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Beyond borders: Reconsidering regional trade in Central Asia

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Abstract

This paper investigates the barriers to trade in Central Asia. While much of the existing literature on international integration of former Soviet Union countries has focussed on the quantities traded, this paper uses relative prices to shed some light on impediments to trade. It finds that the impact of borders on price variations across different locations in Central Asia is much smaller than conventionally thought. While prices vary significantly across the region, variations within one country are just as large as variations across countries. This may be due to obstacles to trade, and in particular rent seeking by enforcement agencies at the numerous internal check points. The paper also confirms that in relative terms, the borders with Uzbekistan are considerably more difficult to cross than those with Kazakhstan or the Kyrgyz Republic.

Keywords: Central Asia, barriers to trade, market integration

JEL classification number: R1, F15, P22, P33

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1. INTRODUCTION

Over the past decade and a half the trade regimes of the former communist countries have changed fundamentally, both in relation to the rest of the world and within the former communist bloc. While the liberalisation of trade relations with the non-CMEA (Council for Mutual Economic Assistance) countries has received considerable attention, less work has been done to investigate the dynamics and structure of trade patterns inside the former communist trading bloc.

Most of the existing research on changing trading patterns in the transition countries studies the geographic re-distribution of trade flows with the help of gravity models. These studies show that the direction of trade in the countries of the former Soviet Union, and in particular in Central Asia and the Caucasus, has changed much less rapidly than in the countries of eastern Europe (Babetskii *et al*., 2003; Broadman, 2005). This is explained to some extent by the considerably higher barriers to trade with the outside world in these countries and hence a greater reliance on intra-regional trade (Fidrmuc and Fidrmuc, 2000; Michalopoulos, 2003). While the collapse of the Soviet Union has increased the costs to trade among the former republics (Djankov and Freund, 2000), they still appear to be "overtrading" among themselves, even once the effects of borders, infrastructure and a common language are taken into account (Babetskii *et al*., 2004).

Against the view that the former republics of the Soviet Union are still excessively integrated, however, stands considerable evidence on difficulties crossing borders, corruption among customs officials and the traffic police, complicated licensing and standardisation systems and other trade barriers (including the use of tariff barriers and differential excise taxes on imports and domestic sales even among countries that are officially party to a free trade agreement).[1] These barriers cumulatively may amount to significant obstacles against regional trade. Regional trade barriers also affect access to third country markets as a result of increasing transit costs (Ojala and Molnar, 2003; Auty *et al*., 2004). Getting a sense of the size and impact of such regional trade barriers has therefore become a topic of considerable interest in the region. In line with the particular policy attention placed on the issue of regional integration in Central Asia, this paper focuses on trade between Kazakhstan, the Kyrgyz Republic, Tajikistan and Uzbekistan. However, the approach could be easily extended to the rest of the former Soviet Union or indeed other regions in the world.

The paper concentrates on the most obvious economic manifestation of barriers to trade - the fact that prices for tradable goods will differ significantly across countries when arbitrage is not profitable due to trade barriers. This approach was first used by Engel and Rogers (1996) for the US and Canada. It allows one not only to estimate the severity of trade barriers across countries but also to simultaneously estimate integration inside countries. With respect to the former Soviet Union it has been used by Berkovitz and de Jong (1999) to study market integration in Russia. The use of price variations to estimate the impact of regional trade barriers has the advantage over existing gravity models that it is not based on official trade data. These data miss the crucial shuttle trade so prevalent across the region. It also does not suffer from biases introduced into official trade data by the significant weight of trade in gas and electricity, which may overshadow the extent of disintegration of trade in consumer goods and other manufactures (Linn, 2004). However, deviations from the law of one price may be due to factors other than trade barriers, such as variations in the price of non-tradables. This factor is controlled to the extent possible in this paper, but should be noted as a drawback to the approach used.[2]

[1] For a summary of trade and transport facilitation issues in Central Asia, see World Bank (2005).

[2] In addition, the approach relies on being able to compare prices of homogenous goods across markets – variations in actual or perceived quality could also contribute to price variations across space thus

The extent of regional integration is investigated using two independent data sets. First, using regional disaggregated consumption price indices for food and non-food goods, the time dimension is exploited to analyse price dispersion and the significance of trade barriers. This part of the analysis includes only Kazakhstan, the Kyrgyz Republic and Uzbekistan. Second, a price survey of around 30 consumer goods is implemented in all territorial sub-regions (oblasts) of Kazakhstan, the Kyrgyz Republic, Tajikistan, Uzbekistan and two Russian oblasts close to the border of Kazakhstan. The price survey allows absolute price differences across locations in Central Asia to be directly compared.

Overall, both data sets confirm that regional market integration in Central Asia is quite high – as suggested by the gravity literature and in contrast to the much publicised anecdotal evidence on trade barriers. Based on the first data set, borders are found to have a significant effect on price dispersion, and that this effect is much larger between Uzbekistan and its neighbours than between Kazakhstan and the Kyrgyz Republic. However, almost the entire estimated border effect is due to trend changes in the bilateral real exchange rates. This may be because of a large component of non-tradable prices in the final retail price index used, but in the specific case of Uzbekistan it may also be a reflection of the systematic underreporting of price inflation by the official Consumer Price Index.[3] Once changes in the real exchange rate are controlled, the border effect even between Uzbekistan and its neighbours becomes quite small and comparable to estimates for other borders around the world.

The fact that borders seem to matter less than is often thought in Central Asia is also confirmed by the second data set. According to the price survey, price dispersion inside Kazakhstan is large enough to contain all prices found elsewhere in Central Asia. In other words, the cost of shipping a good from one end of Kazakhstan to the other is often higher than shipping the same good across the border into the Kyrgyz Republic, Tajikistan or Uzbekistan. However, price differences are often not trivial – in the range of 30-50 per cent on average. This suggests that trade barriers beyond the border remain significant obstacles for market integration both within countries and within Central Asia.

The paper is structured as follows. The next section reviews evidence on the extent of market integration using price co-movements from other parts of the world to establish a benchmark. The subsequent section presents the methodology and the data used (section 3). Section 4 contains results using correlations of price indices over time, while section 5 presents the results of the price survey. Section 6 offers some conclusions and suggestions for further research.

introducing noise into the measure of trade barriers based on price differences. A basket of goods that is as homogenous as possible has been chosen, but some noise is likely to remain.

[3] As explained further below, the black market exchange rate is used in Uzbekistan to convert price series into a common currency. Underestimated official inflation leads to upward bias in real exchange rate depreciation for Uzbekistan and hence may account for an upward bias in price dispersion.

2. HOW WIDE ARE BORDERS IN OTHER PARTS OF THE WORLD?

Research on the importance of borders to trade has been quite active following the findings of McCallum (1995) and Engel and Rogers (1996) on the effect of the US-Canadian border on cross-border trade. McCallum employed a gravity model to find that trade between Canadian provinces is 22 times larger than between Canadian provinces and US states of similar distance and size. This research has been extended by Helliwell (1998) and Wei (1996) to show that similar magnitudes can be found in other OECD countries. However Anderson and van Wijncoop (2003) show that these earlier estimates may have been biased upwards by the use of an inappropriately derived gravity equation. These authors re-estimate McCallum's model using the same data set and conclude that the impact of the US-Canadian border is to reduce trade between a pair of US-Canada provinces by around 40 per cent compared to trade between two equidistant US provinces. While this is much smaller than the original finding, it is still quite significant.

Engel and Rogers (1996) instead looked at price dispersion to investigate the size of the border effect, confirming that even the US-Canadian border has a very large effect on market integration. They showed that the prices of the same (or highly substitutable) good in two different locations display a higher degree of dispersion (measured as the standard deviation of the ratio of relative prices) the larger the distance between the two locations. However the effect of geographical distance on price dispersion is very small compared to the effect of the US-Canadian border. Engel and Rogers (1996) find that crossing the border is equivalent to adding another 75,000 miles to the distance between two cities. These findings are based on the use of disaggregated consumer price indices, in line with the first set of results reported below. In a recent paper, Engel, Rogers and Wang (2005) repeat the analysis for a sample of Canadian and US cities, using a panel of actual goods prices. They confirm the existence of a border effect, which adds on average around seven per cent to actual price differences. This is considerably more than the impact of the average distance between two cities in their sample. The results in this paper are also complemented using price indices with a survey of actual prices.

Recently there has been some research using the Engel and Rogers' methodology on finding the width of borders in other parts of the world. Thus, Parsley and Wei (2000) show that the width of the border between Japan and the US is 6.5 trillion miles or about 70,000 times the distance from Earth to the sun. In other words, the fact that goods between the US and Japan have to cross a national border has an effect on co-movement of prices in the US and Japan equivalent to adding 6.5 trillion miles to the average distance between the two countries. Rogers and Smith (2001) find the economic width of the Mexican-Canadian border to be 155 million miles.[4] Berkovitz and de Jong (2000) apply the same methodology to study market integration within Russia. Their measure of market integration is whether price dispersion is positively related to geographical distance. Around 75 per cent of Russian regions in their sample are integrated with each other over the 1995-99 period. This fluctuates significantly, however, over time and rises to almost 100 per cent by the end of the period. They also show that more reform-oriented regions in Russia have tended to be less integrated with the remainder of the country, as a result of greater price liberalisation and foreign trade orientation.

One paper investigating border effects using price correlations among two developing countries is Morshed (2003). A very similar approach is used in the first part of this paper,

[4] Estimates of the width of the border depend significantly on what approach is used to convert regression estimates into distance equivalents. All distances quoted above follow the simple method suggested by Engel and Rogers. Parsley and Wei (2000) criticise this method as yielding results that are invariate to the unit of measurement of economic distance. Their alternative formula gives much larger distance estimates. The results using both approaches are reported below.

using disaggregated CPI indices for analysis and in taking explicit account of real exchange rate volatility as an important determinant of the border effect. Morshed (2003) suggests deflating the disaggregated CPI indices with the overall CPI index to eliminate any nominal variability and obtain border estimates that should be due primarily to real factors (such as trade barriers). Estimates using deflated data reduce the border effect by a factor of 10^{39}.[5] As shown below, controlling for changes in the real exchange rate also matters critically for the size of the estimated border effect in Central Asia.

