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Who is Trading Well in Central Asia? A Gravity Analysis of Exports from the Regional Powers to the Region

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Abstract

Since early 90s major regional powers have attempted to increase their export flows to Central Asia. This paper assesses the volume of recent export flows from China, India, Iran, Russia and Turkey to countries in Central Asia. We estimate an augmented gravity model and conduct trade complementarity analysis to compare the factual export volumes with projections generated by the model.

We find that China and Turkey were the most successful. They have expanded their exports beyond numbers predicted by the augmented gravity model. Up until 2007 Russia failed to achieve model benchmarks. Exports from India and Iran remain very negligible.

Keywords: *gravity model, bilateral trade, Central Asia*

JEL Code Classifications: *F10, F15, F17*

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1. Introduction

Soviet-era production priorities and trade flows for the republics in Central Asia were determined in Moscow. As part of these settings Central Asia republics specialized in production of raw material, minerals and energy resources. For instance, Soviet-era Uzbek economy was designed to produce and export raw cotton. According to *Goskomstat* in early and mid 80s Uzbek Soviet Socialistic Republic produced about 5 million tons of raw cotton accounting for 70% of national production. Sadly for local industries, most of the harvest had to be shipped to cities of western Soviet Union such as Ivanono in Russia and Minsk in Belarus to produce textile products with much greater added value. Kazakh economy, to the large extent, specialized in production of grain and crude oil. In Turkmenistan, Soviet planners were primarily interested in natural gas. Such economic policies had painful implications for Central Asia. Lack of industrial diversity, lower income level, and environmental disasters are to name few of them. Yet another unfortunate consequence of a colonial relationship was an overwhelming reliance on import of consumable products and capital goods from Western parts of the Soviet Union.

The dissolution of the Soviet Union was a big and unanticipated shock for economies in the region. All of the Central Asian countries experienced falling output and income and increasing incidence of poverty and inequality. Demand and supply chains were severely disrupted, transport infrastructure deteriorated. Transaction costs associated with a product exchange across former Soviet economic space hugely increased due to a shift to international prices and introduction of customs institutions. Kazakhstan, Turkmenistan and to a certain extent Uzbekistan benefited from a shift to world prices on crude oil, gas, cotton and gold. Kyrgyzstan and Tajikistan were less fortunate as their economies lack high-value and easily transported commodities.

For firms from neighboring countries though the Soviet collapse in Central Asia provided lucrative opportunities. The Central Asian market of 55 million inhabitants featured unsatisfied demand for consumable and capital goods. By mid 90s thousands of firms from China, India, Iran, and Turkey as well as Western Europe rushed to the region with an aim of tapping a larger share of the pie. For Russian enterprises the task was a bit different. Along with official Kremlin they tried to minimize the effect of disrupted channels and revive the shipment of goods to the region. As we approach 20-year anniversary of independence in all five countries in this paper we attempt to measure an economic success of the regional powers with regard to Central Asia. The focus of this study is to assess the success of exporters from China, India, Iran, Russia and Turkey in conquering product markets in Central Asia since mid 90s. We use UN Comtrade dataset of trade flows. Our methodology builds upon a standard analytical framework of a comparative political economy: an augmented gravity model of international trade. We estimate

the model and compare the factual export volumes with projections generated by the model. The paper also reports findings from trade complementarity analysis.

We have opted to focus on exports on several grounds. Greater volume of exports from the regional powers to Central Asia facilitate favorable bilateral relations in other areas such cultural, educational and military exchanges. Exports also make countries increasingly interdependent. Foreign trade could be used in a manner to expand political influence in a recipient country that does not have readily existing options to the trade with a certain regional power. Finally, existing political economy literature also indicates that exports from a certain regional power could lead to the business environment of the importing country in favor of exporting country. An extensive discussion of these arguments is offered by Boddewyn (1988) and Hillman & Hitt (1999).

The analysis is limited to regional powers (China, India, Iran, Russia and Turkey) for several reasons. At the moment and in the foreseeable future the Central Asia is not a strategic market for US firms due to a geographic remoteness, relatively smaller population, lower level of household income, obscured trade regime as well as high transactions cost of doing business in the region. Similar arguments go for Europe as well. Its main interests in Central Asia are energy resources, regional stability and issues related to security in Afghanistan. None of these are relevant to exporters in Europe. From their perspectives, the Central Asian market is not a strategic one since many of European export items are not affordable for most consumers in the region. In contrast to the US and Europe, all of the regional powers included in the analysis recognize expansion of trade in Central Asia as a strategic issue of foreign policy. They have government agencies that promote links with the region and participate in regional cooperation mechanisms such as Eurasian Economic Community (EurAsEC), CIS, Turkic Council, Economic Cooperation Organization (ECO), and Central Asia Regional Economic Cooperation (CAREC).

The paper is organized as follows. Section 2 provides a brief overview of export flows from China, India, Iran, Russia and Turkey to Central Asia. Section 3 reviews gravity model applications in international political economy. Section 4 illustrates our modeling strategy for a panel-data environment. Section 5 shows and discusses the main estimation results. It also lists findings from the trade complementarity analysis. Section 6 concludes.

2. Recent export flows China, India, Iran, Russia and Turkey to Central Asia

2.1. China

Up until early 2000s China took a back seat in the quest for Central Asian influence. It didn't neglect Central Asia by signing a wide range of bilateral treaties with the countries in the region but Beijing's priorities had lain elsewhere. As its energy-

hungry economy grew rapidly China woke up to new opportunities in the adjacent region to the west. For Chinese government ideal scenario of partnership is to take an advantage of geographically close resources in exchange for low-cost capital goods and infrastructure projects. To this extent China has heavily invested in extraction and transmission of crude oil in Kazakhstan. Beijing has been persistently offering Tashkent and Ashgabat its help in exploration of crude oil and natural gas. China also wants to help Kyrgyzstan and Tajikistan to extend the hydropower industries. In negotiations with Central Asian countries Beijing has no need to promote its export of consumable goods to the region as Central Asian bazaars had been overwhelmed with Chinese clothing, textile, shoes, electronic appliances, electrical tools and equipment since mid 90s.

In March 2006 Kazakhstan and China signed a trade treaty establishing several free economic zones on the border. The largest of them are located in Chinese Chuguchak and Khorgos. According to the agreement, Kazakh importers are allowed to entry these locations visa free to procure Chinese goods. To support the trade China has recently constructed four road routes: Urumqi-Dostyk-Karaganda, Urumqi-Khorgos-Karaganda, Urumqi-Maikapchagay-Karaganda, and Urumqi-Baketu-Karaganda. Kyrgyz towns of Dordoi and Karasuu also serve as large hubs for Chinese exports to Central Asia. The former is on the border with Kazakhstan, the latter is next to Uzbekistan enabling to service shuttle traders from Uzbekistan and Tajikistan.

