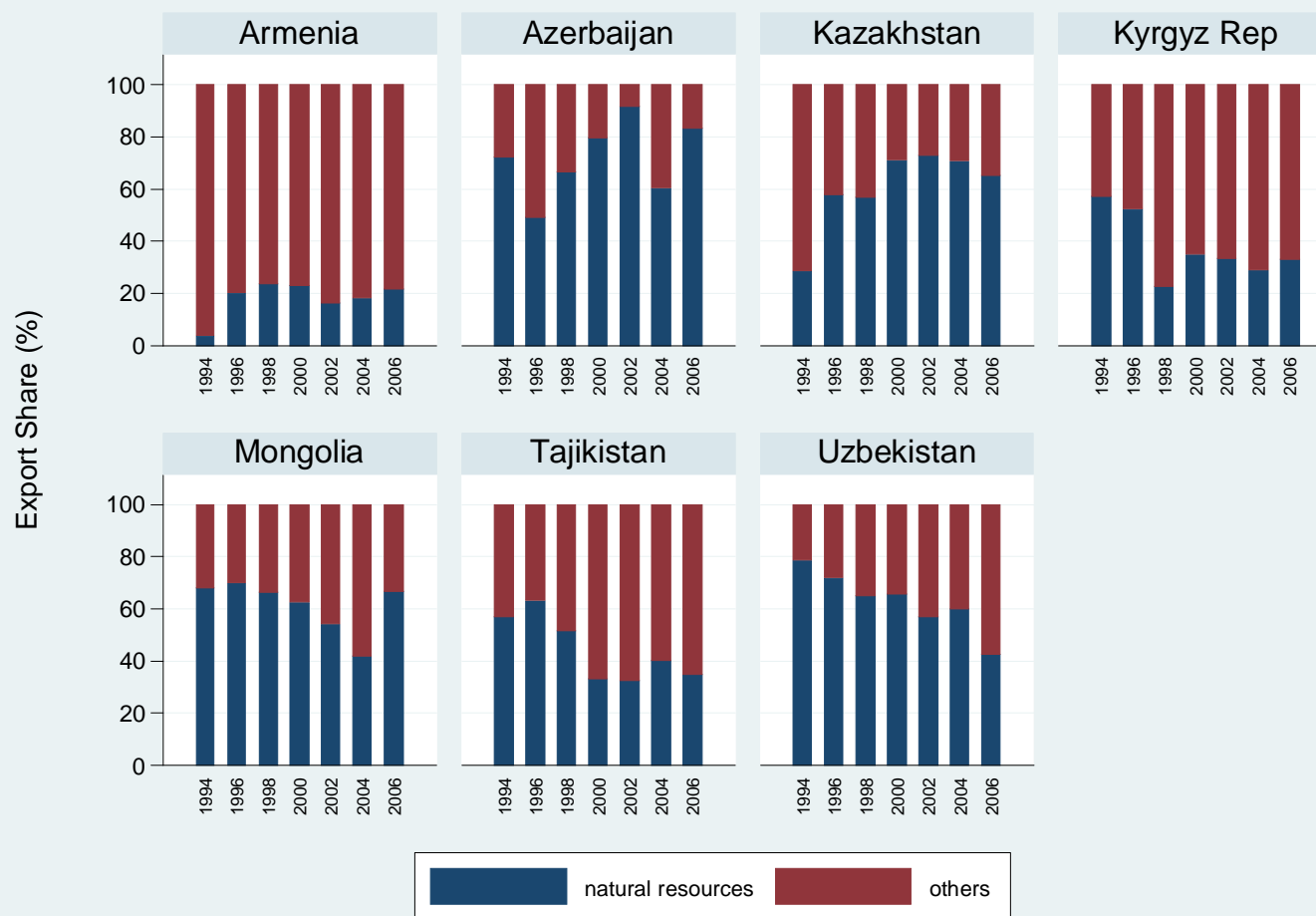


Source: van der Ploeg and Venables (2009)

# What does trade facilitation entail?

- WTO defines trade facilitation as:  
“the simplification and harmonization of international trade procedures, including the activities, practices, and formalities involved in collecting, presenting, communicating, and processing data and other information required for the movement of goods in international trade”
- In general, trade facilitation refers to the ease of moving goods across borders.
- Why does trade facilitation matter?