[5] This large reduction may seem implausible. The extent to which the approach suggested by Morshed may overestimate the degree of market integration is discussed below.

3. METHODOLOGY AND DATA

Following Engel and Rogers (1996), well-integrated regions inside one country should offer only limited arbitrage opportunities. That is prices of goods in different locations should only differ from each other to the extent that this reflects different pricing of non-tradables in the two locations. Prices should also only differ to the extent that transport costs between the two regions make arbitrage trade unprofitable. If the two regions in question are located in different countries, there are additional frictions in economic exchange, summarised in the so-called border effect. There are many possible explanations for this effect, some based on real cost differences, some on nominal price stickiness. Tariff and non-tariff barriers to trade, the presence of non-tradable costs embodied in final prices, relatively less integrated labour markets or distribution networks are all examples of real factors that can explain the border effect. However, prices may also differ because of changes in the nominal exchange rate that are not transmitted immediately to consumer prices, assuming that prices are somehow sticky in the consumers' currency (Betts and Devereux, 2000).

Regional consumer price inflation rates disaggregated into food and non-food segments are used in this paper to calculate indices of relative prices between two regions.[6] These relative price indices are then normalised by their mean over the sample period. As a measure of possible ranges of relative prices for similar goods, the standard deviation of the log of these relative prices is then used. For a pair of regions located in different countries, the price indices are transformed into a common US dollar currency index. Monthly data from January 1993 through December 2003 are available, but for reasons explained below, analysis is restricted to the period January 1999 through December 2003. The consumer price inflation data come from the national statistical offices in each country.

The measure of price dispersion used in subsequent analysis is:

(1) $S\ i/j = (\sigma\ (lnPit/lnPjt)),$

where σ is the standard deviation and Pit = price index for region i and period t in US dollar terms, divided by Pi^* (average of Pi during period t).

There are a total of 33 base regions and hence a total of 528 relative price series. Relative prices for both food and non-food consumer goods are used (the services series is excluded, since this contains mainly non-tradables). Thus, the data set consists of a total of 1,056 observations on (1).

The use of price indices rather than time series of prices for individual goods has a number of drawbacks, which should be noted upfront. First and foremost, estimates of the extent of integration are derivative. As Anderson and van Wijncoop (2004) argue, what we really would like to know is the *ad valorem* tax equivalent of trade barriers. The estimates of distance equivalents of the border effect based on price dispersion within disaggregated price indices also rely on obtaining a reliable estimate of the impact of distance on price dispersion. As seen below, not all distance parameters are precisely estimated.

Second, a number of statistical caveats apply. The basket of goods included in the consumer price index could differ across regions. Therefore relative price movements based on consumer price indices do not reflect actual changes in relative prices for a common basket of goods. However, it helps in this case that the countries studied were all part of the former Soviet Union and have basically retained the same consumer goods basket for the calculation of their CPIs.[7] Additionally, despite focusing on food and non-food prices and excluding the

[6] The CPI index is a weighted average of separate price indices for food, non-food and services.

[7] Nonetheless, concerns remain over the quality of the Uzbek CPI. Measurement error could thus be a source of considerable bias in the estimated border effect. The under-estimation of inflation is likely to cause the variation of prices across borders to be higher than in reality, and hence the border effect to be biased upwards.

service series from the CPI, the price baskets still include at least a subset of goods that are inherently non-tradable. The analysis has been controlled for changes in relative prices of non-tradable goods by deflating the CPI for food and non-food goods with the overall CPI, in line with the approach in Morshed (2003). Thus the alternative measure of price variation is:

(2) $S\,i/j\,' = (\sigma\,(lnPit'/lnPjt''),$

where Pit' = price index for region i and period t, divided by the national CPI, both expressed in US dollars, and then normalised by Pi'^* (average over period t). It should be noted that this correction eliminates any price variation due to foreign sellers pricing to market strategies in a domestic market resulting from imperfect competition. This may have little to do with trade barriers *per se*, but may nonetheless introduce arbitrage opportunities and reduce market integration. The suggested deflation of the price series by the CPI may thus overestimate the extent of market integration based on the deflated series. However, in qualitative terms the survey of actual goods prices reported below confirms the basic message of this section.

One additional problem that arises from the use of price data at the regional level is that the distance between regions is not well defined. This is approximated with the distance between the capital cities of the regions, assuming that economic activity is strongly concentrated around these cities. Distances are measured by road distances rather than a direct line, using a map and choosing the route by main national roads between two cities.[8]

Exchange rate data are taken from the IMF *International Financial Statistics* for the Kyrgyz Republic and Kazakhstan. The choice of exchange rate data is more complex in Uzbekistan. Uzbekistan ran a multiple exchange rate system with frequently changing administered exchange rates from 1996 to 2003. Since this paper is most interested in the extent to which arbitrage trade is able to lead to the equalisation of prices and as this kind of trade is most likely done by shuttle traders, the black market exchange rate, which the EBRD has collected throughout the period, was used.

Table 1 summarises the data. The average distance between regions is much larger inside Kazakhstan (1,586 km) compared to Uzbekistan (546 km) and the Kyrgyz Republic (595 km). The average distances across countries is similar for Kazakhstan and Uzbekistan (1,898 km) and Kazakhstan and the Kyrgyz Republic (1,763 km), while it is significantly lower for Uzbekistan and the Kyrgyz Republic (914 km). The average of the standard deviations (the measure for the variation in regional relative prices) is similar for the three countries but significantly higher for pairs that involve one region inside and one region outside Uzbekistan. Since average distances for these pairs are hardly bigger than those inside Kazakhstan or inside the Kyrgyz Republic, this suggests already that there will be a border effect. Comparing the average standard deviation for food and non-food prices, there appears to be no big difference, with the possible exception of prices inside Uzbekistan. Relative prices for non-food goods appear to differ significantly more inside Uzbekistan than those for food items.

In the lower half of the table, the average standard deviation for the price series, normalised by the average CPI, are reported. These therefore control for changes in the real exchange rate. By controlling for this factor, prices across countries for food do not differ more than inside countries. The border effect appears to be solely due to changes in the real exchange rate. This is not necessarily true for non-food items where within-country pairs show lower price variations than cross-border pairs. However the variation of prices among cross-border pairs is much reduced compared to non-deflated prices (except for Kazakh-Kyrgyz pairs of regions). These observations will be substantiated with regression analysis in section 4.

[8] The map used is a map of Central Asia produced by Gizi-Map, Hungary, available in map stores in London. It shows all the major roads in Central Asia with road distances between all major cities.

Table 1: Average statistics for food and non-food price indices (1999-2003)

Relative Price Variations including exchange rate factors						
	Kaz	Uz	Kyr	Kaz-Uz	Kaz-Kyr	Kyr-Uz
Average Distance	1,586	546	595	1,898	1,763	914
Standard Deviation Distance	808	328	279	814	870	440
Food						
Average	0.027	0.030	0.031	0.166	0.050	0.140
Standard Deviation	0.008	0.013	0.009	0.012	0.012	0.010
Non Food						
Average	0.026	0.053	0.042	0.159	0.049	0.168
Standard Deviation	0.013	0.032	0.021	0.010	0.023	0.013
Relative Price Variations excluding exchange rate factors						
	Kaz	Uz	Kyr	Kaz-Uz	Kaz-Kyr	Kyr-Uz
Average Distance	1,586	546	595	1,898	1,763	914
Standard Deviation Distance	808	328	279	814	870	440
Food						
Average	0.027	0.030	0.031	0.030	0.029	0.033
Standard Deviation	0.009	0.013	0.009	0.013	0.008	0.013
Non Food						
Average	0.026	0.053	0.042	0.077	0.071	0.074
Standard Deviation	0.013	0.032	0.021	0.025	0.026	0.020

Note: Authors' calculations based on CPI series provided by national statistical authorities.

Because the use of price indices to calculate the extent of market integration is somewhat unsatisfactory for reasons mentioned above, the analysis is complemented with a price survey of 31 tradable goods. This survey was implemented in July 2004 in all oblast capitals of Kazakhstan, the Kyrgyz Republic, Tajikistan, Uzbekistan, and in the Russian cities of Omsk and Samara. Prices were collected in three different markets in each city and converted into US dollars using the average spot market exchange rate prevailing during the week the survey was carried out. The goods chosen for the survey are all consumer goods, selected to be as homogenous as possible and sufficiently non-bulky to be tradable by shuttle traders. In this way, the survey concentrates on the segment of the consumer goods market where arbitrage is likely to be easiest, recognising that for some consumer durables (refrigerators, cars, *etc*.) the barriers to shuttle trade are much higher and price variations may thus be larger.

The type of goods surveyed, their average prices and the standard deviation of prices normalised by the average can be found in Table 2. The type of goods surveyed include mainly standard, every day goods. They are grouped according to whether or not they are imported into the region and separated into food and non-food items within both imported and domestic produced goods respectively. The price formation process is expected to be significantly different for branded products that are imported into the region since these goods are produced at one location. Production costs for the goods sold in different parts of Central Asia are identical and most of them are distributed by national or even regional distribution

networks. In contrast, most of the food items are produced in almost every region by many individual producers at potentially different production costs. These differences are discussed in further detail in section 5. The price variation across Central Asia depends strongly on the type of good. As expected, the price variation is large for goods that are difficult to transport or have explicit trade restrictions like cement, cotton cloth, milk (highly perishable) and cigarettes. The variation is also large for goods like onions, carrots and potatoes, which appear easily tradable.

