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Dialogue of Civilizations Research Institute

17 September 2018

Online at <https://mpra.ub.uni-muenchen.de/89041/>  
MPRA Paper No. 89041, posted 23 Sep 2018 01:34 UTC

# Changes in the Geographical Structure of Trade in Central Asia: Real Flows in the 1989-2016 Period versus Gravity Model Predictions<sup>1</sup>

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Sep 2018

## Abstract

In the 1980s, six former southern republics of the USSR (Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan), like other former Soviet republics, traded very intensively both between themselves and with the other Soviet republics, but had a meagre volume of trade with the rest of the world. After the transition to the market, the deregulation of foreign trade, and the collapse of the USSR in the 1990s, trade between the former Soviet republics shrank dramatically and was only partially replaced by trade with other countries, mostly from Western Europe. In the 2000s and 2010s, the relative importance of trade with Western Europe has declined and the share of trade with China and other Asian countries has grown.

This paper compares changes in the geographical structure of trade of both former Soviet republics (Central Asian countries and Azerbaijan) and Turkey, with the predictions of the gravity model. The gravity model suggests that trade between two countries is proportionate to their respective GDPs and is inversely related to the geographical distance between them.<sup>2</sup> Turkey serves as a yardstick for comparison. For Turkey, changes in its geographical trade structure resulted from a rise in the proportion of trade with Asian countries and a decline in the proportion of trade with other regions in the world economy. In contrast, for the former Soviet republics there

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<sup>1</sup> This is a working paper at DOC Research Institute that was conducted for the Food and Agriculture Organization of the United Nations (FAO) on scenarios of agricultural development in Central Asia. The article can be found at <https://doc-research.org/2018/09/geographical-structure-trade-central-asia/>

<sup>2</sup> The Central Asian region, in accordance with the FAO classification, includes six former Soviet republics – Azerbaijan; Kazakhstan; Kyrgyzstan; Tajikistan; Turkmenistan; and Uzbekistan – and Turkey.

was an additional reason for changes in their geographical trade structure: the collapse of trade within the former USSR.

## Introduction

Tables 1 and 2 provide, to the best of our knowledge, the only available estimate () of the intensity of trade in republics of the former Soviet Union for 1989. Trade flows are represented in domestic prices and GDP data is estimated from official data on net material product, so the shares of trade in GDP for 1989 are not totally comparable with data for the 1990s and 2010s, but the general picture is so obvious as to not depend on data adjustment; former Soviet republics had a huge volume of trade with each other and a very modest amount of trade with the outside world.<sup>3</sup> ‘Domestic’ trade represents trade among former Soviet republics and ‘foreign’ trade represents trade with the rest of the world.

**Table 1: Trade flows and trade balances for former Soviet republics, 1989, as a percentage of GNP**

Republics	Trade flows <sup>a</sup>		Trade balance			
	Domestic	Foreign	Domestic <sup>b</sup>	Foreign	Total, in domestic prices	Total in world prices
USSR	21.11	8.27	-0.01(-0.14)	-5.76	-5.78	0.21
Russia	12.92	9.37	0.05 (0.02)	-6.28	-6.23	5.76
Ukraine	26.90	7.14	2.55 (-0.3)	-4.61	-2.05	-2.04
Belarus	44.56	7.39	11.14 (-1.6)	-5.42	-5.72	-5.78
Lithuania	47.26	7.21	-6.56 (4.0)	-5.83	-12.39	-29.97
Latvia	46.85	7.21	-1.03 (5.2)	-6.18	-7.21	-13.39
Estonia	50.11	8.79	-5.27 (5.3)	-7.03	-12.31	-22.86
Moldova	45.88	6.37	-1.87 (5.6)	-7.86	-9.74	-24.34
Armenia	47.85	5.84	-4.23 (-2.5)	-9.70	-13.92	-17.40
Georgia	37.88	5.90	1.98 (-4.9)	-6.15	-4.17	-13.43
Azerbaijan	35.38	5.95	13.89 (-2.6)	-6.61	-7.28	-3.31

<sup>3</sup> We refer to GDP throughout the paper, but due to the limited availability of data, percentages at this point in the paper are calculated on the basis of GNP.