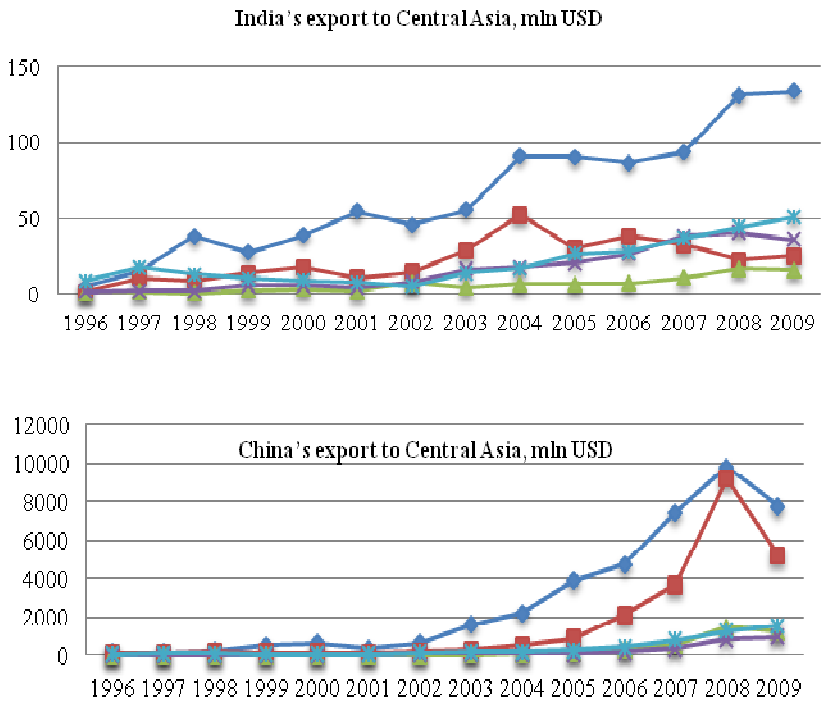
Between 1996 and 2009 Chinese exports to Central Asia skyrocketed from 218.2 to 16669.0 million USD (Figure 1). In 2009, Kazakhstan imported goods for the total value of 7748.2 million USD in 2009. More surprisingly, Kyrgyzstan accounts for 5227.5 million USD which is equivalent to about 1000 USD of Chinese imports per capita. Given the fact the nominal per capita income in this impoverished country is about 860 USD, it is likely that most of these goods were re-exported to Kazakhstan and Uzbekistan. Direct exports to Uzbekistan in 2009 were equal to 1560.5 million USD, Tajikistan- 1217.6 million USD, and Turkmenistan – 915.7 million USD. Nomenclature of Chinese export to the region is very diverse. Apparel, clothing accessories, textile yarn, fabrics, fo otwear, plastic, rubber items, industrial machinery, road vehicles, telecommunication and office equipment, home appliances iron, steel, consumer chemicals, and furniture are at the top of the list.

2.2. India

India is a late-starter in the region; it also doesn't have strong cultural and historic bonds enjoyed by Russia or Turkey. In 1990s and early 2000s economic contacts between Central Asian countries and India were limited and sporadic in nature. However, the recent growth of Indian economy forced Delhi to seek affordable sources of energy and natural resources up in the north. In 2006 Oil and Natural Gas Corporation of India succeeded obtaining exploration right for hydrocarbon reserves in Turkmenistan. Another notable involvement includes participation in

TAPI project. The 1,680 km long Turkmenistan-Afghanistan-Pakistan-India gas pipeline supported by the Asian Development Bank is expected to deliver 90 billion cubic feet of natural gas per months from Turkmenistan's gas fields to Central Pakistan and northwestern regions of India.

In exchange for energy resources, India hopes to export scientific and technological capabilities. For instance, pharmaceutical, IT and telecommunications industries were expected to thrive in the region. Unfortunately for Delhi, the exports to Central Asia remain negligible. In many aspects Indian economic involvement in Central Asia resembles the case of Iran. Despite numerous bilateral trade agreements and geographic proximity Indian exporters failed to deliver: in 2009 exports from India to Central Asia totaled to 261.7 million USD which is equivalent to 1.6 % of Chinese exports to the region (Figure 1). Kazakhstan accounts for roughly half of Indian exports. Medicinal and pharmaceutical products, telecommunication equipment, certain types of industrial machinery as well as apparel and clothing accessories account for a bulk of shipments from India to Central Asia.



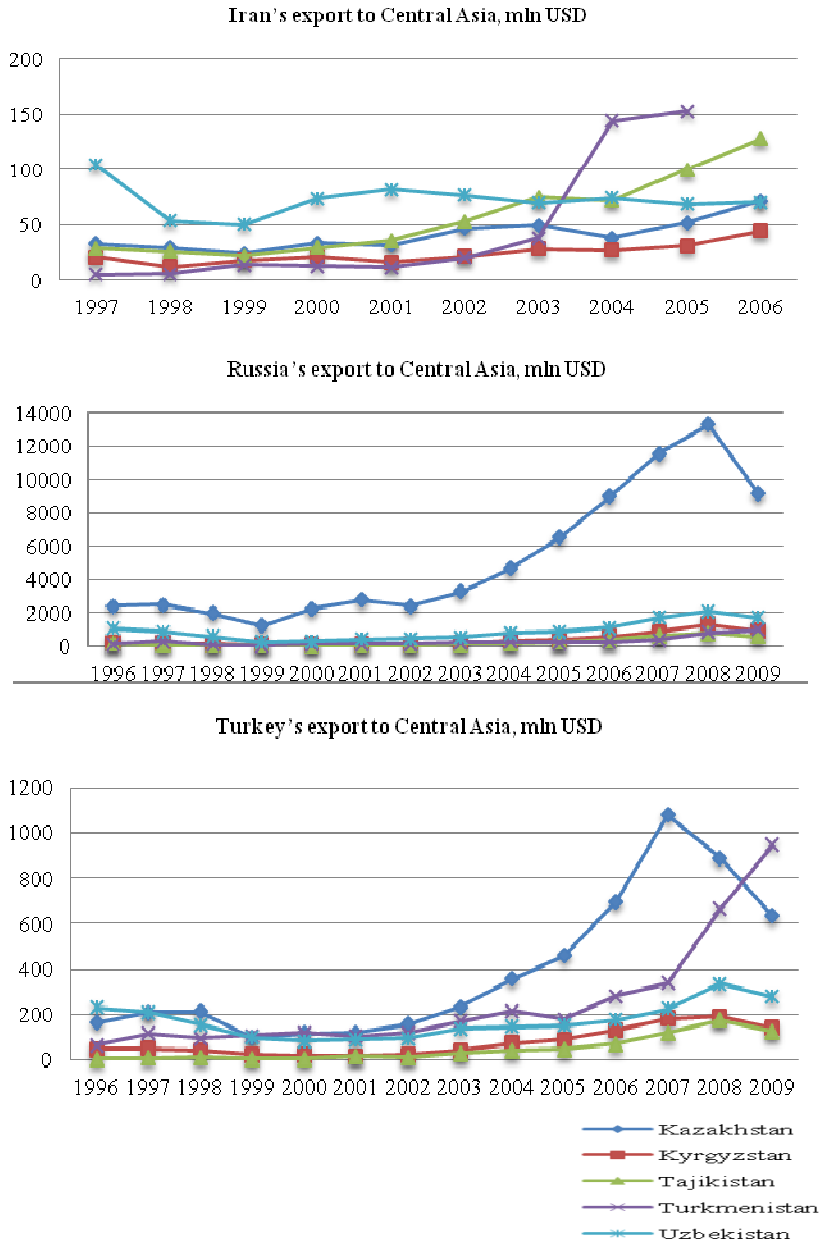


Figure 1: Exports to Central Asia, 1996-2009

Source: UN Comtrade, 1996-2009.