Table 2: List of surveyed goods

			Average Price (US$)	Standard Deviation	Standard Dev/ Average Price
Non-Food Locally produced					
1	Analgin	Paper pack, 10 pills, 0,5 grams	0.11	0.02	0.19
2	Paracetamolum	Paper pack, 10 pills, 0,5 grams	0.11	0.02	0.19
3	Cement	50 kg	4.03	2.02	0.50
4	Cotton cloth	1 metre	0.92	0.88	0.96
Non-Food Imported					
5	Xerox paper	Format A4, 1000 sheets	8.25	1.46	0.18
6	Unleaded №-76	1 litre	0.38	0.10	0.25
7	Diesel	1 litre	0.32	0.09	0.28
8	Tooth paste Colgate	50 grams	0.47	0.13	0.29
9	TV set	20'/51 cm	199.17	35.31	0.18
Food-Locally produced					
10	Sugar	1 kg	0.61	0.06	0.10
11	Cotton-seed oil	Bottled, 1 litre	1.16	0.15	0.13
12	Sunflower-seed oil	Bottled, 1 litre	1.16	0.18	0.15
13	Eggs	12 eggs, of middle size	1.00	0.14	0.14
14	Milk	1 litre	0.34	0.28	0.84
15	Potatoes	1kg of middle sized	0.16	0.08	0.48
16	Carrot	1kg of middle sized	0.26	0.10	0.39
17	Onion	1kg of middle sized	0.16	0.08	0.50
18	Coca-Cola	Plastic bottle, 1 litre.	0.68	0.10	0.15
19	Flour	1 kg	0.29	0.06	0.22
20	Raisins light	100 grams	0.25	0.22	0.89
21	Raisins black	100 grams	0.23	0.23	0.98
Food Imported					
22	Black caviar	Tin, 100 grams	12.46	6.58	0.53
23	Mineral water "Barjomi"	Plastic bottle, 1 litre	1.19	0.23	0.19
24	Efes Pilsener	Tin, 0.33 litre	0.69	0.19	0.27
25	Baltika №3	Glass bottle, 0.5 litre	0.72	0.13	0.18
26	Marlboro lights	Pack 20 cigarettes	0.94	0.37	0.39
27	Chocolate bar (Mars)	50 grams	0.37	0.05	0.14
28	Nescafe	Tin, 50 grams	1.25	0.32	0.26
29	Pele Cafe	Tin, 50 grams	0.81	0.27	0.33
30	Apple juice	Tetrapack, 1 litre	1.06	0.16	0.15
31	Polished rice	1kg	0.56	0.15	0.26

Note: The basket of goods was developed by the authors in consultation with a local survey firm. The price survey was implemented in the course of the same week in July 2004 in all locations by the KAMIS research company, based in Bishkek, Kyrgyz Republic.

The price data for individual goods allow the extent of market integration and the importance of borders to be verified, by comparing price variations within a country to those observed across countries. For ease of presentation and interpretation, this paper concentrates on a qualitative comparison of price differences both within and across countries, although a more formal regression analysis is presented in the Annexes.

4. ESTIMATION AND RESULTS USING PRICE INDICES

Using the price variation indices defined in section 3, these indices can now be regressed against geographical distance and a border dummy:

(3) $Sij = \alpha + \beta\ lnDist\ ij + \gamma\ Border + e,$

where *Dist ij* is the distance in kilometres between region *i* and *j* and *Border* equals 1 if region *i* and j lie in different countries and 0 otherwise; *e* is an error term.

Before detailing the results, two further observations are in order. First, while price variation between two locations is expected to increase with distance, this is not necessarily the case. Instead, the relationship estimated in (3) provides an upper bound for price variations that will not be competed away by arbitrage. The error term *e* is therefore likely to increase with distance, violating standard linear regression requirements. The standard errors have been corrected for heteroskedasticity using the standard White correction (White, 1980).

Second, choosing the period for the estimations is difficult. The former Soviet Union experienced very high rates of inflation and exchange rate volatility, and large relative price adjustments during the early 1990s. This was followed in mid-1998 by the Russian crisis and further exchange rate adjustments. Such nominal volatility is likely to lead to significant price dispersion across regions. Since this paper is interested in identifying the real (rather than nominal) causes of lack of market integration, the estimation period is restricted to July 1999 - December 2003. This period was characterised by relatively stable exchange rates between the Kyrgyz Republic and Kazakhstan. To control for any remaining effects on price variation resulting from shifts in bilateral real exchange rates due to differences in non-tradable price inflation, the relationship in (3) is estimated using both the measure of price dispersion defined in (1) and that defined in (2) above. (That is, it was corrected for non-tradable goods price inflation by dividing all price indices by the national CPI). Finally, a total of eight observations were dropped as clear outliers. These were adjacent regions that for some reason had much larger price dispersion among each other than with regions much further away.

Table 3 contains the results. The first column presents a pooled regression including measures of price dispersion in food and non-food prices jointly. The second and third column present results separately for food and non-food prices. The constant α is allowed to differ across countries, and a number of regional dummies have been inserted, such as for northern Kazakhstan (which is more integrated with Russia than with the rest of Kazakhstan) and for city pairs in the Ferghana Valley (where distances are very short and national territories highly contiguous –hence integration is expected to be higher). Columns 4-6 repeat the same exercise using the measure of price variation corrected for non-tradable goods price inflation.

Turning first to the results in columns 1-3, it appears that the model describes the data well only for the case of food. The coefficient β from model (3) is positive only for the food-only regression, but insignificant in the pooled model and in the non-food regression. However, in all three regressions the border dummies for Uzbekistan are very large compared to the border dummy for Kazakhstan and the Kyrgyz Republic. Because the estimates of β are insignificant for the pooled and the non-food model, the border dummies can be interpreted in terms of economic distance only for the food price indices (see below). The country and regional dummies suggest that price dispersion is generally greater in Uzbekistan than in the other two countries. In addition, prices in Northern Kazakhstan tend to diverge from other regions more than average. Meanwhile, the impact of being located in the Ferghana Valley on price dispersion and the border effect is ambiguous.

Table 3: Regression of standard deviation of price indices

Variables	Pooled non-deflated	Food only non-deflated	Non-food only non-deflated	Pooled deflated	Food only deflated	Non-food only deflated
Constant	0.022*	0.01	0.032*	0.043*	0.024*	0.039*
	3.76	*1.87*	*3.47*	*6.04*	*4.30*	*3.19*
Distance	0.001	0.0021*	-0.001	-0.0004	0.0002	-0.002
	0.84	*2.71*	*-0.84*	*-0.46*	*0.28*	*-1.28*
Kaz-Kyr	0.023*	0.026*	0.021*	0.021*	-0.001	0.042*
	13.61	*15.58*	*7.50*	*9.80*	*-0.48*	*13.44*
Kaz-Uz	0.137*	0.139*	0.134*	0.028*	0.004*	0.052*
	129.24	*115.47*	*87.0*	*14.49*	*2.69*	*21.11*
Uz-Kyr	0.129*	0.116*	0.141*	0.027*	0.006*	0.048*
	73.48	*73.64*	*61.47*	*12.25*	*3.61*	*15.16*
Uz	0.016*	0.007*	0.026*	0.016*	0.005*	0.025*
	6.97	*3.65*	*6.40*	*5.87*	*2.55*	*5.92*
Kyr	0.011*	0.010*	0.011	0.006	0.001	0.010
	3.25	*3.05*	*1.87*	*1.46*	*0.60*	*1.54*
North Kaz	0.006*	0.007*	0.005*	0.007*	0.006*	0.008*
	3.90	*4.14*	*2.29*	*3.20*	*3.63*	*2.27*
Ferghana Kyr	0.002	-0.005*	0.009*	0.011*	0.009*	0.012*
	0.91	*-2.03*	*2.32*	*4.21*	*4.93*	*2.70*
Ferghana Kyr-Uz	0.003	0.021*	-0.016*	-0.012*	-0.001	-0.026*
	0.70	*5.06*	*-2.93*	*-2.62*	*-0.23*	*-3.56*
Nobs	984	494	490	984	494	492

Note: T-statistics in italics. A star indicates significance at 5 per cent level.

The model was also estimated separately for each country to check whether distance has the expected effect on price dispersion (results available on request). For Kazakhstan and the Kyrgyz Republic, there is the expected positive effect. Interestingly, the estimated distance coefficient for the Kyrgyz Republic is around 3 times larger than for Kazakhstan (0.008 against 0.0027). This is plausible, since the Kyrgyz Republic is divided by a high mountain range into a northern and a southern part. Pooling data for the two countries gives an estimated distance parameter of 0.0028 and a border parameter of 0.028. Within Uzbekistan the distance parameter is not significant at the 5 per cent level. It is possible that the latter reflects the continued presence of state distortions in the price setting mechanism in Uzbekistan, or some type of measurement error. Note also that these parameters are at the high end of estimates from other studies. Thus the point estimate for β in the case of the US-Canada is around 0.002 (Engel and Rogers, 1996), for US-Japan it is around 0.0006 (Parsley and Wei, 2000) and for India-Bangladesh it ranges around 0.001-0.0015 (Morshed, 2003). The higher estimated distance parameter for Central Asia is entirely plausible, given these countries' low population density and thus relatively high transport costs.

Columns 4-6 show that while the estimated effect of distance is largely unchanged, the border dummies are now much smaller. Indeed, the Kyrgyz-Kazakh border dummy is insignificant in the food-only regression while the border effect drops dramatically for Uzbekistan. In addition, the border effect in the pooled regression is now only around 40 per cent above that for the Kazakh-Kyrgyz border. This confirms the observations drawn from Table 1. The distance parameter is not significantly estimated in any of the three regressions. When running regressions separately by country, a marginally significant and positive distance parameter is found in Kazakhstan and in the Kyrgyz Republic. Pooling data for just these two countries returns a significant distance estimate of 0.0019, a little below the estimate in the case of the non-deflated data. The border effect between these two countries remains insignificant.

Using the estimates in Table 3 it is possible to translate the border dummy into an equivalent distance and compare it with results for the other countries quoted above. Parsley and Wei (2000) point out that it can be misleading to calculate the equivalent distance of the border dummies by just calculating $\exp(\frac{\gamma}{\beta})$. This is for the simple reason that the estimation of the parameters is invariant to a change in the unit of measurement for distance (for example from miles to kilometres). Thus Parsley and Wei (2000) propose to calculate the equivalent distance by asking how much extra distance must be added to the average distance between two countries to generate as much price dispersion as is actually observed. Thus, the distance equivalent is the value *Z* that solves the following equation.