# Central Asian countries remain dependent on natural resources



Graphs by country

Source: UN COMTRADE and authors' calculations.

ADB



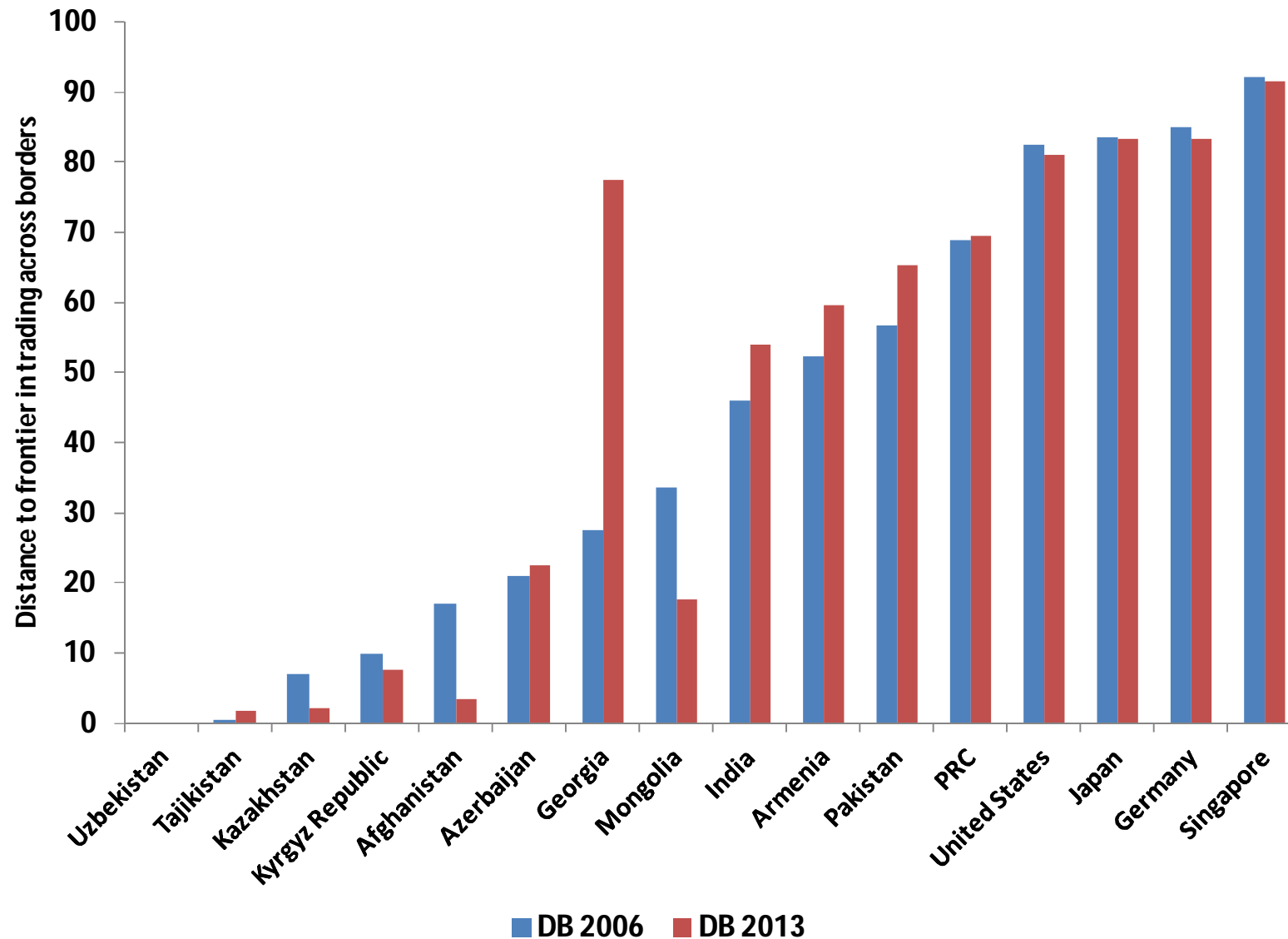
# Outline

- Research questions
- Trade facilitation in Central Asia
- Framework
- Estimation issues
- Definition of key variables
- Results
- "What-if" exercise
- Conclusions and policy implications

## Research questions

- Does trade facilitation (TF) boost trade? If so, how much?
- How much is the increase in trade for the Central Asian countries from greater trade facilitation?
- Do improvements in different components of trade facilitation increase trade in varying degrees?