2.3. Iran

For historical reasons Iran has long considered itself as a gateway to Central Asia. Due to Russian occupation and Soviet expansion in the 20th century the links with the region became very limited. In the past fifteen years though Iran has been trying to catch up by boosting economic and political links with Central Asian countries. The focus of efforts was on those areas with which it shares historical, cultural and linguistic heritage (Tajikistan and certain oblasts of Uzbekistan). Official Tehran has supported cultural, educational and religious exchanges with Tajikistan. Dushanbe hosted several meetings of Persian speaking countries that also include Afghanistan.

In terms of economic cooperation, Iran's interests in the region are significant. Firstly, Iran strives to expand transportation infrastructure in the region with the eventual aim of controlling the transit of goods to and from landlocked region. It frequently uses the ECO meetings as a discussion and lobbying platform. Iran has championed Sarakhs –Bandar Abbas route that connects Turkmenistan and other Central Asian countries to the nearest international waterways. Iranians built Anzab tunnel in Tajikistan. Furthermore, in 2009 Ahmadinejad, Karzai and Rakhmon agreed to construct a brand new road between Iran and Tajikistan via northern Afghanistan. Predictably, Tehran gladly agreed to pick the tab for the project. Secondly, it wants to participate in a number of Caspian oil and gas development projects. In terms of trade promotion Tehran established a number of free trade zones close to borders of Central Asia. Sarakhs and Bandar Anzali are the largest of them.

For the lack of reliable data it is hard to estimate most recent trade volumes between Iran and Central Asian countries. The most recent data for Iran's export to the region dates back to 2006. This data shows that despite significant efforts by the Iranian government exporters performed rather poorly in Central Asia. Between 1997 and 2006 exports to Kazakhstan grew from 32.7 million to 71.2 million USD (Figure 1). Uzbekistan imported only 70.5 million USD worth of Iranian goods in 2006. In Tajikistan and Turkmenistan Iranian firms performed slightly better (128.5 and 153.2 million USD, respectively). Overall, none of these numbers match ambitious intentions of official Tehran. Main items that exported to Central Asia include gasoline (mostly as a cross-border trade to Turkmenistan), consumer chemicals, plastic products, miscellaneous foods (e.g. pasta, spices, sugar products), medicinal and pharmaceutical products as well as selected types of industrial machinery.

2.4. Russia

Major component of Kremlin's foreign policy in the region is to revive closer economic ties between "center" and "republics". Conventionally, Russia's economic actions in Central Asia had been largely focused on safeguarding an access to cheap oil and natural gas. Under the current Russian leadership however

the policy has become more assertive. Central Asia has been tagged by Putin as "near abroad" which qualifies the region to be of "key national interest" (Kupchinsky, 2003). Thanks to a long period of coexistence Russia has a strong edge in Central Asia: Russian businessmen has more contacts in the region, speak the language, and understand the mentality of Central Asian better than businessmen from in China, India, Iran or Turkey. They also face lower transactions costs of doing business in the region as most of export-import documentation and custom clearance forms used by the Central Asian authorities resemble those of Russia. Furthermore, Russian citizens are waived from a visa requirement to enter any of five countries in the region, inaccessible comfort for nationals of other regional powers. One has to also mention regional economic and political organizations in which Russia shares membership with Central Asian countries. The most active of such organizations is EurAsEC that includes Belarus, Kyrgyzstan, Kazakhstan, Russia and Tajikistan. The objectives of the organization are very ambitious as it strives to introduce a common external tariff for all goods entering the common zone and facilitate movement of capital and labor. Unfortunately, little of this has achieved so far.

Despite ineffective regional arrangements, Russia registered notable growth in its exports to Central Asian countries (Figure 1). Exports to the region grew from 3 890 million USD in 1996 to 13 331 million in 2009 (Figure 1). Exports to Kazakhstan account for most of the growth. In 2009, Russia shipped to Kazakhstan 9 147 million USD worth of goods, while Uzbekistan imported Russian goods for the total value of 1 697 million USD. Russia's main export items to the region were limited to metal products such as iron and steel tubes, pipes, tube or pipe fittings, petroleum and petroleum products such as gasoline, chemical materials and products, wood and wood products, and selected types of industrial machinery and equipment.

2.5. Turkey

Turkey was the first country to recognize the independence of Central Asian nations and the first to open embassies across the region. Building on cultural and linguistic similarities the Turkish government, private and civil societies have put extensive efforts in developing political, economic and social interaction between Central Asia and Turkey. Turkish-run universities and secondary schools, joint Turkic TV channels, regular educational and cultural exchanges manifest to increased role of Turkey in the region. The Turkish Cooperation and Development Agency since 1992 implemented numerous economic, social and cultural projects that aim to support nation-building process in the region. Turkey and Central Asian countries are members of ECO and Turkic Council. In fact, many Central Asian look at Turkey as an economic and democratic model of development. Recent surge of Turkish economy and its role in world affairs may have an even more influential role for the Central Asian people.

A key component of Turkish foreign policy in Central Asia is a development of strong economic ties. Turkish government signed multiple bilateral agreements establishing cooperation in customs, energy transportation, tourism and technical assistance. Turkish firms achieved a significant market share in construction, telecommunication, banking, textile and retail sectors. Turkey has become an important investor. It also strives to serve as a gateway for Central Asian trade and energy transit via TRACECA and NABUCCO cooperation schemes. According to Turkstat more than 1000 Turkish firms invested in Central Asia. By 2006 total Turkish FDI in the region reached 3.5 billion USD.

Turkey's economic presence varies from country to country in Central Asia. The heaviest exposure is in Turkmenistan. Turkish businessmen dominate transportation, construction and communication, tourism and retail trade industries in Turkmenistan. Over the past two decade Turkish constructions companies completed about 600 projects for the total values of 21 billion USD. Kazakhstan and Kyrgyzstan also succeeded in attracting significant number of Turkish businesses.

Exports volumes from Turkey to Central Asia increased from 509.7 million USD in 1996 to 2124.0 million USD in 2009 (Figure 1). Turkmenistan accounts for a lion's portion of this flow. In 2009 it imported Turkish goods for the total value of 944.9 million USD. Kazakhstan and Uzbekistan follow with 633.5 and 279.1 million USD, respectively. Nomenclature of Turkish exports is very diverse resembling one of China. Apparel, clothing accessories, textile yarn, fabrics, footwear, plastic, rubber items, iron, steel, metalworking, power-generating and other industrial machinery, road vehicles including automobiles, telecommunication and office equipment, home appliances, consumer chemicals, fertilizers, furniture, foods including cereals consistently remain among the main items of Turkish exports to Central Asia.

3. Gravity model applications in international political economy

The findings from section 2 indicate that China, Turkey and to a certain extent Russia have been quite successful in Central Asia. To analyze this issue further we rely on a standard analytical framework of a comparative political economy: the gravity model of international trade. The gravity model has been employed to study several aspects of the international political economy including migration, FDI and bilateral trade flows. The model establishes a baseline for the extent of connectivity between countries, whereby bilateral trade is a function of the distance between the countries and their joint income. The first empirical study that tried to explain trade flows by the market size of the trading partners and the distance between them goes back to Tinbergen (1962) and Poyhonen (1963). The standard specification of the gravity model estimation involves GDP per capita (to account for intra-industry trade and level of income), a measure of remoteness (this captures the idea that it is the relative cost of trading that matters), adjacency and geographical characteristics. The gravity model is quite flexible, and has seen

numerous empirical applications to test for border effects (McCallum, 1995; Anderson and van Wincoop, 2003), the impact of regional trade blocks (Schiff and Winters, 2003), or the impact of a common currency on bilateral trade flows (Frankel and Rose, 1997). Recently, researchers have also looked at which kinds of institutions promote international trade and at the impact of protectionism on trade flows in the context of a gravity model (Koukhartchouk and Maurel, 2003; Rose, 2002; Subramanian and Wei, 2003). Theoretical foundations of the gravity equation relying on very different modeling assumptions can be found in Anderson and van Wincoop (2003), Eaton and Kortum (2002), and Chaney (2008).

