

Trade relations between China and Azerbaijan under the Belt and Road investment initiative: structure and factors

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Abstract

The chapter studies the current trends in dynamics, sectoral structure, and factors of China-Azerbaijan trade. First, a review of the relevant theoretical and empirical studies is provided. Quantitative analysis approach in the paper involves calculating the shares of structural components of trade-related activities and correlation with potential factors. Regression analysis is used to find both aggregate and sector-specific effects. The study concludes that China's exports to Azerbaijan consist mainly of machinery, vehicles, metal and textile products in exchange for imported liquid fuels, but there is still more potential for the bilateral trade development and product diversification. Chinese exports to Azerbaijan depend on the aggregate export dynamics of China to the rest of the world and on China's GDP. Chinese imports from Azerbaijan depend positively on economic freedom, while the effect of large Chinese investment and construction projects in Azerbaijan is mixed and depends on the time lag. Some sector-specific effects in the bilateral trade include also dependence on either real exchange rate or real interest rates.

Introduction

In the 21st century China became one of the most important international traders and investors worldwide following its growing role of a rising global economic power complementing the traditional global powers (the US and the EU). Its Belt and Road Initiative (BRI) is aimed to facilitate trade and investments in the majority of developing economies and several advanced economies. It resulted in further trade and outward foreign direct investments (OFDI) of China and its participation in construction projects abroad. It helped to develop new division of labor between China and developing countries, to fill the investment gap in many less developed economies, to diversify China's investment activities, to provide better access to resources and to enhance efficiency of trade routes.

The aim of this chapter is to determine structural trends in China-Azerbaijan trade within the context of investment cooperation under the Belt and Road initiative. The chapter starts by discussing the evolution of theoretical and empirical approaches to examine foreign trade and FDI flows followed by a review of empirical studies on the economic relations between China and Azerbaijan. Then a more recent trade, logistical and investment structure of the bilateral relations is assessed. The special section explains the applied methodology. The final section provides empirical results on several factors of trade flows between China and Azerbaijan within the framework of the correlation and regression analysis approach.

Theoretical literature review on international trade and investment.²⁹

Since the Belt and Road Initiative focuses on sustainable trade and investment links between China and the participating country, it is important to examine the relationship between trade and investment flows and the final results of such economic relations to set a new division of labor among the BRI countries.

Theories of international economics and international business examine the link of international trade and direct investment from different methodological positions.

For a long time, these studies were under the influence of economists, who, as a rule, looked at trade and investment flows between the countries on the macro level. In the theoretical aspect, foreign production and export activities of companies were seen as alternatives.

The political economy of international trade developed by Adam Smith and David Ricardo was based on the assumption that the productive factors are internationally immobile. John Stuart Mill was one of the first who recognized that capital is mobile internationally. He made a conclusion that import of capital may cause the expansion of foreign trade. FDI recipient countries can therefore change their trade specialization and increase exports.

Swedish economists Eli Heckscher and Bertil Ohlin developed the theory of factor proportions. The Heckscher-Ohlin theory shows that comparative advantages of a country are based on the available production factors – natural resources, labor and capital. The lack of capital or excess capital is seen as the cause of international capital flows (Davis, 1995; Baldwin, 2008). Heckscher noted that the international trade and international flows of capital in the long-term perspective will equalize the prices of production factors. Heckscher suggested that FDI flows should be determined by differences in factor endowments (Baldwin, 1979). R. Nurkse explained the export of capital by the difference in interest rates and considered it as an alternative to international trade (Nurkse, 1961).

Neoclassical economists believed that the theory of international trade could be successfully developed to analyze the activity of multinational enterprises and their capital flows into the host countries. They view trade and direct investment as substitutes for one another. In this case, investments are seen as a logical continuation or replacement of trading operations.

Current macroeconomic studies of direct investment primarily take neoclassical trade patterns as their starting point and extend them to explain the pattern of foreign production. It is not surprising that they most often focus their attention on the peculiarities of the place of growth and search for the reasons why firms of a given nationality are replaced by others, often more international in trade and production, etc (Moosa, 2002; Kaczmarczyk, 2023).