# Central Asian countries remain far from the “frontier” in trade facilitation

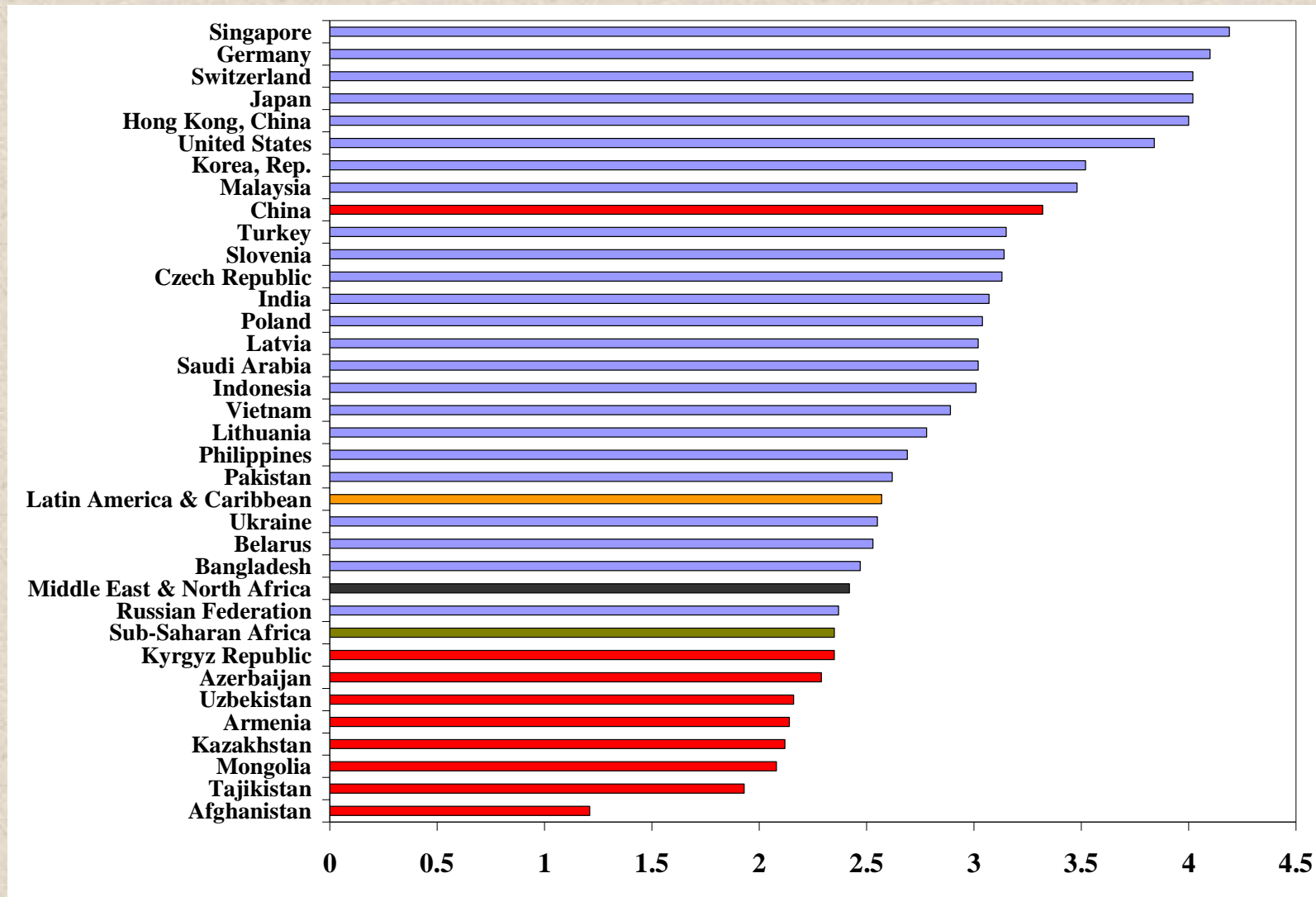


Source: World Bank.