Kazakhstan	29.48	4.69	-14.47(-1.3)	-5.09	-19.56	-17.69
Uzbekistan	34.10	5.62	-5.78 (-1.4)	-0.59	-6.37	-8.71
Turkmenistan	37.58	4.60	-1.53 (-3.0)	-3.07	-4.60	0.00
Kyrgyzstan	39.65	5.98	-7.21 (0.4)	-10.24	-17.45	-15.86
Tajikistan	37.70	6.01	-15.32 (3.0)	-2.10	-17.42	-16.52

Notes:

<sup>a</sup> (Exports + Imports)/(2xGNP), at domestic prices, assuming the same GNP/NMP ratios for the republics as for the USSR as a whole. Domestic trade is trade with the rest of the USSR. Foreign trade is trade with the rest of the world.

<sup>b</sup> Estimates of the balance of tourist trade are shown in brackets.

Source: Commission of European Communities, 1990.

This pattern changed dramatically in the 1990s. Trade within the former Soviet Union collapsed and began to be replaced by trade with other countries (see tables 2 and 3; also fig. 1), but the process was extremely slow, such that by 2016 total foreign trade as a percentage of GDP was still far lower than pre-transition levels of trade with other former Soviet republics and other foreign countries together.

Tables 2 and 3 and figure 1 show the share of trade as a percentage of GDP at four different times. Evidently, the relative size of trade was reduced significantly in the beginning of the 1990s. This was due to the breakdown of the Soviet Union in 1991 and the subsequent collapse of intra-USSR trade flows in the early 1990s. Trade began to recover between 1996 and 2001, but today the share of trade in GDP is still considerably lower than in 1989.

**Table 2: Trade as a percentage of GDP**

Country	1989	1996	2001	2016
AZE	41.33	4.97	11.71	12.00
KAZ	34.17	8.26	10.83	13.65
KGZ	45.63	16.26	10.87	25.8
TJK	43.71	8.87	10.33	16.52
TKM	42.18	11.39	16.64	13.59
TUR	25.55	17.61	12.27	17.7
UZB	39.72	11.07	8.5	8.6

Note: AZE: Azerbaijan; KAZ: Kazakhstan; KGZ: Kyrgyzstan; TJK: Tajikistan; TKM: Turkmenistan; TUR: Turkey; UZB: Uzbekistan

Source: Commission of European Communities, 1990; WDI; COMTRADE.

Figure 1 shows changes in the share of actual trade in GDP in former Soviet republics and in Turkey over the period 1989-2016. Even though 1989 data is not totally comparable with the following years, the comparison is very telling. The share of foreign trade in GDP fell dramatically in the early 1990s and has not yet recovered to the old Soviet level. All former Soviet republics traded much more intensively in Soviet times – mostly among themselves. Today they trade mostly with other countries, but the relative size of this trade is way below the levels of trade reached during the era of the USSR.

**Table 3: Breakdown of trade flows for Central Asian republics and for Turkey as a percentage of GDP (domestic refers to trade between the Central Asian countries, plus Russia, while foreign trade refers to US+EU+China+ rest of the world)<sup>4</sup>**