Theories of New economic geography (Krugman, 1998; Krugman, 2011), Fragmentation of international production (Jones et al., 2002) and Global value chains (Sturgeon, 2001; Gereffi, Humphrey & Sturgeon, 2005) highlight trends in international commodity exchange in the global economic environment. The focus of these approaches is on optimizing the geographic dispersion of trade and investment, clustering the activities of firms, and analyzing the economic distance between foreign countries. Global value chain theory also

²⁹ Some fragments of the review of theoretical literature were first published by the authors in the journal *Hong Kong Review of Belt and Road Studies*. 2024, issue 3(1). They are reproduced in this section with changes and additions with the permission of the editorial committee of the journal.

examines problems of strategic management of MNEs and location of their global production networks.

A number of macroeconomic theories suggest theoretical explanation of structural trends in foreign trade and FDI. Kojima (1985) tried to prove the hypothesis that countries benefit from the expansion of trade when FDI is exported from those industries of the host country in which it does not have a comparative advantage. Foreign direct investment should flow to those industries of the host country in which the latter has a comparative advantage. The purpose of this FDI is to achieve even greater production efficiency, as well as to reduce it in home country's industries without a comparative advantage. Kojima assumed that FDI outflow from "marginal industries," i.e., sectors that have lost their comparative advantage, would promote the export of capital goods and intermediate products to the host country. On the other hand, if FDI move from those industries where the investing country has comparative advantages, and at the same time there are no prospects for further development of these industries, then such FDI reduces international trade.

Kojima (1978) also believed that during industrialization and the formation of a more mature structure of the economy of the capital exporting country, its sectoral priorities in the FDI outflows will also change. At the initial stages of this process, FDI are mostly flows to labor-intensive projects with standard technology. But later in the certain stage of industrialization FDI increasingly target on capital-intensive industries. The transfer of entrepreneurial capital will contribute to the better realization of the comparative advantages of both countries. Such positive effect increases in the case when the home country has sufficient capacity to produce new goods in industries in which it continues to hold a comparative advantage, and has the capacity to fully utilize the resources freed up by reduced production in industries without a comparative advantage (Kojima, 2000; Ozawa, 2009).

The Kojima's theoretical model of mutual complementarity is the opposite to the Mundell's model of substitution. R. Mundell applied his model to analyze capital movement caused by existence of tariffs. In that model capital movement takes place from a country with excess of capital to a country with capital deficit. The Mundell's model shows trade substitution by FDI (Kojima, 1975).

Unlike the Mundell's model, Kojima's complementarity model proves that as a result of MNE investment, production in a host country shifts to a situation when it grows in least capital intensive industries (where a country has comparative advantages) and it decreases in more capital intensive industries (where a country has no comparative advantages). This stimulates trade growth. Thus, the Kojima's model shows complementarity of FDI and trade instead of their substitution.

Empirical literature review on foreign trade factors.

Despite popularity of gravity models for international trade research, they are less suitable for studying the drivers of bilateral trade as distance remain constant when time series are analyzed. In this case alternative analytical tools can be used.

One of the options is breaking export growth down into several partial effects. *Constant market share (CMS) model* distinguishes up to 4 effects:

- Market size effect (demand effect) means that total imports in an importing economy increase (or more exactly import growth of importing country multiplied by exports of exporting country in the base period).
- A positive product structure effect means that an exporter shifts from selling less popular products towards supplying more products with faster demand growth.
- A positive market structure effect envisages that an exporter increases the share of exports to fast growing markets.
- Competitiveness effect is positive if the change in exports of a product by exporter to importer is larger than growth rate in importing economy of the product multiplied by the value of exports of the product in the base year.

In particular, Wang (2015) demonstrated with CMS model that the major factor of vegetable exports of China to ASEAN was competitiveness effect (90%). Cao et al. (2018) used the case of China's wood forest products export growth to show that the market effect and competitiveness effect were larger than product and market structure effects. Xiuqin et al. (2023) used CMS model for exports of China to Japan and South Korea.

Daruich et al. (2016) decomposed export growth into 6 components:

- “(1) comparative advantage (source-by-product effects),
- (2) bilateral trade (source-by-destination effects),
- (3) global product growth (product effects),
- (4) overall destination demand growth (destination effects),
- (5) product-specific destination demand growth (destination-by-product effects), and
- (6) a residual”.