ADB



# Central Asian countries are ranked lowest in terms of logistics performance (2007)



# Components of LPI (2007)

## Ø Customs

- Efficiency of customs and other border agencies

## Ø Infrastructure

- Quality of transport and IT infrastructure

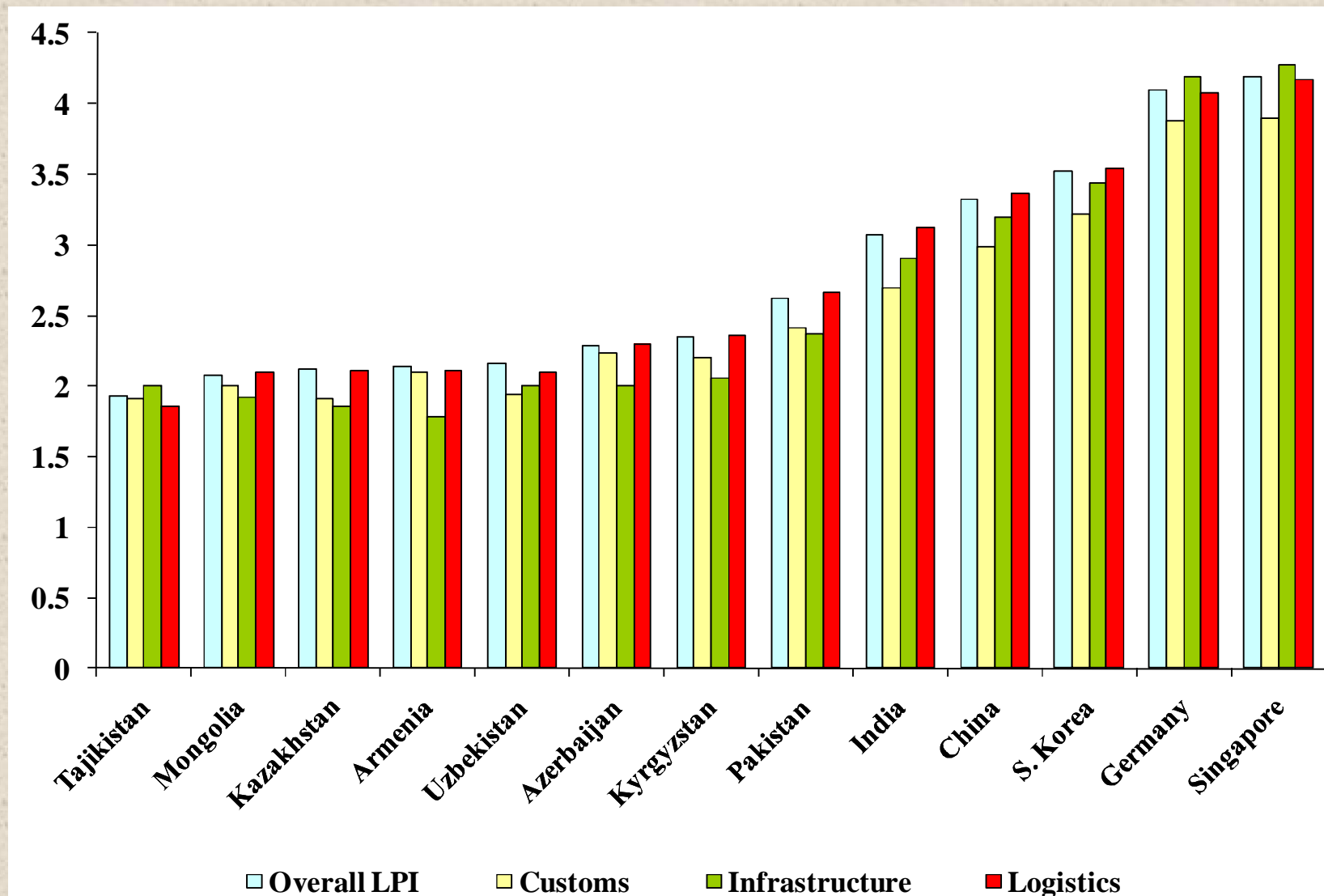
## Ø Logistics

- Ease and affordability of international shipments
- Competence of local logistics industry
- Ability to track and trace

## Ø Others

- Timeliness of shipments in reaching destination
- Domestic logistic costs

# Central Asian countries perform poorly in terms of the various components of LPI



Source: Logistics Performance Index, 2007 (World Bank)



# Comparison of LPI index and rank



Source: Logistics Performance Index, 2007 2010, and 2012 (World Bank).