(4) $$\beta \ln(av(dist.)) + \gamma = \beta \ln(av(dist) + Z) .$$

Rearranging, the equivalent distance is given by

(5) $$Z = av(dist) * (\exp(\gamma / \beta) - 1) .$$

The average distance of Kyrgyz cities from the base cities in Kazakhstan is 989 km while that of the Uzbek cities is 1,464 km. Table 4 calculates the distance equivalent effect of the border dummies estimated in Table 3. It presents estimates using both the simple formula $\exp(\frac{\gamma}{\beta})$ and the formula given in equation (5). The latter estimates are generally much larger. Distance equivalents can only be calculated for the food regressions and for non-deflated data.

To get some sense of the impact of nominal exchange rate variation on the border effect with Uzbekistan, the distance equivalent is also calculated using the food-only regressions in column 5, but using the distance parameter estimated for Kazakh-Kyrgyz data only (β=0.0019). The Kazakh-Kyrgyz border appears to be relatively small, compared to the estimates quoted even for OECD countries in section 2. Using the deflated data, the border effect between Kazakhstan and the Kyrgyz Republic disappears completely. The Uzbek-Kazakh and Uzbek-Kyrgyz borders are much wider although not as wide as the border between Bangladesh and India (compare estimates in rows 2 and 3 with row 4). Using deflated data, all border effects become much smaller. All these estimates are, of course, sensitive to the estimated distance parameter. A lower distance parameter would lead to a much larger estimated border effect. Given the lack of precision of the estimates of β in this paper, as well as concerns raised earlier about the use of CPI deflation to control for differences in non-tradable goods and services inflation, conclusions are tentative at this stage. This lends added importance to the results from the price survey which is discussed next.

Table 4: Distance equivalent of the border effect

Border effect (food only)	**Non deflated data (ER)**	**Non deflated data (Parsley *et al.*)**	**Deflated (ER)**	**Deflated data (Parsley *et al.*)**
Kazakh-Kyrgyz	238,220 km	420 million km	NA (insign.)	NA (insign.)
Kazakh-Uzbek	5.574 km x 10^{28}	1.06 km x 10^{32}	8.5 km	13,683 km
Kyrgyz-Uzbek	9.763 km x 10^{23}	8.92 km x 10^{26}	23.2 km	20,584 km
India-Bangladesh (food only 1976-1995)	3.103 km x 10^{41}	3.74 km x 10^{44}	390 km	371,365 km

5. HOW LARGE ARE TRADE MARGINS – CROSS-SECTION EVIDENCE FROM A SURVEY OF CONSUMER GOODS

The results so far suggest, contrary to prior expectations, that the Central Asian countries are still reasonably closely integrated. This is certainly the case for Kazakhstan and the Kyrgyz Republic, and it appears also to be the case for Uzbekistan, once changes in the real exchange rate with its neighbours during the estimation period are taken into account.

In this section, a different test of market integration is undertaken based on relative prices of specific consumer goods. Charts 1 and 2 contain the basic results. The charts show the average, minimum and maximum price for each of the 31 goods in the sample in Kazakhstan, the Kyrgyz Republic and Uzbekistan (Chart 1), as well as in Kazakhstan, Tajikistan and Russia (Chart 2). Chart 1 shows that for most goods in the sample the difference between the minimum and maximum price in Kazakhstan is larger than the difference between either prices in the Kyrgyz Republic and Uzbekistan. Given that Kazakhstan is the richest country, prices in the other countries are closer on average to the minimum prices in Kazakhstan than the maximum prices. Also the goods for which prices in the smaller two countries are lower than, or closer to, the minimum prices in Kazakhstan tend to be goods that are locally produced. Furthermore, the cheapest regions in Kazakhstan tend to be the regions close to Uzbekistan and the Kyrgyz Republic. All this confirms the earlier results that borders constitute much less of a barrier to trade than often thought. Chart 2 shows that the same result holds for Tajikistan and Russia in relation to Kazakhstan. Chart 3 looks at the Kyrgyz Republic, Tajikistan and Uzbekistan and shows that the variation in prices is larger in Tajikistan than in the other two countries. Specifically the variation of prices inside Uzbekistan appears relatively small compared to the other countries. These results clearly confirm the findings of the previous section: Central Asian borders are porous; the costs of crossing a national border seem to be small relative to the costs of crossing the vast territory of Kazakhstan or the mountains of Tajikistan.

Chart 1: Minimum, average and maximum prices in the Kyrgyz Republic and Uzbekistan in comparison to average prices in Kazakhstan

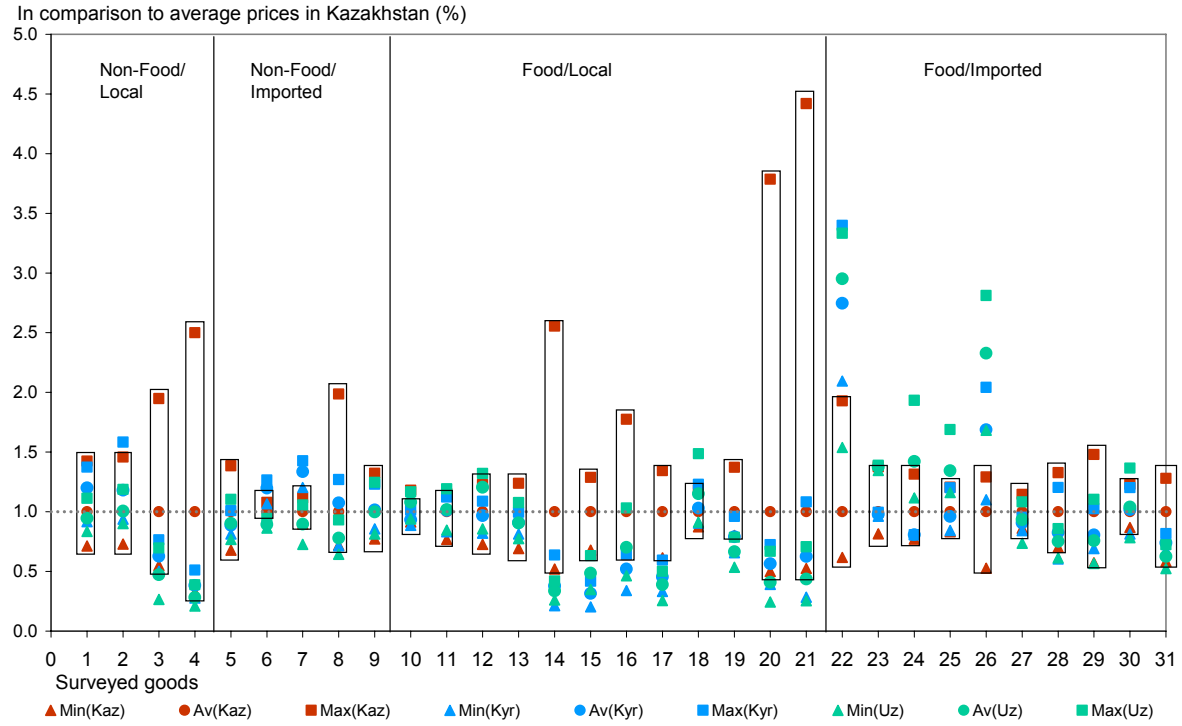


Chart 2: Minimum, average and maximum prices in Tajikistan and Russia in comparison to average prices in Kazakhstan