In their sample of 100 countries in 1998-2010 comparative advantage accounted for only 20% of the variance and bilateral forces for less than 20%. Also advanced economies tended to be less dependent on comparative advantage and bilateral ties. The external forces (effects 3-5) played a somewhat larger role than internal ones in exporting country. This limits ability to implement efficient industrial policies, therefore overall improving ease of doing business and letting the business decide what to export and where may be a better policy option.

Alternative tools included in particular:

- general equilibrium model (Brandt & Lim, 2020);
- panel-corrected standard error (PCSE) estimation method and Gaussian process regression (GPR) machine-learning model (Shetewy et al., 2022);
- generalized method of moments (GMM-IV) technique for panel data (Dua & Suri, 2023);
- OLS panel corrected standard errors model based on input-output tables (Herrero & Rial, 2023);
- four-factor regression export growth model after solving the equations where in a domestic economy and rest of the world economy households' utility function includes leisure, domestic and imported manufactured goods (In et al., 1998);
- 2 factor vector error correction model (Hasanov, 2010);
- autoregressive distributed lag (ARDL) bounds testing procedure (Srinivasan & Kalaivani, 2013);
- panel regression model with factor augmented modification (Agur, 2016).

Like in CMS models *foreign demand* was included in many other types of models. In et al. (1998) noted world income as a significant factor for exports of 4 newly industrialized economies in Asia (Hong Kong, Korea, Singapore and Taiwan). Brandt & Lim (2020) wrote that in 2000-2007 one of the most important drivers for Chinese export growth was foreign demand (it contributed +9.5 pp annually). According to Srinivasan & Kalaivani (2013), foreign economic activity of importing countries (proxied by world GDP) affected Indian real exports in 1970-2011 negatively in the short run and positively in the long run. Herrero & Rial (2023) concluded that global demand is the main driver of exports of 4 South European countries and Germany (especially in Greece and Portugal).

Exchange rate as a price competitiveness indicator is another popular factor to consider. In theory real devaluation stimulates exports by larger income in domestic currency after conversion of returns in foreign currency especially when foreign inflation increases selling prices abroad and there is a domestic deflation decreasing the price of domestic inputs (raw materials, components, fixed assets and possibly labor). Real appreciation vice versa curbs exports and stimulates imports.

As for empirical evidence, export growth in the 4 newly industrialized economies in Asia was mainly influenced by exchange rates (In et al., 1998). According to Dua & Suri (2023), India's exports to 6 advanced and 6 developing economies in 2005-2019 depended on growth in real exchange rates. Srinivasan & Kalaivani (2013) calculated that the effect of real exchange rates (based on the nominal exchange rate and consumer price index of the US and India) for Indian real exports in 1970-2011 was mixed (negative from devaluation in the short run and positive in the long run). Agur (2016) proved almost the strongest effect of relative price variable (export to domestic prices ratio), which is directly linked to exchange rate of the Canadian dollar, on Canadian provinces' manufacturing exports (the elasticity was 2.1-2.4). In case of Azerbaijan, Hasanov (2010) estimated that the real exchange rate of manat negatively affected non-oil exports of Azerbaijan (the elasticity was -1.63, i.e. 1% increase in the rate leads to 1.63% decrease in the exports) in the long run and in a shorter run. Thus, manat appreciation due to influx of petrodollars may curb non-oil exports (causing substitution effect between oil and non-oil exports).

Besides the direct effect of the real exchange rate, its volatility may also affect trade because of uncertainty and unexpected redistribution of wealth between the parties. In the study by Srinivasan & Kalaivani (2013), Indian exports were negatively related to exchange rate volatility (calculated through moving average standard deviation, MASD) in the short-run and long-run. Dua & Suri (2023) further agreed that real exchange rate volatility negatively affected Indian exports to developing economies, but had no significant effect on its exports to advanced economies.

GDP of an exporting economy was as a significant factor of exports from Chinese provinces in 2000-2018 (Shetewy et al., (2022). Real non-oil GDP (excluding non-oil exports too to avoid endogeneity) affected positively non-oil exports of Azerbaijan. The elasticity was 0.49 in the short and 1.46 in the long run (Hasanov, 2010). But the influence of GDP effect can be divided into supply and demand effects. E.g., India's exports positively depended on domestic income and negatively on domestic demand (Dua & Suri, 2023). Moreover, the magnitude of the effect may change in time. Real GDP insignificantly influenced Indian real exports in the short run and positively in the long run (Srinivasan & Kalaivani, 2013).