# Framework: Gravity Model

- As the name suggests, idea behind the model comes from the law of universal gravitation.
- Widely used tool to understand bilateral trade flows.
- Trade flows are positively related to the size of the trading partners and inversely related to the distance between them.
- Used to explain bilateral trade flows, model dates back to Tinbergen (1962) and Pöyhönen (1963).
- Anderson (1979) and Anderson and van Wincoop (2003) provide theoretical foundations for the gravity model.

## Framework: Gravity Model

$$\ln T_{ij} = \alpha_0 + \alpha_1 \ln Y_i + \alpha_2 \ln Y_j + \alpha_3 \ln D_{ij} + \alpha_4 \ln D_{ij}^2 + \alpha_5 \ln \text{POP}_i + \alpha_6 \ln \text{POP}_j + \alpha_7 \ln \text{GDP}_{ij} + \alpha_8 + \alpha_9 + \alpha_{10} + \alpha_{11} \ln(\text{GDP}_{ij}^2) + \alpha_{12} \ln(\text{GDP}_{ij}^2) + \dots$$

- Estimated for the year 2005
- Bilateral trade data for 140 countries
- Manufacturing sector
- Estimation: Heckman MLE procedure



## Estimation Issues: Question of zeros?

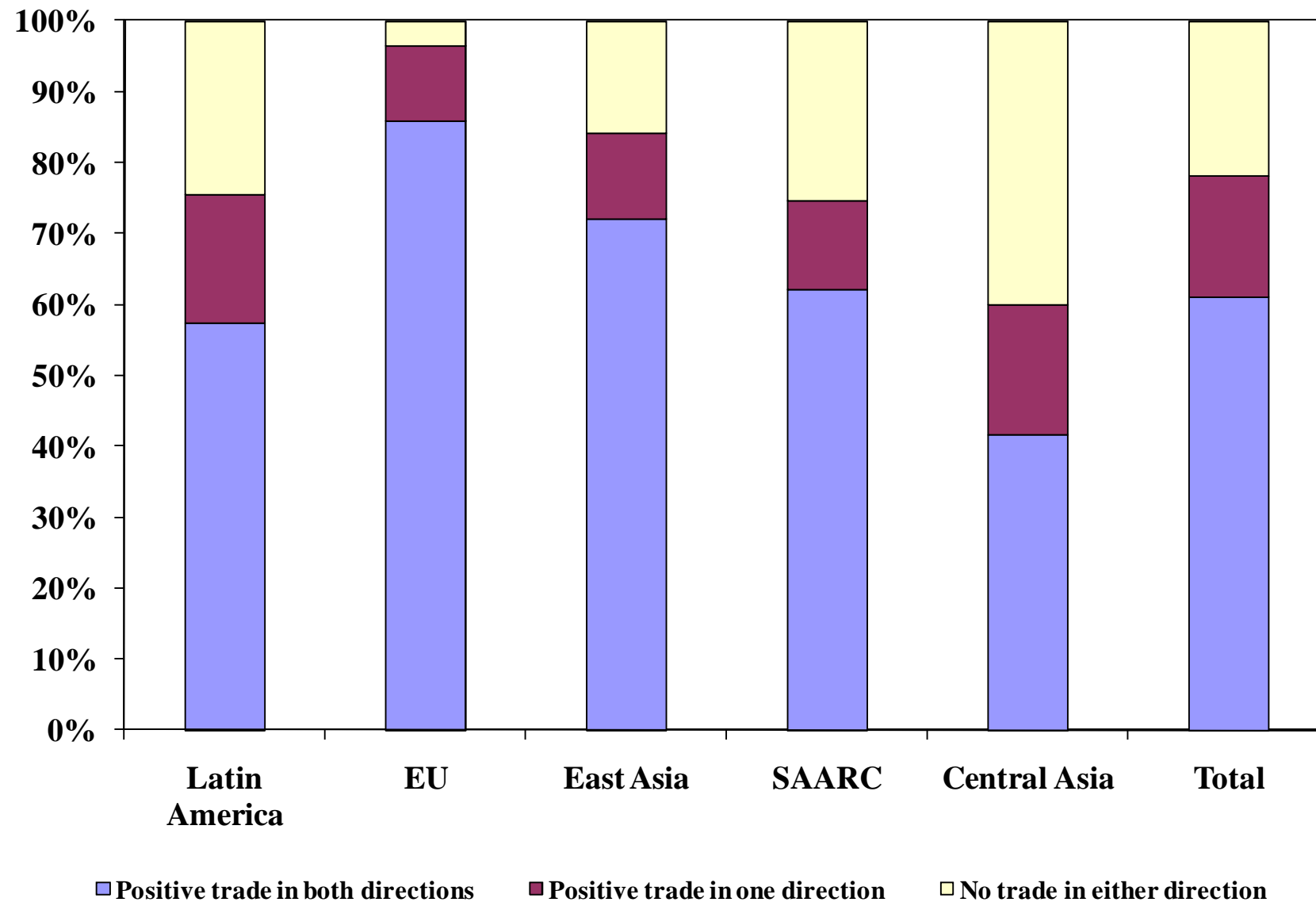
- 30% of the data is zero trade
- Previously such data was simply dropped or a small number was added to bilateral trade
- However, zero trade might represent important information
- Tobit estimation: using minimum of the sample as the censoring point
- Two-step Heckman procedure