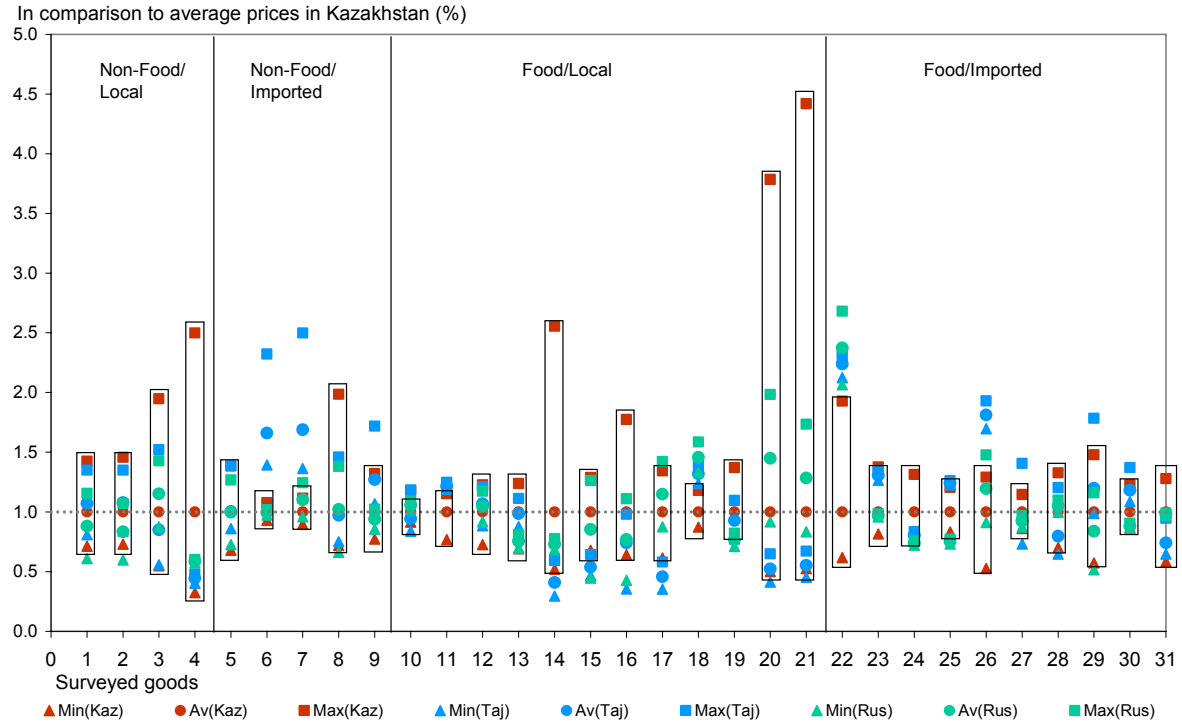
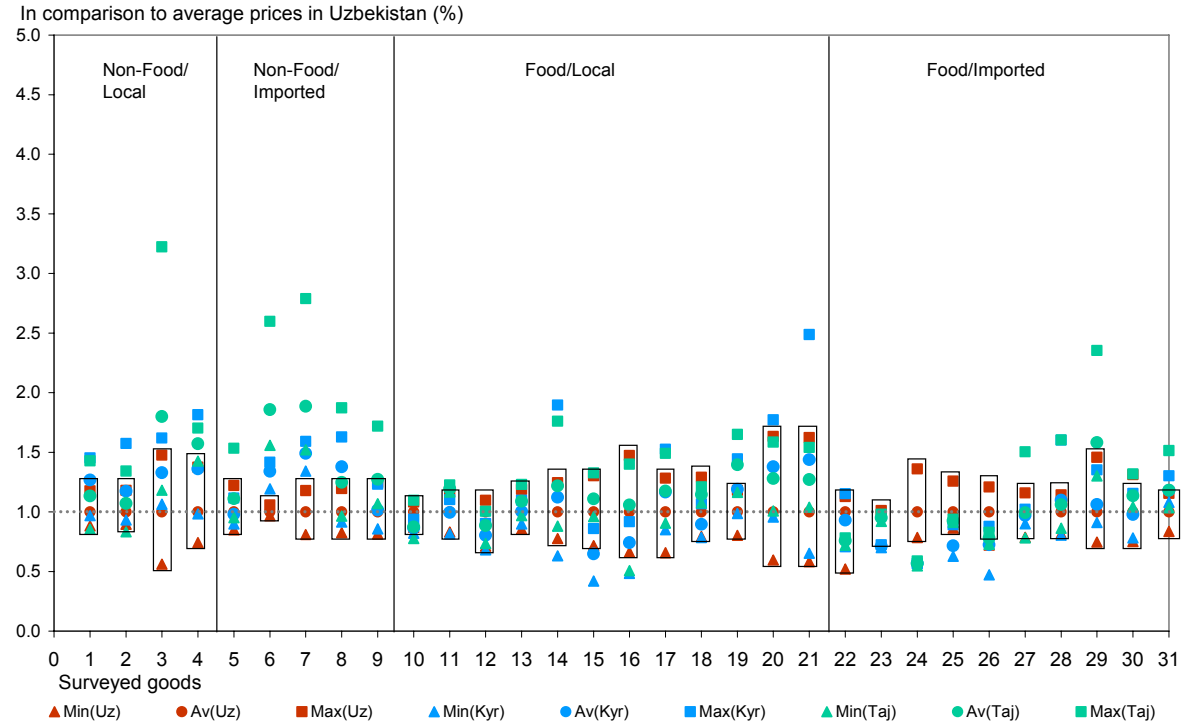


Chart 3: Minimum, average and maximum prices in the Kyrgyz Republic and Tajikistan in comparison to average prices in Uzbekistan



When determining the size of price variations within each country and identifying whether these are primarily related to distance, a number of points should be noted. First, maximum price differences are actually quite large. As shown by Charts 1-3, price margins tend to be in the range of 30-50 per cent and sometimes reach more than 100 per cent. These differences suggest that more than just transport costs are at play here.[9] One possibility is that differences in the price of non-tradable goods account for the bulk of the price differences. Another possibility is that internal barriers to trade are large – thus domestic markets are only weakly integrated, and significant rents are being collected within countries.

To investigate these different hypotheses, the average cost of living across regions, as reflected in the basket of 31 consumer goods, is compared. In line with the idea that non-tradable goods prices drive variation in final goods prices, it might be expected that in the capital city, where purchasing power is concentrated, prices might be higher. Alternatively, it is also possible that for manufactured goods which are traded internationally (such as chocolate bars, coffee or aspirin), prices in the capital city might be lower, given better access to international markets, and that for agricultural products prices might be lowest in the more rural regions.

The cost of living is calculated as an index of each region *i* relative to a base region *j*:

(6) $Costij = AVERAGE\{ln(Pki/Pkj)\},$

[9] It is interesting to compare these numbers with estimates of trade costs for developed countries. Anderson and van Wijncoop (2004) suggest, using gravity estimates, that the ad valorem tax equivalent of trade costs (including international trade and local distribution costs) amount to around 70 per cent. Engel, Rogers and Wang (2005) find that the US-Canadian border adds around 7 per cent to price differences between pairs of cities. It would appear that Central Asia is less integrated than the US and Canada (not surprisingly) but not out of line with estimates for other developed countries. No such estimates exist to the authors' knowledge for developing countries.

where *Pki* is the price of good *k* in region *i* and thus the cost index is simply the average of all relative prices between two regions.[10]

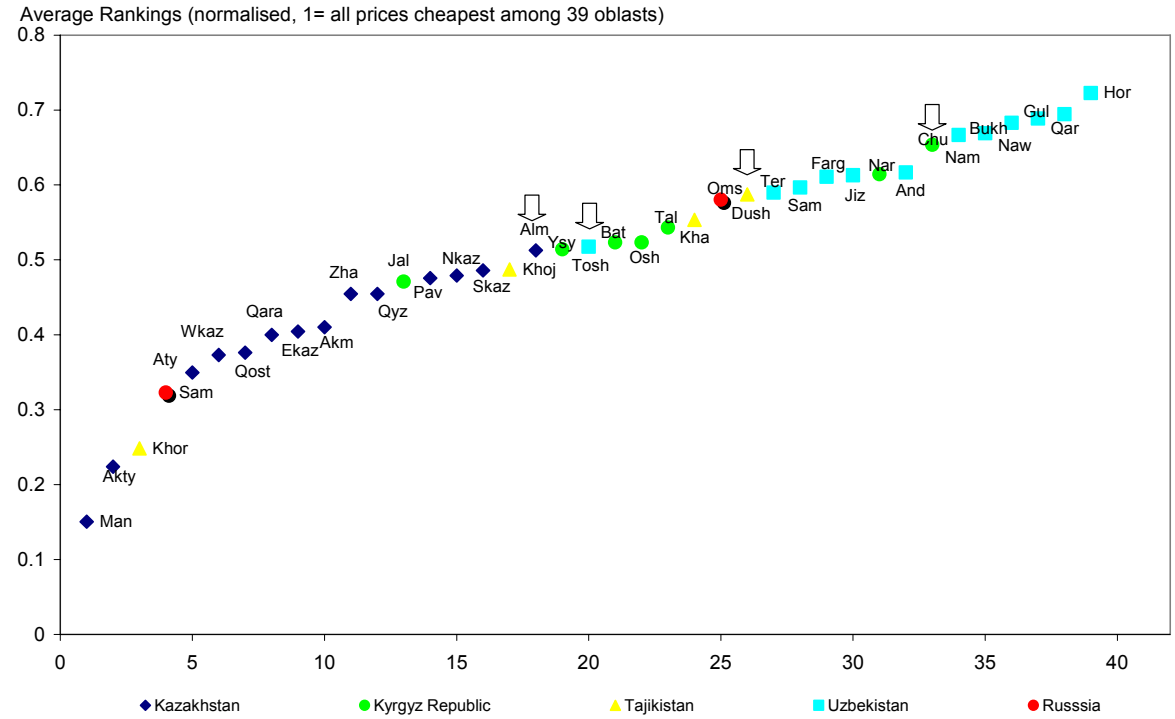
In Kazakhstan, the Kyrgyz Republic and Tajikistan, the capital cities are among the cheapest locations in each country, whereas Tashkent is the most expensive city on average in Uzbekistan. It is not clear whether these contradicting patterns are due to greater market integration in Uzbekistan, which means that the price of non-tradables has a strong influence on the cost of living. Alternatively, this may be due to remnants of price control in Uzbekistan leading to an implicit subsidisation of less economically advanced regions (such as Khorezm and Qashkadarya, which are the cheapest regions in the entire sample). However, taking into account the results of the previous section, the latter interpretation is more favoured.

When comparing all regions to Almaty and ranking them by descending cost indices, the Kazakh regions cluster towards the more expensive end, while Uzbek regions are by and large the cheapest in the sample (Chart 4). The other countries fall somewhere in the middle, with considerable variation particularly in the case of Tajikistan – consistent with the high physical barriers to transport in this country.

Behind these broad regional rankings, however, there is quite a lot of variation in the ranking of the regions for different goods. In analysing the patterns of this variation two steps are undertaken. First the cheapest and second cheapest region for each good in each country is established to see whether they are located close to one another, as would be expected if transport costs are the main factor limiting price arbitrage across goods and regions. For the majority of products, the cheapest and next cheapest locations are not neighbouring (results available upon request).

[10] Cost indices based on ranking each region for each good and then taking averages of ranks across all the 31 goods were calculated. The results are very similar to taking averages of relative goods prices and then ranking across regions.

Chart 4: Average regional rank across Central Asia by oblast



Note: Authors' calculations based on prices of each good. Rankings were normalised (1=all prices cheapest among 39 oblasts surveyed). Arrows point to the largest city in each country.

Second, the absolute difference in prices for each good between two locations was calculated, and this difference regressed on the distance between these two locations and the relative cost of living index.