As for *other factors*, In et al. (1998) also noted export prices and world export prices, but their effect varied substantially among the 4 Asian economies. Dua & Suri (2023) concluded that the exports of India positively depended on infrastructure.

Agur (2016) proved a significant effect of a number of factors on Canadian provinces' manufacturing exports. They included a positive influence of labor productivity (elasticity 1.9-2.2), jointly physical capital stock (0.9-1.0) and vocational training (0-0.2), R&D expenditure (0,3-0,4), inward FDI (0,2), as well as a smaller effect of population density and foreign imports to GDP ratio. There was also a negative impact of real wages (-1.2 – -1.4), energy share of GDP, interprovincial imports to GDP ratio and unionization. Several more variables had either no or non-robust effect: government investment, female participation, tertiary education, corporate tax ratio, migrant inflows, unemployment, and unemployment benefits. As for sectoral breakdown, automotive industry and wood products were supply constrained due to high capacity utilization, while manufacturing of metal products, industrial machinery, plastic and rubber products, aircraft and parts, and computer and electronic products were rather international demand constrained industries. In a review of the findings from Bank of Canada staff analytical work published by Brouillette (2018), the reasons of weakness of Canadian non-energy exports in 2002-2017 included limitations in physical capacity, shortages of skilled labor, transportation bottlenecks, environmental and regulatory changes.

Brandt & Lim (2020) wrote that in 2000-2007 other important drivers for Chinese export growth were productivity (5.4 pp annually in 2004-2007), imported input access (even 13.0 pp before 2004 – it depended on competitors prices and transportation costs after controlling for export prices), firm entry (3.0 pp before 2004), employment growth (1.6 pp in 2000-2007). The estimated market access was the highest in Asia and the lowest one in Western Europe. The highest market access was for metals, textiles, leather and furs, and the lowest one was for chemicals. The negative factors included harder foreign competition in Chinese export markets (-3.4 ppa) and declining investment efficiencies. After 2007 external factors of export growth became relatively more important than internal ones. In the study by Shetewy et al. (2022), export growth in Chinese provinces positively depended on internet use especially in high-middle developed provinces. But financial development level's effect was insignificant according to PCSE. The GPR model treated population, internet use, and financial development as important factors of export growth.

Herrero & Rial (2023) mentioned that in the 5 European economies the effect of labor costs (through relative prices) on export growth was negligible as a drop by 1 pp in the costs decreased export prices by only 0.02-0.23 pp. Instead, stronger linkages between knowledge-intensive business services (KIBS) and manufacturing turned out to be an important factor contributing to export growth by more than 1 pp.

Thus, it is logical that further regression models of the bilateral trade growth should include at least real exchange rates, prices, economic growth, competitiveness, demand, investments and possibly other available indicators.

Literature review on China-Azerbaijan economic relations.

Currently there are only few studies specifically focused on the bilateral economic relations between China and Azerbaijan.

In particular, Nahmadova (2021) estimated with a partial general equilibrium model that China's tariff reduction for Azerbaijani exports under a scenario of Azerbaijan's accession to WTO may increase the trade by 80% (China didn't apply most favored nation tariffs for WTO non-members, which limits access of Azerbaijan to its market). The trade creation effect may be the largest for Azerbaijan's exports of fuels (+US\$332 million) and plastics (+US\$29 million). These two product categories will constitute 99% of the effect. Meanwhile China's revenue from tariffs may drop by US\$87 million.

Hovhanesian & Manasyan (2014) assessed the potential for free trade agreements between China and South Caucasian states (by comparing trade creation, trade diversion, welfare and revenue effects for individual product groups). China may enhance its economic and political influence in the region as the Caucasian states were weakly depended on China at the time of the study, despite its role as a global powers. The authors recommended Azerbaijan deepen cooperation in the oil and gas sector and to promote Azerbaijani carpets in the Chinese market.

Babayev & Ismailzade (2020) described opportunities for China provided by Azerbaijan within the Belt and Road Initiative (a reliable partner and a transportation hub on the way from the Caspian Sea to the West) and discussed opportunities provided by establishing Trans-Caspian International Transport Route (TITR) for logistical improvements and foreign direct investments from China.