Many recent studies deal with estimating trade potential for rapid-growing developing countries. For example, Batra (2004) estimated trade potential for India using the gravity model approach for the year 2000. Author found that the magnitude of India's trade potential is highest with the Asia-Pacific region followed by Western Europe and North America. Bhattacharyya (2006) also applied the gravity model to India's bilateral trade flows for the years 1950-2000. He found that India's trade responds less than proportionally to size and more than proportionally to distance. Colonial heritage is still an important factor in determining India's direction of trade at least in the second half of the twentieth century. Also India trades more with developed rather than less-developed countries. Rahman (2003) analyzed the Bangladesh's trade with its major trading partners. The results showed that Bangladesh's trade is positively determined by the size of the economies, per capita GNP differential of the countries involved and openness of the trading countries. The major determinants of Bangladesh's exports are the exchange rate, partner countries' total import demand and openness of the Bangladesh economy. The country specific effects showed that Bangladesh would do better by trading more with its neighboring countries. DeRosa (2008) applied gravity model including a standard set of variables to estimate bilateral trade flows between the Maghreb Union countries, as well trade flows of the Maghreb countries with the EU and the US from 1976 to 2005. Similarly, Jošić (2008) investigated relationship between trade variables such as exports and country's macro variables for OECD countries from 1990 to 2008.

Application of gravity approach for Central Asian studies is rather limited. Raballand (2003) uses a gravity approach estimates the impact of land-lockedness on trade. His findings indicate that the land-lockedness constitutes a significant transportation cost for exporters in Central Asia. Felipe and Kumar (2010) estimate the gains in trade derived from improvements in trade facilitation measured through the World Bank's Logistic Performance Index (LPI). Their results show that there are significant gains in trade as a result of improving trade facilitation in these countries. These gains in trade vary from 28 percent in the case of Azerbaijan to as much as 63 percent in the case of Tajikistan.

Most economists agree that the gravity model of trade has been a success from the empirical point of view. Over the years, it has played an important role in the

estimation of trade patterns. This paper contributes to the existing literature by focusing on exports from China, India, Iran, Russia and Turkey to Central Asian countries.

4. An augmented gravity model

Our methodology builds upon a standard analytical framework of comparative political economy: the gravity model. We follow the common practice of estimating expected trade volumes between countries using a single equation. For the values of x_{ijt}, the exports from exporting country i to importing country j in year t, the gravity equation can be formulated as following:

$$x_{ijt} = M_{it}^{ex} M_{jt}^{im} \vartheta_{ijt} \quad (1)$$

$$\ln \vartheta_{ijt} = D_{ijt} + \varepsilon_{ijt} \quad (2)$$

Where M_{it}^{ex} and M_{jt}^{im} are vector of monadic characteristics of countries i and j. These are conventionally measured by some functional form of the total population and income per capita.

ϑ_{ijt} is a dyadic term that captures observable and unobservable characteristics of a bilateral trade between countries i and j. In line with previous literature, observable characteristics of a dyadic term D_{ijt} include variables for geographic remoteness (common border, distance between the largest cities), cultural and institutional commonalities (common language and legal system), past and present colonial links as well as economic cooperation (regional trade agreement, common currency and membership in WTO). Finally, ε_{ijt} is an error term.
The conventional approach to estimation is to take logs of (1) and substitute in (2) to obtain:

$$\ln x_{ijt} = \ln M_{it}^{ex} + \ln M_{jt}^{im} + D_{ijt} + \varepsilon_{ijt} \quad (3)$$

Early empirical studies used cross-sectional data to estimate a gravity model; in most recent years, researchers started using panel data. The use of panel data instead of cross-sectional analysis allows us to remove some biases stemming from unobserved country-pair heterogeneity and to estimate the parameters of the model with greater precision (Shepotylo, 2009). Therefore, our analysis will be based on export panel data for the years 1996-2009 for 165 countries.

A major challenge in estimation of augmented gravity models is existence of multilateral trade resistance (MTR). According to Anderson and van Wincoop (2003, 2004) MTR refers to the set of barriers which each of trading partners face in their trade with all other countries. If MTR is unchecked it may lead to biased as well as inconsistent parameter estimates in the gravity equation. To account for MTR we follow Rose and van Wincoop (2001) and Melitz (2007) and proxy the MTRs with country-specific export and import dummy variables. Next, we run pooled panel model that leads to consistent parameter estimates (Feenstra, 2005).

This approach also enables us to generate parameter estimates for the time–invariant regressors in the model.

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More specifically, we estimate the following equation:

$$\ln x_{ijt} = \beta_0 + \beta_1 \ln N_{ijt} + \beta_2 \ln y_{it} + \beta_3 \ln y_{jt} + \beta_4 \ln Dist_{ij} + \beta_5 Border_{ij} + \beta_6 Lang_{ij} + \beta_7 Law_{ij} + \beta_8 Col_{ij} + \beta_9 RTA_{ijt} + \beta_{10} WTO_{ijt} + \beta_{11} Cur_{ijt} + \sum_i \gamma E + \sum_i \gamma I + \varepsilon_{ijt} \quad (4)$$

where E and I variables that identify an export and import from country I. The remaining explanatory variables are applied according to the CEPII's[1] definitions. Following CEPII's definition also allows us to ascertain the similarity of our findings with previous gravity studies that rely on CEPII resources.

Trade flow x_{ijt} is a trade flow from country i to country j in U.S. dollars. Theoretically, this could be measured as exports from country i to country j or imports of country j from country i. However in practice, these two numbers deviate from each other due to exchange rate fluctuations, treatment of transportation costs and differences in customs procedures. To deal with this issue we follow the procedure used by Head, Mayer and Ries (2010) and take the larger of two numbers.

Population N_{ijt} is a product of population for countries i and j that are obtained from the World Bank's World Development Indicators. For various reasons countries with larger population are likely to import and export more than countries with lower population. Thus we expect positive sign for the coefficients of N_{ijt}.

Income $y_{it}$and y_{jt} are nominal GDPs per capita that also come from the World Bank's World Development Indicators. These variables are included to measure economic well-being of the trading partners. We also expect positive sign for the coefficients of y_{it} and y_{jt}.

Distance $Dist_{ij}$ stands for a distance in kilometers between the main cities in countries i and j. Greater distance between two countries leads to increased transportation costs for trade flows. We expect a negative sign for the coefficient of Dist. The data is generated by the CEPII.

Common border $Border_{ij}$, single currency Cur_{ijt} , common language $Lang_{ij}$, colonial ties Col_{ij} positively influence bilateral trade flows. These variables account for the historical, cultural, economical and political relations between trading countries both at state and firm levels that may lead to reduction in transaction

[1] CEPII is a non-profit research institute in France that specializes on international trade.

costs. For example, common language is expected to reduce transaction costs in international trade as speaking the same language simplifies and promotes trade negotiations. Similarly colonial ties provide shared history for countries and this is also expected to reduce transaction costs caused by cultural differences. Thus we expect that the signs of the coefficients for Border_{ij}, Lang_{ij}, Cur_{ijt} and Col_{ij} to be positive.