(7) $ln\ |Pki - Pkj| = \delta + \eta\ lnDist\ ij + \theta\ Costij + u.$

The results are presented in Annex Tables A.1 – A.2. There are a total of 31 goods and hence 31 regressions in each country. The results are inconclusive. While both distance and differences in the average cost of living have an impact on absolute price differences for some goods, this result is not uniform across goods. As expected, distance explains some of the variation in relative prices in Kazakhstan for locally produced food items, cement, pain killers and TV sets. Distance is not a significant determinant of relative prices for almost all of the branded imported goods and goods that are distributed in national distribution companies like petrol. The reason is most likely that all these goods are delivered locally at the same wholesale price by national or international distribution networks and relative prices only depend on non-tradable costs and the degree of local competition. Distance related costs appear to be less important in the other two countries. This might be explained by the significantly lower distances. Also inside the Kyrgyz Republic distances are not necessarily a good measure for transport costs since some regions are separated by large mountain ranges that are difficult to cross.

In a last step the relative prices across countries, as well as inside countries, were regressed.

(8) $ln\ |Pki - Pkj| = \delta + \eta\ lnDist\ ij + \theta\ Costij + \gamma Country + \beta Border + u.$

This is done pairwise by country (that is, separate regressions for Kazakh-Kyrgyz, Kazakh-Uzbek, Kyrgyz-Uzbek) and the results are also in Annex Table 3. The country dummy is either Uzbekistan or the Kyrgyz Republic depending on the regression. The results for the distance parameter are largely in line with those inside countries. Distance is a significant determinant of relative prices for locally produced goods, less so for branded products. Surprisingly the border effects turn out to be negative and significant in quite a few cases.

This suggests that local factors that determine relative prices cannot be sufficiently controlled and that these are in many cases more important than the national borders. However, the border effect is significant and positive for most locally produced agricultural goods at the Kazakh and Kyrgyz border.

6. CONCLUSION

This paper presents an unexpected conclusion: the Central Asian countries do not seem to suffer from a great amount of regional disintegration in consumer goods markets. Instead, it appears that shuttle trade is effective in taking advantage of arbitrage opportunities. National borders do not seem to add much to the variation in relative prices across different regions in Central Asia, at least compared to existing, within-country barriers to trade. At the same time, it appears that the within-country barriers to trade are significant and go beyond simple transport costs related to the distance between two locations. Rather, internal barriers to trade such as numerous roadblocks and attempts by local governments to restrict access to local markets and bazaars are driving up price differences across regions to levels that are at least as high as differences across countries.

The results obtained in this paper are nevertheless subject to important caveats. First, the use of CPIs to measure the degree of market integration as in section 4 of this paper is unsatisfactory for reasons mentioned earlier. Second, the survey of consumer goods prices is taken at only one point in time and hence results could be quite strongly affected by noise in the data. The same survey should be repeated over several time periods to gauge the robustness of this paper's main conclusion.

Third, the survey of consumer goods concentrates on the kinds of goods which are likely to be most easily tradable by shuttle traders. In a separate exercise, the World Bank collected the prices of selected consumer durables between Tashkent, Shymkent (in Southern Kazakhstan) and Khojand (in Tajikistan). This suggested that for consumer durables such as color TV sets, refrigerators, VCRs, microwaves and so on, prices in Tashkent are on average around 20 per cent higher than those in Shymkent and around 10 per cent above prices in Khojand. This is in contrast to the cost of living estimates produced in this paper based on a different goods basket, which show that Tashkent is on average cheaper than either Shymkent or Khojand. The significant weight of agricultural products in our basket may explain the difference. It would therefore be interesting in future work to extend the basket to consumer durables.

Fourth, it would also be interesting to compare price variation within Central Asia to other CIS countries and perhaps other developing countries. The results suggest that price differences between locations can be very considerable, suggesting significant arbitrage opportunities. It would be interesting to try and benchmark these differences to other developing countries to get a better sense of whether price dispersion is large or small by comparison.

If the results in this paper were to be confirmed in future work, how could they be reconciled with the considerable evidence that has accumulated on the costs of crossing borders in Central Asia, and the particular difficulties that shuttle traders face at the Uzbek border? The following hypothesis may be proposed: shuttle trade in Central Asia is large because trading margins across regions (within and across countries) are large. Uzbekistan is the largest market in Central Asia and hence attractive to shuttle traders. The anecdotal evidence merely reflects the relative weight of Uzbekistan in all shuttle trade transactions. Moreover, it appears that once within Uzbekistan, price differences are quite small, so that the greatest gains lie in exploiting price differences in bordering regions such as with southern Kazakhstan or in the Ferghana. Note that according to the data in this paper this goes for both exports from and imports to Uzbekistan.

The upshot of the analysis is this: trade barriers in Uzbekistan do not protect domestic producers and do not even generate significant income for border guards – at least relative to trade rents collected along the roads inside Kazakhstan. Uzbek trade barriers have simply led to the relocation of regional wholesale markets to Kazakh (Shymkent) and Kyrgyz (Osh) border towns. The Kazakh and Kyrgyz bazaars are collecting the large wholesale rents, while Uzbek border guards and shuttle traders fight over the crumbs of arbitrage rents.

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ANNEXES

Annex Table 1: Distances and relative price inside countries for individual goods

Distance and relative price inside countries for individual goods							
		Kaz		Kyr		Uz	
Average Price USD	Product	Coef	t-stat	Coef	t-stat	Coefficient	t-stat
0.11	Analgin	**0.06**	2.47	0.01	-0.22	-0.01	-0.57
0.10	Paracetamolum	**0.05**	1.85	**0.06**	1.59	0.00	-0.35
4.15	Cement	**0.14**	3.13	**0.15**	2.10	-0.01	-0.22
0.92	Cotton cloth	0.03	0.24	**0.10**	1.80	**0.06**	3.07
8.28	Xerox paper	**0.08**	3.82	0.01	0.44	**0.03**	2.17
0.38	Unleaded №-76	0.00	0.31	0.00	0.17	0.00	-0.88
0.32	Diesel	0.00	0.20	0.02	1.03	**0.03**	1.97
0.47	Tooth paste Colgate	0.04	1.02	0.00	-0.06	**0.02**	1.67
198.24	TV set	**0.10**	4.69	0.00	0.13	**0.05**	3.22
0.61	Sugar	-0.02	-1.30	0.01	-1.04	0.00	0.29
1.16	Cotton-seed oil	0.04	0.77	**0.06**	2.04	0.00	0.11
1.16	Sunflower-seed oil	**0.04**	1.93	0.02	0.89	**0.05**	2.55
0.99	Eggs	**0.05**	2.19	0.02	1.43	**0.02**	1.46
0.34	Milk	**0.33**	5.58	0.02	-0.14	0.02	1.33
0.16	Potatoes	**0.12**	4.55	**0.09**	2.11	0.01	0.68
0.26	Carrot	**0.09**	3.16	**0.13**	2.60	**0.05**	1.60
0.17	Onion	**0.08**	2.78	**0.11**	2.05	0.01	0.27
0.69	Coca-Cola	0.00	-0.18	0.02	0.54	**0.04**	1.63
0.29	Flour	**0.07**	3.78	0.02	1.32	**0.05**	3.22
0.27	Raisins light	-0.03	-0.23	0.04	-0.76	0.04	1.18
0.24	Raisins black	0.02	0.16	0.11	1.19	**0.29**	5.67
12.66	Black caviar	**0.12**	2.33	0.00	-0.07	**0.09**	1.56
1.18	Mineral water "Barjomi"	0.00	-0.11				
0.67	Efes Pilsener	**0.05**	2.09			**0.07**	3.34
0.71	Baltika №3	-0.01	-0.78			0.01	0.71
0.92	Marlboro lights	0.03	0.82	0.07	-1.34	**0.05**	3.43
0.37	Chocolate bar (Mars)	0.00	0.19	0.06	0.95	0.01	0.78
1.26	Nescafe	**0.07**	1.84	0.01	-1.25	-0.01	-0.55
0.81	Pele Cafe	0.06	0.96	0.01	0.18	0.01	0.25
1.05	Apple juice	**0.02**	1.98	0.02	0.52	**0.03**	1.60
0.57	Polished rice	0.01	0.21	0.03	0.82	0.00	0.05

Annex Table 2: Distances and relative price inside countries for individual goods (with coefficients)

Non-foods	**Average Price, US$**	Var	**Kazakhstan** Coef	t-stat	**Kyrgyz Republic** Coef	t-stat	**Uzbekistan** Coefficient	t-stat
Analgin	0.11	livingcost	0.38	**2.14**	0.32	0.43	-0.17	-0.97
		lndistance	0.06	**2.47**	0.01	-0.22	-0.01	-0.57
		constant	-0.20	-1.23	0.23	1.02	0.15	2.46
Paracetamolum	0.10	livingcost	0.51	**2.7**	0.80	0.82	0.33	**1.83**
		lndistance	0.05	**1.85**	0.06	1.59	0.00	-0.35
		constant	-0.18	-0.87	0.11	-0.48	0.12	1.60
Cement	4.15	livingcost	-0.46	-1.58	0.48	0.55	1.21	**1.96**
		lndistance	0.14	**3.13**	0.15	**2.10**	-0.01	-0.22
		constant	-0.52	-1.76	0.76	-1.76	0.24	1.34
Cotton cloth	0.92	livingcost	1.82	**3.8**	0.08	0.07	-0.17	-0.50
		lndistance	0.03	0.24	0.10	1.80	0.06	**3.07**
		constant	0.34	0.45	0.36	-1.00	-0.14	-1.25
Xerox paper	8.28	livingcost	0.76	**6.12**	0.81	**2.08**	-0.19	-0.94
		lndistance	0.08	**3.82**	0.01	0.44	0.03	**2.17**
		constant	-0.43	-3.1	0.11	0.99	-0.05	-0.56
Unleaded №-76	0.38	livingcost	-0.02	-0.4	0.14	0.28	0.03	0.56
		lndistance	0.00	0.31	0.00	0.17	0.00	-0.88
		constant	0.05	0.82	0.04	0.29	0.06	2.31
Diesel	0.32	livingcost	0.10	1.64	0.27	0.68	0.30	1.07
		lndistance	0.00	0.2	0.02	1.03	0.03	**1.97**
		constant	0.06	0.98	0.03	-0.32	-0.05	-0.57
Tooth paste Colgate	0.47	livingcost	1.28	**5.12**	1.98	1.44	0.41	**1.83**
		lndistance	0.04	1.02	0.00	-0.06	0.02	1.67
		constant	-0.15	-0.57	0.17	0.46	-0.03	-0.44
TV set	198.24	livingcost	0.27	**2.21**	0.47	0.53	0.06	0.22
		lndistance	0.10	**4.69**	0.00	0.13	0.05	**3.22**
		constant	-0.56	-3.71	0.08	0.39	-0.19	-1.89