## Zero Trade

	No. of Observations
<b>Positive trade in both directions</b>	12,220
<b>Positive trade in one direction</b>	3,132 (1,566 positive trade and equal number zero)
<b>Zero trade in both directions</b>	4,108

Source: BACI, authors' calculations.

# Zero trade by region



Source: BACI, authors' calculations.



## Definition of key variables

- Dependent variable: log of bilateral trade between countries i and j (source: BACI)
- Distance: Log of distance (measured in kilometers) between capital cities (calculated using great circle distance formula) of countries i and j (source: CEPII)
- GDP: Log of GDP (measured in PPP terms) for countries i and j (source: WDI)
- GDPpc: Log of GDP per capita (measured in PPP terms) for countries i and j (source: WDI)
- LPI: Log of logistics performance index of countries i and j (source: World Bank)
- Landlocked=1 if one of the trading partners is landlocked
- Border=1 if the trading partners share a common border
- Remoteness: log of GDP-weighted average distance to all other countries (source: own calculations)
- Common language=1 if importer and exporter share a common language (source: BACI)
- Colonial ties=1 if importer (or exporter) colonized its trading partner
- Common colonizer=1 if importer and exporter shared a common colonizer



# Summary statistics

	Overall	Intra-Central Asia
Bilateral trade	US\$ 333m	US\$ 9.2m
Distance (bilateral)	7,353 km	2,033 km
GDP	US\$ 373 bn	US\$ 37.2 bn
GDP per capita	US\$ 10,896	US\$ 3250
LPI	2.743	2.153
Customs	2.551	2.041
Infrastructure	2.581	1.946
Logistics	2.725	2.133
Remoteness	7,920 km	6,687 km
No. landlocked countries	28	7
<i>Number of trading pairs</i>		
Contiguous	432	12
Common Language	1,590	2
Colonial Ties	266	0
Common Colonizer	1,546	30

Source: BACI, CEPII, World Bank, and authors' calculations.

**ADB**



# Regression Results: Gravity Model

	Heckman ML Estimation	
	Overall LPI	Components of LPI
Log Distance	-1.56***	-1.55***
Log GDP Exporter	1.07***	1.06***
Log GDP Importer	0.75***	0.76***
Log GDPpc Exporter	0.05**	-0.02
Log GDPpc Importer	0.002	-0.02
Log LPI-Exporter	5.46***	
Log LPI-Importer	2.77***	
Common Border	0.87***	0.90***
Landlocked-Exporter	-0.29***	-0.24***
Landlocked-Importer	-0.48***	-0.45***
Log Remoteness-Exporter	0.43***	0.36***
Log Remoteness-Importer	1.13***	1.11***
Log Customs- Exporter		-0.001
Log Customs- Importer		1.04***
Log Infrastructure- Exporter		3.09***
Log Infrastructure- Importer		0.86***
Log Logistics- Exporter		2.19***
Log Logistics- Importer		0.75***
Observations	19460	19460