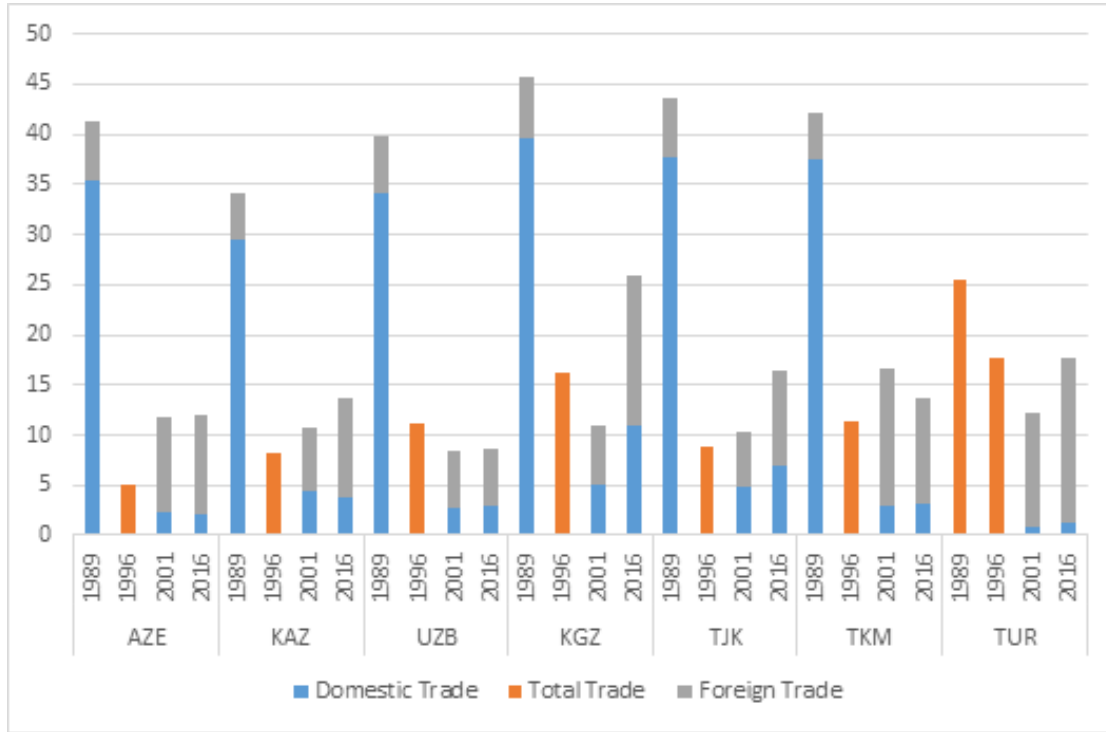
Country	1989		1996	2001		2016	
	domestic	foreign	Total	domestic	foreign	domestic	foreign
AZE	35.38	5.95	4.97	2.26	9.45	2.13	9.87
KAZ	29.48	4.69	8.26	4.41	6.42	3.74	9.91
KGZ	39.65	5.98	16.26	5.02	5.85	11.04	14.77
TJK	37.70	6.01	8.87	4.78	5.55	6.87	9.65
TKM	37.58	4.60	11.39	2.97	13.66	3.23	10.36
TUR	25.55		17.61	0.88	11.39	1.24	16.47
UZB	34.10	5.62	11.07	2.83	5.67	3.02	5.58

Note: AZE: Azerbaijan; KAZ: Kazakhstan; KGZ: Kyrgyzstan; TJK: Tajikistan; TKM: Turkmenistan; TUR: Turkey; UZB: Uzbekistan

Source: Commission of European Communities, 1990; WDI; COMTRADE.

<sup>4</sup> For 1989, domestic trade includes trade with other former Soviet republics as well (the three Baltic states, Belarus, Ukraine, Moldova, Georgia, and Armenia). For 2001 and 2016, domestic refers to trade between the Central Asian countries, including Turkey, plus Russia, while foreign trade refers to the US + the EU + China + the rest of the world.

**Figure 1: Trade as a percentage of PPP GDP**



Source: Commission of European Communities, 1990; WDI; authors' calculations.

### The model

We use the gravity model of international trade, which incorporates both economic potential and distance as determinants of trade flow. The model was first introduced to economics by Isard (1954). Among other factors, the economic size of trading partners and trade resistance are crucial determinants of trade flows. Geographical resistance between countries is used as a proxy for trade resistance, so the formula for trade flows between two countries,  $i$  and  $j$ , is as follows:

$$Trade\ Flow = \tau \frac{GDP_i^\alpha * GDP_j^\beta}{DIST_{ij}^\gamma}$$

Where  $GDP_i$  and  $GDP_j$  are Gross Domestic Product for countries  $i$  and  $j$ ;  $DIST_{ij}$  is the distance between the countries; and  $\alpha$ ,  $\beta$ ,  $\gamma$ , and  $\tau$  are parameters.

We make a very crude estimate by assuming all parameters are equal to 1 instead of estimating them from a regression equation. But this crude estimate is sufficient at this point to demonstrate the major discrepancies between predicted and actual trade patterns.

Very often a dummy variable is introduced into gravity models to account for common culture, language, and history; landlocked status; and memberships in trading blocs and the WTO. Some of these factors (culture and language) have been taken into account in augmented gravity models by various scholars (e.g., Filippini and Molini, 2003).