Common legal origins Law_{ij} identifies unity of legal origin. Several recent gravity studies (e.g. see La Portaet al, 1998; Portes and Rey, 2005; Aviat and Coeurdacier, 2007; Daude and Fratzscher, 2008) find that shared origin of a legal system positively affects the volume of bilateral trade. $\mathrm{Law}_{ij}$is included to capture such a relationship. We use data on common legal origins of the two countries generated by Andrei Shleifer and available at the CEPII website. Shleifer distinguishes five legal origins, namely, English, French, German, Scandinavian and Socialistic. In our analysis Law_{ij} takes the value of one if countries share these legal origins.

WTO membership WTO_{ijt} tends to positively influence bilateral trade flows. Taking into account the fact that trade policy is more liberal in the countries that are WTO members than for non-members, we expect that bilateral trade flows between WTO members will be greater than between non-members. WTO_{ijt} takes the value of one if both trading partners are WTO members. Its coefficient is likely to be positive.

Membership in bilateral or regional trade agreements RTA_{ijt} positively influences bilateral trade flows. Countries join traded blocks and integrated groupings aiming to simplify and expand their trade relations. Thus we expect the positive sign for the coefficient of this variable. Bilateral trade agreements are quite common. They are fairly easy to negotiate, and give those two nations favored trading status between each other. Regional trade agreements are more complicated to negotiate, but are very powerful once all parties sign the agreement. Cases of regional trade agreements include ASEAN Free Trade Area, Greater Arab Free Trade Area, Gulf Cooperation Council, North American Free Trade Agreement, Southern African Development Community, and South Asia Free Trade Agreement.

To estimate (4) we extend CEPII gravity dataset. The original CEPII dataset available online at http://www.cepii.fr at no cost features information for all pairs of countries for the period 1948 to 2006.We supplement data for time-varying variables for the period 2007 to 2009 using the definitions provided by the CEPII.

Table 1 lists parameter estimates for the coefficients of our interest. The full model includes all the right-hand side variables described earlier. In the base model we drop Lang_{ij} and Law_{ij} to check the robustness and fit of our estimates to specification changes. Variance inflation factor (VIF) test for multicollinearity shows that our variables are not correlated with each other.

Table 1: Estimated gravity model of log exports, 1996-2009

	Base Model	Full Model
log of population	0.677*** (0.082)	0.665***(0.082)
log of GDP per capita (export origin)	0.421***(0.030)	0.424***(0.030)
log of GDP per capita (export destination)	0.523***(0.027)	0.525***(0.027)
log of distance	-1.652***(0.022)	-1.512***(0.022)
common border	1.003***(0.095)	0.947***(0.093)
common language		0.661***(0.043)
common legal system		0.436***(0.028)
colonial history	1.214***(0.092)	0.729***(0.088)
regional trade agreements	0.243***(0.047)	0.281***(0.045)
WTO membership	0.361***(0.038)	0.315***(0.037)
common currency	0.216 (0.135)	-0.066 (0.129)
Observations	216,039	216,039
R-squared	0.729	0.735

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Overall, our gravity model is well fit and the estimated coefficients are in line with most recent studies (e.g. Head, Mayer and Ries, 2010). The R-squared of the model is around 0.73. The estimates are robust to model specification. We find sizeable positive effect of population, GDP per capita both in country of origin and destination of exports. Consistent with myriad previous publications we find a negative effect of the distance between trading partners. Despite decreased transportation cost and development of communication technologies the distance effect has been persistent in gravity studies for decades.

We also find that colonial history between trading partners has a very strong positive effect on bilateral trade. Common language has a positive impact as well. Our regressions show that bordering countries have higher trade turnover notwithstanding the fact that we control for a distance between major cities in two countries. Finally, all variables that indicate a closer trade and monetary cooperation have a positive effect on trade flows.

5. Discussion of findings

Having estimated the gravity model for bilateral trade flows in the world for the period of 1996-2009, we proceed to analyze the export potential of China, India, Iran, Russia and Turkey in Central Asian countries. We use parameter estimates from the full model to predict export volumes for the same time period. The resulting numbers can be viewed as export potential. Next, we compare projected potential with actual export flows in this period. The difference between potential and actual export numbers can be interpreted as an un-exhausted export potential. Such technique has been frequently used in the literature (e.g., Baldwin, 1994; Wangand Winters, 1991; Breuss and Egger, 1999; Brulhart and Kelly, 1999). Tables 2-6 list actual exports and gravity model projected exports from China, India, Iran, Russia and Turkey to Central Asian countries.

Before 2006 Chinese exports to Central Asia were below projections from the gravity model. However, in 2007-2009, China performed extremely well, well beyond our model projections. Most of the gap is caused by exports to Kyrgyzstan. For instance, for 2009 the gravity model predicts that Chinese exports to this country are supposed to be around 790 million USD. In reality, they equaled to 5227.5 million USD. As discussed earlier re-export of Chinese goods from Kyrgyzstan to other Central Asian countries may partially explain such a high volume.

The comparison of projected and actual exports confirms our earlier discussion about poor performance of Indian exporters in Central Asia. Numbers projected by the gravity model are consistently higher than actual exports. For 2009, the model predicts exports for the total value of 682.6 million USD whereas actual exports were equal to 261.7 million USD. Worth mentioning, India performed weak in all five countries of the region.

Similar to India, for the region as a whole Iran actual exports were also consistently behind benchmarks predicted by the gravity model. For 2005 the model projects 864.9 million USD of Iranian exports to Central Asia. To a great disappointment of Tehran actual exports were only 404.3 million USD. The gap is most caused by low exports to larger countries in the region. In fact, for Tajikistan and Kyrgyzstan in most of the years actual exports exceeded the project numbers. Unfortunately, due the data unavailability the analysis for Iran does not cover more recent years.

For the region as whole up until 2007 Russia failed to achieve export benchmarks projected by gravity models. However, in 2007-2009 actual exports to Central Asia exceeded the projected one by 2.5-3.0 billion USD. Once again Kyrgyzstan and Tajikistan are exporting significantly more than projected given their size, income, distance and other characteristics. In 2009, for instance, Kyrgyzstan imported Russian goods for the total value of 916.0 million USD although the model predicts 260.1 million USD.

In every single year included in the analysis, Turkey's actual exports to Central Asia were higher than those projected by the gravity model. Since 2007 Turkish exporters shipped to the region twice more that they are projected to do, the performance which even China fell short to achieve. While Turkish exporters were successful in all countries of the region, performance in Turkmenistan is particularly distinctive.