Foods	Average Price, US$	Var	Kazakhstan Coef	t-stat	Kyrgyz Republic Coef	t-stat	Uzbekistan Coefficient	t-stat
Sugar	0.61	livingcost	-0.04	-0.6	0.37	1.15	-0.21	-1.46
		lndistance	-0.02	-1.3	0.01	-1.04	0.00	0.29
		constant	0.23	2.53	0.12	1.58	0.08	1.59
Cotton-seed oil	1.16	livingcost	-0.20	-0.61	1.67	**2.27**	0.60	3.14
		lndistance	0.04	0.77	0.06	**2.04**	0.00	0.11
		constant	-0.05	-0.15	0.11	-0.56	0.07	0.93
Sunflower-seed oil	1.16	livingcost	0.04	0.24	0.95	**2.29**	-0.92	**-3.55**
		lndistance	0.04	**1.93**	0.02	0.89	0.05	**2.55**
		constant	-0.09	-0.67	0.04	0.23	-0.14	-1.12
Eggs	0.99	livingcost	0.00	-0.01	0.05	0.11	0.25	1.31
		lndistance	0.05	**2.19**	0.02	1.43	0.02	1.46
		constant	-0.16	-0.99	0.04	-0.64	0.00	0.03
Milk	0.34	livingcost	2.57	**9.39**	0.29	0.13	0.99	**4.68**
		lndistance	0.33	**5.58**	0.02	-0.14	0.02	1.33
		constant	-2.14	-5.07	0.50	0.71	-0.02	-0.31
Potatoes	0.16	livingcost	0.25	1.41	0.45	0.27	-0.23	-0.83
		lndistance	0.12	**4.55**	0.09	**2.11**	0.01	0.68
		constant	-0.64	-3.54	0.24	-0.96	0.13	1.13
Carrot	0.26	livingcost	1.68	**10.14**	2.08	1.25	0.70	1.40
		lndistance	0.09	**3.16**	0.13	**2.60**	0.05	1.60
		constant	-0.53	-2.72	0.34	-1.20	-0.04	-0.19
Onion	0.17	livingcost	0.41	1.57	1.45	1.43	-0.08	-0.22
		lndistance	0.08	**2.78**	0.11	**2.05**	0.01	0.27
		constant	-0.36	-1.85	0.51	-1.66	0.20	0.91
Coca-Cola	0.69	livingcost	0.00	-0.04	0.88	1.11	-0.40	-0.95
		lndistance	0.00	-0.18	0.02	0.54	0.04	1.63
		constant	0.13	1.3	0.08	0.54	-0.02	-0.10
Flour	0.29	livingcost	0.37	**3.49**	1.03	1.52	0.28	1.15
		lndistance	0.07	**3.78**	0.02	1.32	0.05	**3.22**
		constant	-0.37	-2.99	0.08	0.75	-0.13	-1.61
Raisins light	0.27	livingcost	-0.43	-0.79	0.73	0.47	3.36	**7.97**
		lndistance	-0.03	-0.23	0.04	-0.76	0.04	1.18
		constant	0.80	1.09	0.62	2.25	-0.07	-0.40
Raisins black	0.24	livingcost	-0.64	-1.12	4.16	1.74	0.07	0.12
		lndistance	0.02	0.16	0.11	1.19	0.29	**5.67**
		constant	0.53	0.66	0.06	0.11	-1.32	-4.11
Black caviar	12.66	livingcost	0.08	0.27	0.31	0.84	0.84	0.95
		lndistance	0.12	**2.33**	0.00	-0.07	0.09	1.56
		constant	-0.55	-1.59	0.14	0.46	-0.40	-1.11
Mineral water "Barjomi"	1.18	livingcost	-0.06	-0.36				
		lndistance	0.00	-0.11				
		constant	0.24	1.03				
Efes Pilsener	0.67	livingcost	0.46	**2.82**			3.26	**3.93**
		lndistance	0.05	**2.09**			0.07	**3.34**
		constant	-0.24	-1.31			-0.35	-2.48
Baltika №3	0.71	livingcost	0.03	0.29			0.42	**2.23**
		lndistance	-0.01	-0.78			0.01	0.71
		constant	0.18	2.13			0.04	0.37
Marlboro lights	0.92	livingcost	-0.34	-1.61	1.81	**1.92**	0.95	**3.82**
		lndistance	0.03	0.82	0.07	-1.34	0.05	**3.43**
		constant	-0.02	-0.08	0.45	1.49	-0.21	-2.73
Chocolate bar (Mars)	0.37	livingcost	-0.03	-0.32	3.00	1.34	0.28	1.31
		lndistance	0.00	0.19	0.06	0.95	0.01	0.78
		constant	0.10	0.97	0.16	0.70	0.06	0.71
Nescafe	1.26	livingcost	0.04	0.15	0.10	0.39	0.08	0.47
		lndistance	0.07	**1.84**	0.01	-1.25	-0.01	-0.55
		constant	-0.18	-0.73	0.09	2.70	0.16	1.89
Pele Cafe	0.81	livingcost	0.07	0.24	0.79	0.47	-0.81	-2.03
		lndistance	0.06	0.96	0.01	0.18	0.01	0.25
		constant	-0.04	-0.09	0.26	0.92	0.29	1.39
Apple juice	1.05	livingcost	0.24	**2.86**	0.11	0.12	0.24	0.72
		lndistance	0.02	**1.98**	0.02	0.52	0.03	1.60
		constant	-0.09	-1.04	0.04	0.13	0.03	0.25
Polished rice	0.57	livingcost	0.22	1.11	0.02	0.03	-0.05	-0.23
		lndistance	0.01	0.21	0.03	0.82	0.00	0.05
		constant	0.18	0.88	0.03	-0.17	0.13	1.62

Annex Table 3 Distances and relative price cross-border (with coefficients)

		Kaz Uz		Kaz Kyr		Kyruz	
		Coef	t-stat	Coef	t-stat	Coef	t-stat
Imported/branded products							
Analgin	lndistance	**0.02**	1.81	**0.06**	7.79	**0.06**	8.08
	livingcost	**0.36**	4.75	-0.08	-1.62	-0.07	-1.29
	border	**-0.16**	-6.90	0.02	1.14	0.02	1.12
	uz/kyr/kyr	**-0.13**	-5.98	0.02	0.75	0.03	0.82
	_cons	0.10	1.54	-0.21	-4.14	-0.22	-4.48
Paracetamolu	lndistance	**0.04**	2.98	**0.08**	8.94	**0.08**	8.95
	livingcost	**0.29**	3.64	**-0.11**	-2.22	**-0.12**	-2.23
	border	**-0.14**	-5.28	**0.04**	2.03	-0.03	-1.40
	uz/kyr	-0.10	-4.25	0.03	0.87	0.03	0.65
	_cons	-0.02	-0.22	-0.31	-5.62	-0.29	-5.46
Tooth paste C	lndistance	-0.01	-0.71	**0.03**	3.25	**0.04**	3.77
	livingcost	**1.14**	8.37	**0.47**	5.91	**0.53**	6.64
	border	**-0.28**	-7.23	-0.03	-1.26	**0.14**	5.92
	uz/kyr	**-0.12**	-3.98	0.09	1.76	**0.12**	2.34
	_cons	**0.22**	2.10	-0.06	-0.86	-0.11	-1.80
TV set	lndistance	**0.04**	3.69	**0.03**	3.93	**0.03**	3.72
	livingcost	**0.18**	2.82	0.08	1.55	0.05	0.94
	border	**-0.08**	-3.93	**-0.03**	-2.06	**-0.04**	-3.26
	uz/kyr	-0.01	-0.42	-0.01	-0.43	-0.02	-0.70
	_cons	-0.10	-1.35	-0.04	-0.84	-0.02	-0.42
Coca-Cola	lndistance	**0.03**	2.77	**0.03**	3.96	**0.03**	3.74
	livingcost	**-0.17**	-2.43	**-0.08**	-1.98	**-0.13**	-3.08
	border	**0.09**	4.38	**-0.08**	-7.10	-0.02	-1.41
	uz/kyr	**0.12**	4.31	**-0.06**	-2.50	**-0.06**	-2.42
	_cons	-0.11	-1.29	0.01	0.27	0.02	0.47
Mineral water	lndistance	0.02	0.61	**0.03**	2.32	**0.04**	2.93
	livingcost	-0.04	-0.28	0.08	0.94	0.04	0.49
	border	0.14	3.15	**-0.10**	-3.60	**0.15**	7.42
	uz/kyr	-0.15	-2.79	**-0.14**	-7.57	**-0.13**	-6.79
	_cons	0.09	0.47	-0.03	-0.34	-0.09	-0.98
Efes Pilsener	lndistance	-0.01	-0.36	-0.03	1.03	-0.02	0.70
	livingcost	-0.33	-1.85	0.17	1.49	0.16	1.49
	border	**0.21**	4.15	**-0.11**	-2.24	**0.28**	3.30
	uz/kyr	-0.02	-0.32				
	_cons	0.33	1.66	**0.45**	2.61	0.38	2.24
Baltika №3	lndistance	-0.01	-1.26	**0.03**	3.41	**0.04**	4.29
	livingcost	-0.28	-4.53	-0.05	-1.04	-0.01	-0.16
	border	0.24	12.21	**-0.11**	-8.83	**0.17**	7.67
	uz/kyr	-0.01	-0.58	**-0.09**	-2.44	-0.05	-1.29
	_cons	0.25	3.41	0.02	0.24	-0.06	-0.96
Chocolate bar	lndistance	-0.01	-0.70	-0.01	1.22	-0.01	1.60
	livingcost	0.03	0.71	0.03	0.92	-0.01	-0.24
	border	0.01	0.70	**-0.06**	-5.46	**-0.06**	-6.02
	uz/kyr	0.02	0.94	**-0.12**	-13.38	**-0.13**	-13.60
	_cons	0.15	2.58	0.20	4.90	0.23	5.52
Nescafe	lndistance	**0.10**	5.76	**0.08**	8.71	**0.08**	8.69
	livingcost	0.18	1.72	**0.24**	4.26	**0.24**	4.06
	border	-0.06	-1.67	0.01	0.23	-0.02	-0.83
	uz/kyr	**-0.06**	-1.99	**0.12**	2.36	**0.11**	2.27
	_cons	-0.43	-3.67	-0.35	-5.98	-0.34	-5.85
Pele Cafe	lndistance	**0.09**	3.35	**0.06**	4.13	**0.05**	3.89
	livingcost	0.21	1.43	**0.28**	3.35	**0.22**	2.52
	border	-0.08	-1.78	**-0.07**	-3.03	**-0.08**	-3.53
	uz/kyr	-0.02	-0.33	**-0.11**	-3.36	**-0.12**	-3.66
	_cons	-0.25	-1.31	-0.07	-0.84	-0.04	-0.45
Apple juice	lndistance	0.01	0.89	-0.01	1.25	-0.01	1.25
	livingcost	0.00	-0.02	0.04	0.97	0.03	0.87
	border	**0.05**	2.97	**-0.05**	-4.36	0.02	1.31
	uz/kyr	**0.13**	5.68	-0.03	-0.91	-0.02	-0.65
	_cons	0.05	0.66	0.23	5.22	0.22	4.93
Xerox paper	lndistance	**0.02**	2.20	**0.04**	5.23	**0.03**	5.08
	livingcost	**0.63**	10.13	**0.39**	9.54	**0.36**	8.56
	border	**-0.19**	-9.90	**-0.04**	-2.91	**-0.04**	-3.31
	uz/kyr	**-0.06**	-2.88	-0.01	-0.65	-0.02	-0.88
	_cons	0.00	0.04	-0.13	-3.08	**-0.11**	-2.73
Black caviar	lndistance	**0.08**	2.30	**0.06**	2.28	**0.05**	1.85
	livingcost	0.04	0.20	**1.30**	8.09	**1.33**	8.20
	border	**0.77**	14.67	**0.30**	4.15	**-0.18**	-2.92
	uz/kyr	0.03	0.41	**0.07**	2.36	0.04	1.17
	_cons	-0.27	-1.11	-0.08	-0.43	0.01	0.05
Average							