## Trade Facilitation is an important determinant of trade flows

- Decrease in distance by 1% increases trade by 1.56%
- Landlocked exporters (importers) trade 25% (38%) less than coastal exporters (importers)
- Countries with a common border trade 2.4 times more than countries that do not share a common border
- Improvement in trade facilitation (LPI) of the exporting country by 1% increases exports by 5.5%
- Improvement in trade facilitation (LPI) of the importing country by 1% boosts imports by 2.8%
- Components of LPI have a differing impact on trade

## **“What-if” exercise: Gains from improvements in trade facilitation**

- Procedure follows Wilson, Mann, Otsuki (2003)
- Question: What is the increase in trade flows derived from an improvement in a country's own TF as well as in that of the trading partners *up to halfway* of the average of all countries in the sample?
- Large gains in total manufacturing trade
- Gains in intra-regional trade flows are larger
- Differing gains in trade from improvements in different components of LPI



## **“What-if” exercise: Calculating gains from improving logistics**

Improvement in a country's own TF as well as in that of the trading partners *up to halfway* of the average of all countries in the sample

	Initial LPI	New LPI	% change in LPI
Armenia	2.14	2.45	14.49%
Azerbaijan	2.29	2.52	9.89%
Kazakhstan	2.12	2.43	14.69%
Kyrgyz Republic	2.35	2.55	8.36%
Mongolia	2.08	2.41	15.94%
Tajikistan	1.93	2.34	21.06%
Uzbekistan	2.16	2.45	13.5%



# Gains from improvement in trade facilitation

	% change in manuf. trade	Due to exports	Due to imports
	(1)	(2)	(3)
<b>Armenia</b>	49.2	25.5	23.7
<b>Azerbaijan</b>	28.4	3.2	25.2
<b>Kazakhstan</b>	46.8	16.6	30.2
<b>Kyrgyz Republic</b>	34.1	12.3	21.8
<b>Mongolia</b>	50.8	18.6	32.2
<b>Tajikistan</b>	62.5	11.2	51.3
<b>Uzbekistan</b>	46.6	20.3	26.3

Source: Authors' calculations.



# Gains from improvement in trade facilitation

	<i>As Exporter</i>	<i>As Importer</i>
	% Change in total exports	% Change in total imports
<b>Armenia</b>	72	37
<b>Azerbaijan</b>	54	27
<b>Kazakhstan</b>	76	39
<b>Kyrgyz Republic</b>	62	27
<b>Mongolia</b>	81	42
<b>Tajikistan</b>	105	57
<b>Uzbekistan</b>	73	37

Source: Authors' calculations.





# Larger proportionate gains for intra-regional trade

	% change in total trade	<i>As Exporter</i>	<i>As Importer</i>
		% Change in exports to Central Asian countries	% Change in imports from Central Asian countries
<b>Armenia</b>	108.8	52.6	56.3
<b>Azerbaijan</b>	95.3	26.7	68.6
<b>Kazakhstan</b>	100.8	49.0	51.8
<b>Kyrgyz Republic</b>	88.0	51.7	36.3
<b>Mongolia</b>	115.2	4.0	111.2
<b>Tajikistan</b>	115.8	3.7	112.1
<b>Uzbekistan</b>	103.5	70.2	33.3

Source: Authors' calculations.





## Gains in trade from improvements in different components of LPI

	<i>% change in manufacturing trade</i>		
	<b>Infrastructure (1)</b>	<b>Customs (2)</b>	<b>Logistics (3)</b>
<b>Armenia</b>	33.6	6.9	17.2
<b>Azerbaijan</b>	14.1	6.9	7.8
<b>Kazakhstan</b>	24.4	12.8	14.7
<b>Kyrgyz Republic</b>	19.7	7.8	10.4
<b>Mongolia</b>	22.4	10.4	15.3
<b>Tajikistan</b>	18.1	14.5	20.6
<b>Uzbekistan</b>	21.3	11.5	16.7

Note: Each cell shows the percent increase in total trade (exports + imports) from improvement in different components of LPI. Source: Authors' calculations.



## Conclusions and policy implications

- Improvements in trade facilitation can lead to significant gains in trade in Central Asia
- Infrastructure improvements lead to biggest gains in trade
- Central Asian countries are landlocked and developing regional infrastructure will provide transport corridors for trade within the region and outside the region
- Some measures such as improvements in customs administration and efficiency are relatively easier and cheaper to implement



**Thank You**