Liu & Suk (2021) applied SWOT analysis for strategy development in sustainable tourism between Azerbaijan and China. E.g., the strengths include complementary cultural and natural resources in both countries, which meet the needs of tourists for diversification of destinations. Meanwhile weaknesses also exist, e.g. uneven development of various types of tourism and relatively less developed tourism infrastructure services in Azerbaijan (such as air transport and hotels).

Schuhbert & Thees (2020) looked at the Belt and Road initiative through the perspective of opportunities for realigning GDP growth from Baku Area further to the regions of Azerbaijan, smoothing regional economic inequalities, trade optimization and cultural relations.

A relative lack of previous study provides a reason for further research of the bilateral trade links between China and Azerbaijan, their structure and factors with disaggregation by the main tradable products.

Trade, logistical and investment structure. China's exports to Azerbaijan are well-diversified with the dominance of machinery and vehicles (table 1). In particular, the main product group (electronic and electrical appliances) constitutes $\frac{1}{4}$ of the exports. Metal and textile products are also important exporting items. Azerbaijan's exports to China are predominantly fuel exports, with ores and chemical products being other substantial components. The values reveal a lack of product diversification. E.g., in a study by Daruich et al. (2016) the largest export category in 100 economies on average constitutes only 25% of exports and, top 20% categories account for 70% exports. Therefore, the bilateral trade is almost completely inter-industry. Food and beverages account for a very small component of the bilateral trade for both countries.

Table 1: Product structure of the bilateral trade between China (mainland) and Azerbaijan, 2022

	China's exports to Azerbaijan		China's imports from Azerbaijan	
	US\$ million	%	US\$ million	%
Total merchandise trade	1136	100	246	100
Food	13	1.1	1	0.4
Textile fibres, yarn, fabrics and clothing	99	8.7	0.2	0.1
Petroleum, petroleum products and related materials	26	2.3	177	72.0
Chemical products	60	5.3	38	15.4
Ores	0.0	0.0	27	11.0
Metals and manufactures of metal	142	12.5	1	0.4
Power generating, specialized and other industrial machinery	194	17.1	0.0	0.0
Electronic and electric appliances	278	24.5	0.0	0.0
Road vehicles	102	9.0	0.0	0.0

Source: UNCTAD (2024a).

As for logistical structure of the bilateral trade (table 2), most of the Chinese goods are transported to Azerbaijan via road, air and railway transport with only minor contribution of sea transport as Azerbaijan has no direct access to either oceans or seas. The share of air transport is unusually high (usually this type of transport is the most expensive one). Sea, other modes (largely pipelines) and railway are the most important for Azerbaijan's exports to China.

Table 2: Structure of the bilateral trade between China (mainland) and Azerbaijan by mode of transport, 2021

	China's exports to Azerbaijan		China's imports from Azerbaijan	
	US\$ million	%	US\$ million	%
All modes	1498	100	196	100
Air	453	30	2	1
Sea	223	15	70	36
Railway	358	24	43	22
Road	684	46	21	11
Other modes	67	5	61	31
Multimodal adjustment	-287	-19	-1	-1

Source: UNCTAD (2024b).

According to International Trade Centre (2025), actual exports of electric machinery from China to Azerbaijan are 52% of their potential (unrealized potential is estimated to be US\$330 million), electronic equipment 49% (+US\$336 million), motor vehicles and parts 61% (+US\$87 million), metal products 50% (+US\$77 million), ferrous metals 49% (+US\$71 million), chemicals 29% (+US\$71 million) etc. In contrast, exports of flat products of iron/steel, photosensitive semiconductor devices and rubber tires are above their potential level.

Actual exports of fruits from Azerbaijan to China are 0% of their potential (unrealized potential is US\$10 million), precious metals 0% (+US\$9 million), plastics and rubber 57% (+US\$6 million), other chemicals 7% (US\$8 million) etc. Exports of polyethylene are above their potential level. The data for fuels was not provided.