Landlocked status is an important consideration for Central Asian countries and Azerbaijan because all of them are landlocked. Conventional understandings of trade believe landlocked status harms development by reducing trade and the gravity model seems to confirm this opinion (see Carmignani, 2015). However, there is no evidence of a systematic relationship between landlocked status and the trade-to-GDP ratio. Switzerland and Austria are landlocked countries, but their trade-to-GDP ratios are very high. Carmignani explored the possibility that landlocked status might affect GDP independently. He suggested that landlocked status has a negative impact on GDP but that this impact is transmitted through institutions rather than through trade.

The results from the study by Ariekot (2017) show that landlocked countries are negatively affected by the time taken by importing. However, these delays are only associated with a 0.19% decrease in trade.

## **Data**

In order to compute predicted trade, we used GDP at Purchasing Power Parity (GDP PPP). GDP at PPP is a good representative of the economic condition of the country as it does not incorporate the impact of the exchange rate.

Data for distance between countries was taken from the CEPII, a French international economics research centre which produces research and data on the world economy; GDP data comes from the World Bank's World Development Indicators database; trade data was collected from the UN's COMTRADE database.

The distance used in this report is the distance between the capital cities of trade counterparts. However, in order to estimate a distance between these economies and the rest of the world, we divided the world into six major locations; South America (represented by Brasilia,

Brazil); Europe (represented by Berlin, Germany); Africa (represented by N'Djamena, Chad); Australia and Oceania (represented by Canberra); East Asia (represented by Tokyo, Japan); and South Asia (represented by New Delhi, India), took the distances of the respective Central Asian countries from these locations, and divided the sum of these distances by six. To estimate the distances between the countries of Central Asia – for interregional trade – we added up the distances between each pair of Central Asian countries and then divided by six.

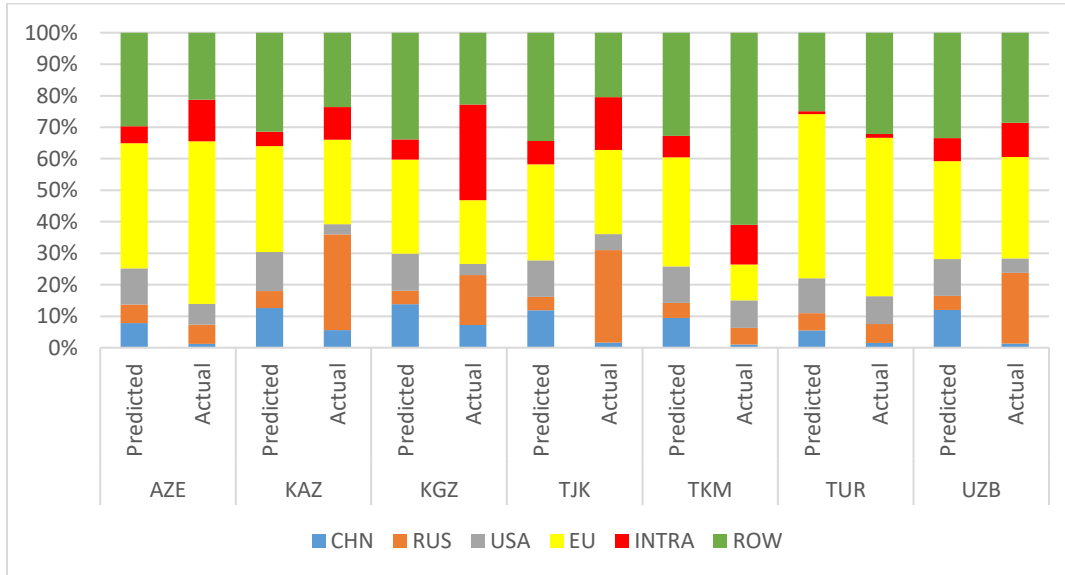
## **Trends**

Comparing trade flows in 2001 and in 2016 shows that the relative volume of trade as a percentage of GDP remained almost the same, but the magnitude of trade changed. Trade with China has increased considerably in 2016, compared to 2001, partially at the expense of trade with the EU and partially at the expense of the rest of the world. This is in line with the implications of the gravity concept. It is not just that the Chinese economy is now the largest in the world, but also the fact that it has been growing faster in recent decades than most other countries and regions.