Table 2: Exports from China to Central Asia in million USD, 1996-2009

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Kazakhstan	factual	95.3	94.6	204.7	494.4	598.7	327.7	600.1	1571.9	2211.8	3896.8	4750.5	7445.9	9824.5	7748.2
	projected	1827.6	2042.3	2119.1	1730.0	1922.6	2136.6	2363.3	2798.7	3662.7	4543.8	5648.4	5905.8	7883.6	6825.2
Kyrgyzstan	factual	68.7	70.6	172.4	102.9	110.2	76.6	146.2	245.2	492.7	867.2	2112.8	3665.5	9212.0	5227.5
	projected	229.7	246.5	247.6	202.4	226.7	330.7	355.8	411.6	486.7	551.1	613.5	654.2	900.8	791.8
Tajikistan	factual	7.6	11.0	11.0	2.3	6.8	5.3	6.5	20.8	53.6	143.7	305.8	513.8	1479.7	1217.6
	projected	189.5	192.5	242.8	207.0	209.3	224.3	249.7	296.5	378.9	429.5	505.3	520.7	726.4	668.5
Turkmenistan	factual	8.5	11.6	10.3	7.5	12.1	31.5	86.8	78.8	84.5	90.9	162.6	302.5	801.9	915.7
	projected	97.7	108.4	116.7	106.7	124.6	139.1	164.7	202.5	238.6	279.5	339.9	334.3	459.2	466.5
Uzbekistan	factual	38.2	61.5	56.9	27.4	39.4	50.7	104.4	146.8	172.4	230.1	406.2	764.9	1277.8	1560.5
	projected	354.6	398.8	419.6	424.5	404.5	369.0	355.0	383.1	460.1	545.6	630.7	644.4	853.4	858.5
Total Central Asia	**factual**	**218.2**	**249.4**	**455.3**	**634.4**	**767.3**	**491.8**	**943.9**	**2063.5**	**3015.1**	**5228.6**	**7737.8**	**12692.6**	**22596.0**	**16669.5**
	projected	**2699.2**	**2988.5**	**3145.9**	**2670.6**	**2887.6**	**3199.8**	**3488.5**	**4092.3**	**5227.0**	**6349.6**	**7737.9**	**8059.3**	**10823.3**	**9610.4**

Table 3: Exports from India to Central Asia in million USD, 1996-2009

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Kazakhstan	factual	4.4	15.1	38.0	27.2	38.6	54.5	45.6	55.5	90.7	90.3	86.6	93.7	131.6	133.9
	projected	98.6	108.3	109.8	90.8	97.7	106.0	115.9	140.4	182.8	226.8	275.9	294.8	350.2	307.3
Kyrgyzstan	factual	1.0	10.8	8.7	13.8	17.7	10.7	14.5	28.6	52.2	30.2	38.1	32.7	22.2	25.2
	projected	17.3	18.2	24.5	20.3	22.0	22.9	24.3	28.8	33.9	38.4	41.8	45.6	55.8	49.7
Tajikistan	factual	0.7	1.1	0.5	2.4	3.3	1.7	7.5	4.3	6.3	6.6	6.9	10.5	16.7	15.8
	projected	20.0	19.9	24.6	21.2	20.8	21.8	23.9	29.1	36.9	41.9	48.2	50.8	63.1	58.8
Turkmenistan	factual	1.4	1.7	1.9	5.6	5.4	4.2	7.6	16.4	17.5	20.4	26.5	37.9	40.2	35.9
	projected	24.9	27.1	28.5	26.4	29.8	32.5	38.1	47.9	56.1	65.7	78.2	78.6	96.1	99.0
Uzbekistan	factual	8.1	17.6	12.8	9.9	8.8	7.1	4.9	14.0	16.6	26.5	27.7	36.9	44.3	50.9
	projected	83.0	91.8	94.4	96.6	89.2	79.5	75.6	83.4	99.6	118.2	133.7	139.6	164.5	167.7
Total Central Asia	**factual**	**15.6**	**46.3**	**61.9**	**58.9**	**73.9**	**78.2**	**80.1**	**118.8**	**183.2**	**173.9**	**185.9**	**211.8**	**255.1**	**261.7**
	projected	**243.8**	**265.3**	**281.9**	**255.3**	**259.6**	**262.7**	**277.8**	**329.6**	**409.3**	**491.0**	**577.9**	**609.3**	**729.8**	**682.6**

Table 4: Exports from Iran to Central Asia in million USD, 1997-2006

		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Kazakhstan	*factual*	*32.7*	*29.5*	*24.1*	*33.2*	*31.6*	*46.9*	*49.3*	*37.8*	*51.5*	*71.2*
	projected	112.2	112.1	90.0	94.7	106.8	114.2	137.2	181.7	225.9	279.9
Kyrgyzstan	*factual*	*21.1*	*12.2*	*18.1*	*21.3*	*16.4*	*21.1*	*28.3*	*27.3*	*31.0*	*44.5*
	projected	14.1	13.6	11.0	11.6	12.6	13.1	15.3	18.3	20.8	23.1
Tajikistan	*factual*	*28.9*	*25.9*	*22.1*	*29.3*	*35.9*	*52.8*	*74.8*	*71.8*	*100.3*	*128.5*
	projected	37.8	45.9	38.5	36.8	40.1	43.1	51.9	67.2	76.3	89.5
Turkmenistan	*factual*	*5.5*	*5.5*	*13.6*	*12.9*	*11.3*	*20.2*	*38.1*	*144.3*	*153.2*	
	projected	176.1	182.6	164.3	181.5	205.6	235.4	293.6	350.1	411.0	
Uzbekistan	*factual*	*104.2*	*53.8*	*50.0*	*73.8*	*81.7*	*76.5*	*69.6*	*74.0*	*68.3*	*70.5*
	projected	105.7	107.1	106.6	96.1	89.0	82.7	90.6	110.1	130.9	150.8
Total Central Asia	**factual**	**192.3**	**126.9**	**128.0**	**170.5**	**177.0**	**217.4**	**260.2**	**355.2**	**404.3**	
	projected	**445.9**	**461.3**	**410.3**	**420.8**	**453.9**	**488.6**	**588.6**	**727.4**	**864.9**	

Table 5: Exports from Russia to Central Asia in million USD, 1996-2009

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Kazakhstan	*factual*	*2388.6*	*2471.9*	*1967.2*	*1225.6*	*2247.4*	*2778.0*	*2403.0*	*3280.7*	*4664.1*	*6533.9*	*8967.0*	*11548.8*	*13300.6*	*9147.0*
	projected	3289.2	3551.1	3010.5	2080.7	2492.5	2841.6	3169.9	3908.2	5442.1	7043.0	9042.3	9461.8	12563.7	9167.0
Kyrgyzstan	*factual*	*159.3*	*167.4*	*132.7*	*84.5*	*102.9*	*83.3*	*104.0*	*160.9*	*267.9*	*376.8*	*561.0*	*875.8*	*1311.0*	*916.0*
	projected	138.5	143.6	117.9	81.6	98.5	107.6	116.7	140.6	176.8	208.9	240.2	256.3	351.1	260.1
Tajikistan	*factual*	*150.6*	*88.5*	*77.5*	*66.6*	*55.9*	*69.4*	*67.9*	*128.6*	*183.4*	*240.0*	*378.0*	*606.1*	*793.9*	*572.4*
	projected	132.0	129.6	133.5	96.4	105.1	115.5	129.7	160.3	217.9	257.7	313.2	323.0	485.9	376.9
Turkmenistan	*factual*	*114.8*	*265.6*	*95.1*	*60.2*	*130.0*	*140.3*	*142.7*	*221.6*	*242.0*	*223.5*	*229.0*	*384.0*	*808.9*	*999.0*
	projected	248.9	266.6	234.6	181.6	228.5	261.7	312.7	400.2	501.7	613.1	769.9	757.8	1035.5	886.7
Uzbekistan	*factual*	*1077.0*	*874.5*	*563.8*	*240.3*	*274.4*	*409.1*	*453.4*	*512.0*	*766.6*	*860.9*	*1087.0*	*1722.3*	*2066.9*	*1697.0*
	projected	685.0	744.3	639.9	548.1	562.8	526.8	511.1	574.2	733.8	907.8	1083.9	1108.1	1459.8	1237.7
Total Central Asia	**factual**	**3890.3**	**3868.0**	**2836.3**	**1677.1**	**2810.6**	**3480.1**	**3171.0**	**4303.8**	**6124.0**	**8235.0**	**11222.0**	**15136.9**	**18281.4**	**13331.4**
	projected	**4493.6**	**4835.2**	**4136.5**	**2988.4**	**3487.3**	**3853.2**	**4240.0**	**5183.3**	**7072.4**	**9030.6**	**11449.4**	**11907.1**	**15896.0**	**11928.3**