The statistical data on the bilateral investment cooperation and especially on services trade seems to be incomplete. China Global Investment Tracker provides the data on major construction and investment deals larger US\$100 million (The American Enterprise Institute & The Heritage Foundation, 2023):

- Sinomach – US\$210 million construction project in gas industry in 2007;
- Sinoma – US\$440 million in construction sector in 2008;
- China National Building Material – \$100 million in construction sector in 2011;
- Sinomach / China CAMC Engineering Co. – US\$1170 million in steel industry in 2018;
- China National Machinery Industry (Sinomach) – US\$270 million investment in autotransport industry in 2019.

Meanwhile, according to the IMF, inward investment in Azerbaijan from China, was US\$210 million before 2024 (International Monetary Fund, 2024a).

Dependent and independent variables.

The available annual data for analysis of the factors of the bilateral merchandise trade between China (mainland) and Azerbaijan are for 1996-2022. We analyzed several dependent variables, which are indicators of bilateral trade in all or main traded products. Growth rates are considered in a form of the change in ratio of the relevant exports or imports according to UNCTAD (2024a) (multiplied by 1000000 to adjust for smaller magnitude of values) to the GDP of China (large economy) taken from WorldBank (2024). Alternative measures would have more drawbacks. Using ordinary growth rates relative to the previous years value of exports or imports would lead to a substantial number of outliers as a result of the base effect. Using a ratio to Azerbaijan's GDP would lead to the problem of endogeneity considering larger dependence of relatively small economies on foreign trade.

The dependent variables are (in 2022 the analyzed groups of products under sectoral break-down constituted 72% of the bilateral export of China to Azerbaijan and 98% of the bilateral imports):

- Exp – growth of China's exports to Azerbaijan, total all products;
- ExpText – the same indicator, but for the product group Textile fibres, yarn, fabrics and clothing (SITC 26+65+84);

- ExpMet – the same for Iron and steel, Non-ferrous metals, Manufactures of metal, n.e.s. (SITC 67+68+69);
- ExpMach – the same for Machinery and transport equipment (SITC 7);
- ExpInd – the same for Other industrial machinery and parts, specialised machinery, as well as Power generating machinery and equipment, Metal working machinery (SITC 71+72+73+74);
- ExpElec – the same for Electrical machinery, apparatus and appliances, n.e.s., Telecommunication and sound recording apparatus, office machines and automatic data processing machines (SITC 75+76+77);
- ExpRoad – the same for Azerbaijan, Road vehicles (SITC 78);
- Imp – growth of China's imports from Azerbaijan, total all products;
- ImpOre – the same for Ores and metals (SITC 27 + 28 + 68);
- ImpOil – the same for Fuels (SITC 3), in particular Petroleum, petroleum products and related materials;
- ImpChem – the same for Chemical products (SITC 5), which is mostly plastics in primary form.

The first group of independent variables includes trade with the entire world (to consider overall export competitiveness of a country and overall demand in a country for imported goods). The growth rates are considered in a form of the change in ratio of the relevant exports or imports (UNCTAD, 2024a) multiplied by 1000 to China's GDP taken from WorldBank (2024). The factors are (additional sectoral break-down is also envisaged, so that the same product group only is considered as the product group in a dependent variable):

- ChExpW – growth of China's exports to the world;
- ChImpW – growth of China's imports from the world;
- AzExpW – growth of Azerbaijan's exports to the world;
- AzImpW – growth of Azerbaijan's imports from the world.

Business cycle factors are taken from World Bank (2024) (it is also an alternative way to consider growth of export capacities and demand):

- GDPCh – GDP growth in China, real, %;
- GDPAz – GDP growth in Azerbaijan, real, %;
- GDPndCh – GDP growth in China, nominal in US\$, %;
- GDPndAz – GDP growth in Azerbaijan, nominal in US\$, %.

Price competitiveness factors include:

- RER – growth of real exchange rate of Chinese renminbi to Azerbaijani manat (calculated based on official exchange rates, local currency units per US\$, and inflation based on consumer prices), %;
- RIRCh – real interest rate in China, % (interest rates show costs of borrowing money for domestic financing purchases of imported goods and for developing export capacities);
- RIRAz – real interest rate in Azerbaijan, % (World Bank, 2024);

- OilPr – growth of Crude oil (petroleum) simple average of three spot prices; Dated Brent, West Texas Intermediate, and the Dubai Fateh, % – it is assumed to affect trade in petroleum and petroleum products;
- MetPr – growth of Commodity metals price index based on Copper, Aluminum, Iron Ore, Tin, Nickel, Zinc, Lead, and Uranium Price Indices, % (International Monetary Fund, 2024b) – it is assumed to affect trade in ores, metals and metal products.