Goods with special taxation							
Unleaded №-7	lndistance	-0.01	-1.76	-0.01	0.51	0.00	0.31
	livingcost	**-0.09**	-3.37	-0.02	-0.28	0.01	0.17
	border	**0.06**	7.54	**-0.03**	-2.62	**0.09**	6.86
	uz/kyr	**-0.04**	-6.25	**-0.15**	-8.60	**-0.13**	-7.03
	_cons	0.14	4.56	0.26	3.11	**0.22**	2.65
Diesel	lndistance	0.00	0.36	0.00	0.14	0.01	0.40
	livingcost	0.06	1.04	0.03	0.35	0.13	1.48
	border	**0.04**	2.72	**0.03**	2.28	**0.18**	9.49
	uz/kyr	**0.07**	3.93	**-0.18**	-11.07	**-0.14**	-8.72
	_cons	0.06	0.97	0.26	3.09	0.17	2.12
Marlboro light	lndistance	-0.03	-1.44	0.03	1.52	0.03	1.49
	livingcost	**-0.28**	-2.86	**0.94**	8.63	**0.95**	8.67
	border	**0.75**	25.51	-0.04	-0.88	0.02	0.43
	uz/kyr	**-0.09**	-2.50	0.02	0.21	0.02	0.28
	_cons	0.39	3.17	0.08	0.67	0.08	0.64
Sugar	lndistance	**-0.02**	-3.65	**-0.01**	1.80	-0.01	1.64
	livingcost	**-0.09**	-2.73	-0.01	-0.33	0.00	0.09
	border	**0.03**	2.42	**-0.03**	-3.25	**0.03**	3.56
	uz/kyr	**-0.06**	-5.05	**-0.07**	-6.61	**-0.07**	-5.72
	_cons	**0.29**	6.23	0.18	5.85	**0.17**	5.24
Average	lndistance	-0.01	-1.62	0.00	0.99	0.01	0.96
	livingcost	-0.10	-1.98	0.24	2.09	0.27	2.60
	border	0.22	9.55	-0.02	-1.12	0.08	5.09
	uz/kyr	-0.03	-2.47	-0.10	-6.52	-0.08	-5.30
	const	0.22	3.73	0.20	3.18	0.16	2.66
Locally produced							
Cement	lndistance	**0.18**	6.20	**0.09**	5.80	**0.09**	5.45
	livingcost	-0.04	-0.19	**0.94**	9.17	**0.88**	8.47
	border	**0.24**	4.41	**-0.11**	-2.66	**-0.06**	-1.90
	uz/kyr	0.04	0.88	**-0.10**	-2.82	**-0.10**	-2.85
	_cons	-0.84	-4.38	-0.30	-3.10	-0.27	-2.73
Cotton cloth	lndistance	0.05	1.13	**0.10**	4.89	**0.10**	4.80
	livingcost	**2.00**	7.14	**1.84**	11.05	**1.80**	10.54
	border	-0.14	-1.72	0.06	0.88	**-0.12**	-3.77
	uz/kyr	**-0.36**	-4.27	-0.02	-0.48	-0.05	-1.03
	_cons	0.17	0.57	-0.46	-3.38	-0.41	-3.02
Cotton-seed o	lndistance	**0.03**	2.25	**0.03**	4.07	**0.04**	4.29
	livingcost	-0.04	-0.46	-0.03	-0.56	-0.05	-1.10
	border	-0.04	-1.09	-0.01	-0.41	-0.03	-1.77
	uz/kyr	-0.04	-1.35	0.04	1.12	0.03	0.92
	_cons	-0.01	-0.08	-0.07	-1.40	-0.07	-1.48
Sunflower-see	lndistance	**0.08**	6.03	**0.04**	6.85	**0.05**	7.16
	livingcost	**-0.21**	-2.54	-0.06	-1.54	-0.04	-0.90
	border	**0.06**	2.76	**-0.04**	-3.36	**0.08**	5.59
	uz/kyr	0.00	0.10	-0.03	-1.46	-0.01	-0.59
	_cons	-0.34	-3.84	**-0.11**	-2.52	-0.14	-3.22
Eggs	lndistance	-0.01	-0.46	**0.03**	3.96	**0.02**	3.69
	livingcost	0.00	-0.02	-0.01	-0.23	-0.05	-1.09
	border	-0.03	-1.14	-0.01	-0.36	**-0.07**	-6.67
	uz/kyr	**-0.10**	-3.90	**-0.06**	-4.52	**-0.08**	-5.32
	_cons	0.26	2.97	-0.01	-0.18	0.02	0.56
Milk	lndistance	**0.15**	5.52	0.20	1.65	0.20	1.72
	livingcost	**2.87**	20.19	**2.01**	19.33	**2.03**	18.99
	border	**-0.31**	-6.70	**0.12**	2.61	-0.03	-0.69
	uz/kyr	**-0.13**	-2.76	**0.29**	3.27	**0.27**	3.11
	_cons	-0.84	-4.48	-1.26	-11.00	-1.25	-10.90
Potatoes	lndistance	**0.09**	5.41	0.15	0.36	**0.16**	9.25
	livingcost	**0.76**	7.33	**0.81**	9.86	**1.05**	10.80
	border	**0.27**	8.37	**0.63**	20.75	**0.13**	3.46
	uz/kyr	**0.08**	2.75	0.08	1.63	0.06	1.23
	_cons	-0.52	-4.32	**-0.70**	-7.80	-0.78	-6.94
Carrot	lndistance	**0.05**	2.63	**0.08**	5.17	**0.08**	5.50
	livingcost	**1.45**	11.68	**0.53**	5.29	**0.62**	6.11
	border	**-0.24**	-6.77	**0.20**	5.24	**0.08**	2.24
	uz/kyr	**0.13**	3.20	0.09	1.44	0.09	1.47
	_cons	-0.22	-1.65	**-0.26**	-2.69	-0.30	-3.09
Onion	lndistance	**0.10**	4.33	**0.17**	9.95	**0.16**	9.85
	livingcost	**0.81**	5.61	**1.27**	13.60	**1.25**	13.15
	border	**0.47**	10.71	0.07	1.91	**-0.09**	-2.61
	uz/kyr	**0.13**	3.60	0.03	0.79	0.01	0.24
	_cons	-0.53	-3.42	**-0.87**	-7.90	-0.83	-7.63
Flour	lndistance	0.00	0.19	**-0.03**	3.31	**-0.03**	3.23

ANNEX 4: LIST OF OBLASTS SURVEYED

Kazakhstan (14)

Akmolinsk

Aktyabinsk

Almaty (region)

Atyrau

Eastern Kaz

Zhambyl

Western Kaz

Qaraghandy

Qostanay

Qyzlorda

Mangghystau

Pavlodar

Northern Kaz

Southern Kaz

Kyrgyz Republic (7)

Batken

Chuy (Bishkek)

Jalal-Abad

Naryn

Osh

Talas

Ysyk-Kol (Karakol)

Tajikistan (4)

Dushanbe

Mukhtori Kuhistoni Badakhshon (Khorog)

Khatlon (Qurghonteppa)

Leninobod (Khojand)

Uzbekistan (12)

Andijon

Bukhoro

Jizzakh

Qashqadaryo (Qarshi)

Nawoiy

Namangan

Samarqand

Surkhondaryo (Termiz)

Sirdaryo (Guliston)

Toshkent Oblast

Farghona

Horeziska

Russia (2)

Samara

Omsk