Table 6: Exports from Turkey to Central Asia in million USD, 1996-2009

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Kazakhstan	*factual*	*163.2*	*210.5*	*212.9*	*96.5*	*116.1*	*119.8*	*158.7*	*234.0*	*355.6*	*459.9*	*696.8*	*1079.9*	*890.6*	*633.5*
	projected	146.6	159.8	165.1	127.1	140.4	131.0	154.3	194.9	262.5	330.8	399.7	455.4	574.6	444.4
Kyrgyzstan	*factual*	*47.0*	*49.4*	*41.4*	*23.1*	*20.3*	*17.4*	*24.0*	*40.9*	*74.7*	*89.5*	*132.2*	*181.3*	*191.4*	*140.1*
	projected	20.4	21.3	29.3	22.6	25.1	22.5	25.7	31.7	38.6	44.4	48.1	55.8	72.7	57.1
Tajikistan	*factual*	*4.4*	*7.2*	*9.8*	*5.2*	*4.4*	*15.6*	*10.9*	*29.5*	*41.6*	*46.7*	*71.8*	*118.1*	*176.5*	*126.5*
	projected	12.1	12.0	15.1	12.1	12.2	10.9	13.0	16.4	21.6	24.9	28.5	32.0	42.1	34.6
Turkmenistan	*factual*	*65.2*	*117.4*	*95.5*	*106.5*	*119.5*	*105.3*	*118.5*	*170.3*	*214.8*	*180.6*	*281.3*	*340.0*	*662.9*	*944.9*
	projected	64.3	69.5	74.6	64.3	74.6	69.9	88.2	115.7	140.3	166.9	197.2	211.4	274.5	249.1
Uzbekistan	*factual*	*229.8*	*210.5*	*155.9*	*99.1*	*82.1*	*89.7*	*93.5*	*138.4*	*145.2*	*151.1*	*176.0*	*225.6*	*337.0*	*279.1*
	projected	91.1	100.0	104.8	100.0	94.6	72.5	74.3	85.5	105.7	127.3	143.0	159.2	199.3	179.1
Total Central Asia	**factual**	**509.7**	**595.0**	**515.5**	**330.5**	**342.4**	**347.7**	**405.5**	**613.1**	**832.0**	**927.9**	**1358.1**	**1944.9**	**2258.3**	**2124.0**
	projected	**334.5**	**362.6**	**388.8**	**326.0**	**346.9**	**306.9**	**355.6**	**444.3**	**568.7**	**694.2**	**816.5**	**913.8**	**1163.3**	**964.3**

To analyze further the prospects of Chinese, Indian, Iranian, Russian and Turkish exporters we have calculated trade complementarity indices (TCI) in the region. The index measures degree of similarities between the export basket of one country and the import basket of another (Michaely, 1996). The intuition behind TCI is the fact that economic integration arrangements such as a free trade agreement lead to a better outcome if trading partners have high trade complementarities. In other words, the trade turnover increases if goods produced by some members are demanded for consumption by other members of the free trade agreement. TCI values range between 0 and 100. Higher TCI between two countries is associated with a better product complementarity so countries feature a high potential for a bilateral trade.

Formally, a bilateral TCI is defined as:

$$TCI_{ij} = 100 - \sum_{k} \frac{|m_{jk} - x_{ik}|}{2}$$

where x_{ik} is country *i*'s total export of product *k*, and m_{jk} is country *j*'s total imports of product *k*. The index takes value of zero when one country imports no goods exported by another country whereas the index is 100 if the structure of exports in one of the countries is identical to the structure of imports in the other country. Tsikata (1999) and Khandelwal (2004) argue that TCI's above 25 could be considered as a sign of strong trade complementarity. As the world economy becomes more integrated the benchmark obviously could be adjusted upward. To calculate TCI for exports from China, India, Iran, Russia and Turkey to Central Asia we utilize 2009 UN COMTRADE data using two-digit SITC Rev 4 classification of goods and commodities. Table 7 presents the matrix of the trade complementarity indices for exports from China, India, Iran, Russia and Turkey to Central Asia.

Table 7: Trade Complementarity Indices for Exports from China, India, Iran, Russia and Turkey to Central Asian Countries

			Importers		
Exporters	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
China	0.47	0.39	0.50	0.45	0.40
India	0.49	0.49	0.60	0.39	0.49
Iran	0.14	0.09	0.17	0.07	0.16
Russia	0.28	0.31	0.29	0.20	0.29
Turkey	0.59	0.47	0.63	0.55	0.58

Once again, the calculations point out Turkey's comfortable exporting position. Its export structure matches very well with the makeup of importing goods in all five nations of Central Asia. TCI for Turkish export range between 0.47 in Kyrgyzstan to 0.59 in Kazakhstan. The analysis indicates that Turkey is likely to continue to perform well in Central Asia.

TCI table indicates on a great potential of Indian exports in Central Asia. There is high degree of similarities between the export from India and the import baskets of Central Asian countries. Unfortunately, very little of that potential has been

realized so far. Interestingly, for four out of five countries India features higher TCI than those of China.

Chinese exports are also well compatible with Central Asian imports. The TCIs range between 0.39 in Kyrgyzstan and 0.47 in Kazakhstan. As oppose to India, China has been very successful in utilizing trade potential in the region. Despite the lowest set of exporting TCIs, Russia is well positioned; four out of five TCIs are above of 25, conventional benchmark value of compatibility. However, it is likely that Russia will be unable to expand substantially exports to the region.

Finally, we also find poor match of Iranian exports with Central Asian imports. The TCIs for Iranian exports range between 0.07 in Turkmenistan to 0.17 in Tajikistan. Such poor match is driven by the fact that significant share of Iran's export are energy resources for which Central Asia as of now doesn't have a demand. TCI analysis indicates that if the structure of Iranian economy does not change significantly Tehran will unlikely increase its exports to Central Asia in the near future.

6. Conclusion

Russia and China are the largest exporters to the region. Between 1996 and 2009 Chinese exports to Central Asia skyrocketed from 218.2 to 16669.million USD. For Russia, exports to the region grew from 3 890 million USD in 1996 to 13 331 million in 2009. In the same time period exports volumes from Turkey to Central Asia increased from 509.7 to 2124.0 million USD. In absolute terms, Turkey is by far ahead of India and Iran.

In this paper we have also attempted to assess recent export flows from regional powers China, India, Iran, Russia and Turkey to Central Asia. We used an augmented gravity model that relates bilateral trade flows with GDP, population, distance and other characteristics of the trading partners.

Our results suggest that China and Turkey were able to expand their exports were beyond numbers predicted by the gravity model. Their export structure to the region is very diversified as it includes apparel, clothing accessories, textile yarn, fabrics, footwear, plastic, rubber items, iron, steel, metalworking, power-generating and other industrial machinery, road vehicles including automobiles, telecommunication and office equipment, home appliances, consumer chemicals, fertilizers, furniture and selected food items. Moreover, TCI analysis indicates that overall export structure of China and especially Turkey matches very well with the import baskets of Central Asian countries. We predict that exporters from these countries will further increase their share in the market.