Bilateral financial relations variables are ($t-1$ index is added if an indicator is with 1 year lag, $t-2$ for 2 year lag; analysis of these group of factors is complicated by smaller period of available data – since 2005 and 2009 respectively):

- InvCon – large investment and construction deals involving China's financing for Azerbaijan (The American Enterprise Institute & The Heritage Foundation, 2023; World Bank, 2024) divided by GDP of Azerbaijan from WorldBank (2024), %;
- InvCDIS – inward investment in Azerbaijan from China, also in % GDP of Azerbaijan (International Monetary Fund, 2024a; World Bank, 2024).

Economic freedom factors are (publication lag is also considered, e.g. score for 2024 in their report of Heritage Foundation (2023) is based on the data between the 2nd half of 2022 and 1st half of 2023):

- EFCh – change in overall economic freedom index in China, pp (i.e. change in 0-100 scale score);
- EFAz – change in overall economic freedom index in Azerbaijan, pp;
- TFCh – change in trade freedom index in China, pp (considers trade-weighted average tariff rate and qualitative evaluation of nontariff barriers);
- TFAz – change in trade freedom index in Azerbaijan, pp;
- IFCh – change in investment freedom index in China, pp;
- IFAz – change in investment freedom index in Azerbaijan, pp.

Correlation analysis (see tables 3 and 4) shows a number of potential factors affecting the bilateral trade between China and Azerbaijan. Correlation analysis is done with Pearson correlation coefficients, but robustness check with Spearman correlation is also provided as there may be deviations from normal distribution in case of some variables.

According to this primary analysis, the total multilateral exports or imports of the products are relevant as factors for some Chinese exports to Azerbaijan, but they are irrelevant for the bilateral imports from Azerbaijan. Business cycle and real interest rates are also more important for the trends in Chinese exports to Azerbaijan than vice versa. On the other hand, bilateral investment relations and overall economic freedom may be more influential for Chinese imports from Azerbaijan. With a few exceptions real exchange rate and trade freedom are not significant factors of the bilateral trade. Contrary to theoretical assumptions, commodity prices are not significant factors for the bilateral trade in the relevant products (petroleum and metals).

Table 3: Correlation analysis of the exports of China to Azerbaijan and its factors

	Exp	ExpText	ExpMet	ExpMach	ExpInd	ExpElec	ExpRoad
ChExpW	0.48**/0.46**	0.42**/0.37*	0.21/0.14	-0.09/-0.07	-0.32/0.03	0.07/0.12	0.35/0.27
AzImpW	0.29/0.14	0.10/0.08	0.04/0.03	0.15/0.20	-0.21/-0.27	0.25/0.46**	0.56**/0.47**
GDPCh	0.20/0.35*	0.18/0.32	0.07/0.14	0.08/0.18	0.08/-0.01	0.02/0.13	0.03/0.08
GDPAz	0.32*/0.44**	0.27/0.51**	0.02/0.15	0.19/0.25	0.16/0.17	0.30/0.18	-0.04/0.02
GDPndCh	0.38*/0.56**	0.29/0.46**	0.22/0.29	0.21/0.39*	-0.01/0.09	0.44**/0.37*	0.37/0.35
GDPndAz	0.13/0.31	0.08/0.11	0.26/0.32	0.07/0.30	-0.08/-0.03	0.13/0.19	0.35/0.40*
RER	-0.22/-0.32*	-0.10/-0.35*	-0.13/-0.18	-0.26/-0.37*	-0.08/-0.14	-0.52**/-0.49**	-0.25/-0.11
RIRCh	-0.36*/-0.44**	-0.35*/-0.24	-0.27/-0.23	-0.03/-0.38*	0.21/-0.15	-0.21/-0.36*	-0.52**/-0.46**
RIRAz	-0.09/-0.34*	-0.09/-0.13	-0.35*/-0.40*	0.04/-0.30	0.26/0.09	-0.22/-0.34*	-0.51**/-0.44*
OilPr	0.30/0.42**	0.22/0.22	0.35*/0.27	0.08/0.28	-0.15/-0.03	0.36*/0.41**	0.47**/0.48**
MetPr	0.29/0.40**	0.35*/0.34*	0.31/0.22	-0.07/0.08	-0.21/-0.02	0.25/0.29	0.13/0.09
InvCon	0.16/0.12	0.08/0.22	0.08/0.15	0.13/0.20	0.08/0.06	0.11/0.05	0.14/0.28
InvCont-1	-0.00/-0.05	-0.14/-0.04	0.01/0.22	0.18/0.33	0.18/0.21	0.22/0.32	-0.03/0.12