Figure 2 depicts the predicted trade share vs actual trade share with different foreign trading partners for Turkey and Central Asian countries in 2001. It demonstrates that overall, Central Asian countries trade with Russia more than the gravity model predicts. This is also true with respect to trade between Central Asian countries themselves. Russia and Central Asian countries are considered to be ‘overtraded’ countries – where actual trade is higher than predicted – whereas China, the US, the EU, and the rest of the world are ‘under-traded’ regions for Central Asian countries. To be more precise, the EU was an under-traded region for all countries except for Azerbaijan and Uzbekistan. And the rest of the world trade also traded less than would have been predicted with all the countries of Central Asia except for Turkmenistan and Turkey.



**Figure 2: Predicted vs actual trade share with various regions as a percentage of total trade in 2001**



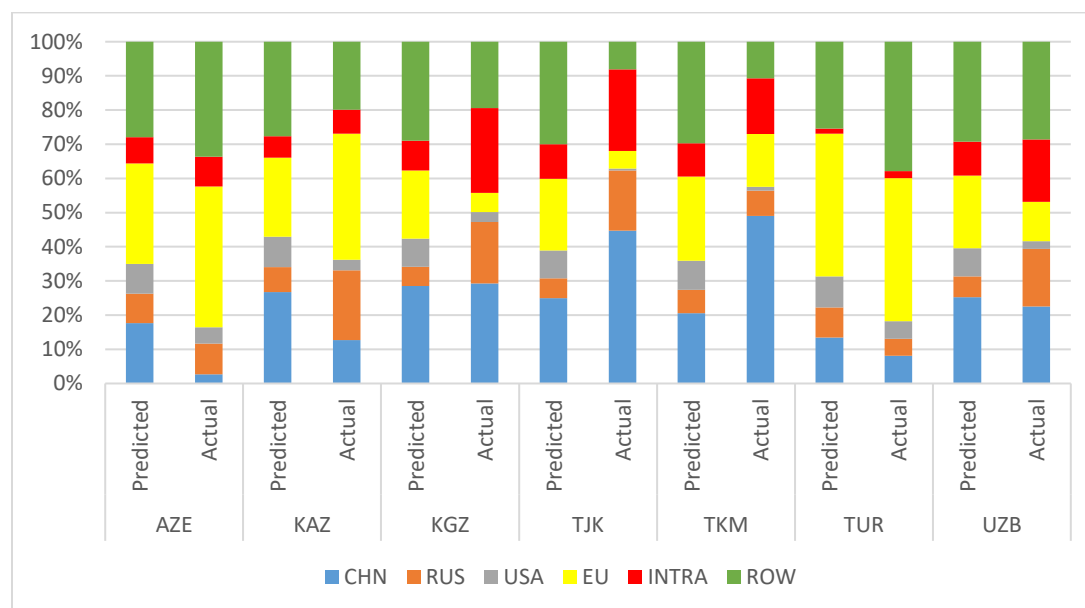
Overtraded countries: 2001	Under-traded countries: 2001
<i>Russia</i> <i>Intra-Trade</i>	<i>China</i> <i>US</i> <i>EU</i> <i>Rest of the world (ROW)</i>

Note: AZE: Azerbaijan; KAZ: Kazakhstan; KGZ: Kyrgyzstan; TJK: Tajikistan; TKM: Turkmenistan; TUR: Turkey; UZB: Uzbekistan

Source: COMTRADE, WDI, CEPII, authors' calculations.

Figure 3 presents predicted trade and actual trade for different regions as a percentage of total trade for 2016. Central Asian countries, except Turkey, traded with Russia more than the gravity model would have predicted. Intra-regional trade had a higher than predicted share of total trade for all countries. China traded less than the gravity model would have predicted with all countries except for Tajikistan and Turkmenistan; China's trade with Kyrgyzstan was virtually equal to the level predicted. Trade with the US was lower than predicted for all countries of Central Asia, and trade with the EU was below the level predicted for all countries except for two oil rich economies, Azerbaijan and Kazakhstan. Trade with the rest of the world was lower than predicted for most Central Asian countries except for Azerbaijan and Turkey.