Russian exporters performed relatively well in Kyrgyzstan and Tajikistan; however, for the region as whole up until 2007 Russia failed to achieve export benchmarks projected by gravity models. It is yet to be seen whether the progress achieved in 2007-2009 will last in the longer term.

Despite an excellent potential, Indian exports were significantly lower than those predicted by our augmented gravity model in all five countries of Central Asia. For 2009, the model predicts Indian exports for the total value of 682.6 million USD whereas the actual exports to the region were equal to 261.7 million USD. We believe that further trade facilitation by Indian government may increase the volume of shipments to all five countries.

Finally, we find that Iranian actual exports were also consistently behind benchmarks predicted by the gravity model. For 2005 actual exports were only 404.3 million USD whereas the model projects 864.9 million USD of exports to Central Asia. The gap is most caused by low level of exports to the larger countries in the region. In fact, for Tajikistan and Kyrgyzstan in most of the years actual exports exceeded the project numbers. The TCIs for Iranian exports range between 0.07 in Turkmenistan to 0.17 in Tajikistan which indicates a poor match. If the structure of Iranian economy does not change significantly, Tehran will unlikely increase its exports to Central Asia.

References

Anderson, J.E. and E. van Wincoop (2003), "Gravity with Gravitas: a Solution to the Border Puzzle," American Economic Review, 93(1): 170-192.

Aviat, A. and N. Coeurdacier (2007), "The Geography of Trade in Goods and Asset Holdings,"

Journal of International Economics, 71 (1): 22-51.

Babetskaia-Kukharchuk, Oxana and Maurel, Mathilde (2003), "Accession to the WTO and EU Enlargement: What Potential for Trade Increase?", CEPR Discussion Paper No. 3944.

Baldwin, Richard E. (1994), Towards an Integrated Europe", London: Centre for Economic Policy Research.

Baldwin, Richard E. (1993), "The Potential for Trade between Countries of EFTA and Central and Eastern Europe", European Free Trade Association, Occasional Paper No. 44.

Batra, Amita (2004), "India's Global Trade Potential: The Gravity Model Approach", Indian Council for Research on International Economic Relations, Working Paper No. 151.

Bhattacharya, Biswa N. (2006), "Understanding the Latest Wave and Future Shape of Regional Trade and Cooperation Agreements in Asia, CESIfo Working Paper 1856, May 2006, Centre for Economic Studies and the Ifo Institute for Economic Research, Munich, Germany, November.

Boddewyn, J. (1988). Political aspects of MNE theory. J. Int. Bus. Stud.: 341–363

Breuss, Fritz, and Peter Egger (1999), "How Reliable Are Estimations of East-West Trade Potentials Based on Cross-Section Gravity Analyses?", Empirica 26(2):81–94.

Brulhart, Marius and Mary J. Kelly (1999), "Ireland's Trading Potential with Central and Eastern European Countries: A Gravity Study", The Economic and Social Review 30(2): 159-174.

CEPII Gravity Dataset, available at http://www.cepii.fr/anglaisgraph/bdd/gravity/gravdata_cepii.zip, last accessed on June 3, 2011.

Chahine, S. and A. Safieddine, 2008, “Corporate Governance and the External Monitoring of Banks in Lebanon”, Corporate Governance 8(3): 258-270.

Chaney, Thomas, 2008, ”Distorted Gravity: The Intensive and Extensive Margins of International Trade”, American Economic Review 98(4): 1707-1721.

Daude, C. and M. Fratzscher (2008), “The Pecking Order of Cross-Border Investment”, Journal of International Economics, 74(1): 94-119.

DeRosa, D. (2008), “Prospects for Greater Global and Regional Integration in the Maghreb”, Peterson Institute for International Economics, Washington, D.C.

Eaton, Jonathan, and Samuel Kortum (2002), “Technology, Geography, and Trade”, Econometrica 70: 1741-1779.

Felipe J. and Kumar, U. (2010). "The Role of Trade Facilitation in Central Asia: A Gravity Model," Economics Working Papers series, wp_628, Levy Economics Institute.

Frankel, J.A. and A. Rose (2000), “Estimating the Effect of Currency Unions on Trade and Output,” NBER Working Papers #7857.

Hillman, A. J., and Hitt, M. A. (1999). “Corporate political strategy formulation: A model of approach, participation, and strategy decisions.” Academy of Management Review, 24(4): 825-842.

Head, Keith, Thierry Mayer and John Ries (2010), “The Erosion of Colonial Trade Linkages after Independence”, Journal of International Economics, Elsevier, vol. 81(1): 1-14.

Jošić M. (2008), “Gravity Model and International Trade: the Case of OECD Countries”, Challenges of Economic Sciences in the 21st Century, Model of Market Economy for Countries in Transition: 47-54.

Khandelwal, P. (2004), “COMESA and SADC: Prospects and Challenges for Regional Trade Integration,” IMF Working Paper 04/227.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer, and R. Vishny (1998), “Law and Finance”, Journal of Political Economy, 107 (6): 1113-1155.

Leamer, E.E. (2006), “A Flat World, a Level Playing Field, a Small World After All, or None of the Above?” UCLA Anderson Forecast Book Review.

Lejour, A.M., R.A. de Mooji and C.H. Capel (2004), “Assessing the Economic Implications of Turkish Accession to the EU”, CPB Document 56. CPB, Netherlands Bureau for Economic Policy Analysis, The Hague.

Martínez-Zarzoz, I. and Nowak-Lehmann, F. (2003), “Augmented Gravity Model: an Empirical Application to Mercosur-European Union Trade Flows”, Journal of Applied Economics VI(2): 291-316.

McCallum, John (1995), “National Borders Matter: Canada-U.S. Regional Trade Patterns,” AmericanEconomic Review 85(3):615–23.

Michaely, M. (1996), “Trade Preferential Agreements in Latin America”, WB Policy Research Working Paper #1583.

Portes, R. and H. Rey (2005), “The Determinants of Cross-Border Equity Flows”, Journal of International Economics, 65 (2): 269–296.

Poyhonen, P. (1963), “A Tentative Model for the Volume of Trade Between Countries”, WeltwirtschaftlichesArchiv 90: 93-100.

Raballand, G. (2003), " Determinants of the negative impact of being landlocked on trade: an empirical investigation through the Central Asian case", Comparative Economic Studies 45: 520–536.

Rahman, M.M. (2003), A Panel Data Analysis of Bangladesh's Trade: The Gravity Model Approach, University of Sydney.

Rose, A.K. (2002), "Do We Really Know That the WTO Increases Trade?", NBER Working Paper No. 9273.

Schiff, M. and A. Winters (2003), "Regional integration and development," Oxford University Press.

Shepotylo, O. (2009), "Gravity with Zeros: Estimating Trade Potential of CIS Countries," Kyiv School of Economics Discussion Paper 16.

Subramanian, A. and S-J. Wei (2003), "The WTO Promotes Trade, Strongly but Unevenly," NBER Working Paper #10024.

Tinbergen, J. (1962), "Shaping the World Economy: Suggestions for an International Economy Policy," The Twentieth Century Fund, New York

Tsikata, Y. (1999), "Southern Africa: Trade, Liberalization and Implications for a Free Trade Area," TIPS Annual Forum.

United Nations Commodity Trade Statistics Database (UN COMTRADE), available at http://comtrade.un.org/db, last accessed on June 3, 2011.

Wang, Z.K. and Winters, L.A. (1991), "The Trading Potential of Eastern Europe", CEPR Discussion Paper No 610.