**Figure 3: Predicted vs actual trade share with various regions as a percentage of total trade in 2016**



<i>Overtraded countries:</i> 2016	<i>Under-traded countries:</i> 2016
<i>Russia</i> <i>Intra-regional trade</i>	<i>China</i> <i>US</i> <i>EU</i> <i>Rest of the world (ROW)</i>

Source: COMTRADE, WDI, CEPPII, authors calculations.

The overall 2016 geographical trade structure was more in line with what the gravity model would have predicted than the 2001 structure, but Russia and Central Asia were still overtraded regions, whereas China, the EU, the US and the rest of the world were under-traded.

Trade with China increased considerably in 2016, compared to 2001, partially at the expense of trade with the EU and partially at the expense of trade with the rest of the world. This highlights the importance of China as a neighbouring country in the region and of the rapid growth of China’s GDP.

### Interpretation

The greater-than-predicted trade between Russia and Central Asian countries, and between Central Asian countries themselves, has a natural explanation: that these countries all belonged to

the former Soviet Union and still have some common socio-cultural features and a common language, which obviously facilitate trade.

In contrast, trade with the EU goes through Russia, creating customs-related problems in addition to the simple problem of remote distance. For trade with China, transportation facilities are scarce – roads and railways being hampered by difficult mountainous landscapes on one hand and a history of strained geopolitical relations between China and USSR since the late 1960s on the other hand. However, the new One Belt One Road (OBOR) initiative aims to improve trade connectivity between China and Central Asian countries. Central Asia is bound to become one of the major transportation routes for Chinese trade with Europe and Middle East.

An oil pipeline from Kazakhstan to China and a gas pipeline from Turkmenistan to China were recently completed. Khorgos Gateway, a dry port on the China-Kazakh border that is seen as a key cargo hub on the new Silk Road, began operations in August 2015. In December 2017, at the tripartite meeting between China, Uzbekistan, and Kyrgyzstan, decisions were taken on the Uzbekistan-Kyrgyzstan-China railway project. This project will shorten the route to China and provide access to the Middle East and to Europe through the Transcaucasian corridor.

The Mazar-e-Sharif–Herat railway, which is a continuation of the existing Hairatan–Mazar-e-Sharif rail line, connects Uzbekistan to Afghanistan. Based on expert estimates, a direct railway link between the Iranian port of Chabahar and Mazar-e-Sharif and Herat could increase foreign trade turnover by almost 50% in Afghanistan which is a neighbouring country to Central Asia.<sup>5</sup> By having access to the Iranian port of Chabahar, the railway will grant market access to India. In return, India will have access to Central Asia and the wider Eurasian region. Another railway development between the Iranian city of Khaf and Herat in Afghanistan is also expected to increase the volume of trade in the region.

## **Conclusions**

For all countries considered, the geographical structure of trade changes in the direction of the structure predicted by the gravity model: less trade with Russia and Europe; more trade with China and Rest of the world. But this process is happening faster for former Soviet republics rather than for Turkey. For some of these countries – Kyrgyzstan, Tajikistan, Turkmenistan – trade with

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<sup>5</sup> Zilola Karimova of the Center for International Relations Studies, Tashkent, a body affiliated to Uzbekistan's Ministry of Foreign Affairs, shares these statistics in *The Diplomat* (2018).

China was already close to one-third or over of total trade (between 29% and 49%) and was even higher than the predictions of the gravity model.

This is probably explained by the fact that former Soviet republics, after experiencing the collapse of trade with the former Soviet Union, were less and still are less involved in international trade than other countries of the same size and level of development. Their trade-to-GDP ratios are similar to that of Turkey (fig. 1), which is a much bigger economy, whereas smaller countries normally have higher ratios for external trade-to-GDP. Unlike Turkey, which is restructuring its trade by finding new partners in China instead of old partners in Europe, former Soviet republics are building up their foreign trade from scratch, and, like in many other cases, building anew turns out to be easier than restructuring. The external trade of former Soviet republics will likely continue to grow at an accelerated pace, predominantly due to the expansion of trade with China and Asia.

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