IncCon _{t-2}	0.10/-0.03	0.13/0.08	0.18/0.20	-0.06/-0.26	-0.08/-0.21	0.13/0.09	-0.09/-0.29
InvCDIS	0.23/0.15	0.22/0.46*	0.06/0.20	0.03/0.08	0.08/0.27	-0.03/0.15	-0.07/-0.16
EFCh	-0.09/-0.18	0.04/-0.11	-0.29/0.07	-0.15/-0.29	-0.10/-0.02	-0.21/-0.44**	-0.07/-0.09
EFaz	-0.10/-0.14	0.02/0.09	-0.27/-0.10	-0.09/-0.27	-0.06/-0.01	-0.07/-0.25	-0.10/-0.15
TFCh	0.13/0.03	0.04/0.09	0.08/0.07	0.02/-0.01	-0.01/0.09	0.17/-0.12	-0.05/0.12
TFaz	0.03/0.18	0.05/0.17	-0.02/0.03	-0.02/0.24	-0.07/0.02	0.14/0.22	0.04/0.10
IFCh	0.16/0.14	0.26/0.08	0.29/0.30	-0.25/-0.17	-0.30/-0.27	-0.05/-0.12	0.01/-0.12
IFaz	-0.27/-0.16	-0.38*/-0.13	-0.14/-0.02	0.18/0.05	0.30/0.01	0.27/0.19	-0.47**/-0.42*
EFCh _{t-1}	-0.12/-0.30	-0.09/-0.14	-0.18/-0.30	-0.09/-0.19	-0.05/-0.31	-0.05/0.21	-0.11/-0.12
EFaz _{t-1}	-0.01/-0.19	0.01/0.02	-0.08/-0.20	-0.08/-0.21	0.01/-0.08	-0.16/-0.08	-0.19/-0.27
TFCh _{t-1}	0.25/0.26	0.31/0.44**	-0.16/-0.11	0.12/0.06	0.09/0.18	0.26/0.13	-0.01/-0.25
TFaz _{t-1}	0.20/0.17	0.26/0.26	-0.22/-0.08	0.00/0.15	0.03/0.12	-0.07/-0.05	-0.02/0.10
IFCh _{t-1}	-0.15/-0.20	-0.23/-0.31	-0.36*/-0.46**	0.15/0.10	0.13/0.11	0.05/0.08	0.17/0.24
IFaz _{t-1}	0.13/-0.02	0.29/0.16	0.31/0.04	-0.29/-0.33*	-0.31/-0.24	-0.21/-0.26	0.01/0.02

Note: in tables 3-4 Person and Spearman correlations are separated with a slash (/).

** denotes significant correlations at $p < 0.05$, * – marginally significant correlations at $p < 0.1$.

Table 4: Correlation analysis of China's imports from Azerbaijan and its factors.

	Imp	ImpOM	ImpOil	ImpChem
AzExpW	-0.02/-0.04	0.27/0.28	-0.06/-0.14	0.29/0.22
ChImpW	-0.02/-0.05	0.06/0.11	-0.09/0.07	0.19/0.18
GDPCh	-0.04/-0.09	-0.13/-0.20	-0.11/-0.15	0.15/0.19
GDPAz	-0.12/-0.04	-0.12/-0.08	-0.22/-0.26	0.14/0.17
GDPndCh	-0.09/-0.15	0.07/0.08	-0.30/-0.17	0.26/0.13
GDPndAz	-0.13/-0.18	-0.00/-0.12	-0.49*/-0.36	0.28/0.17
RER	0.02/0.03	-0.19/-0.26	0.13/-0.06	-0.29/-0.11
RIRCh	-0.07/-0.13	-0.09/-0.23	0.05/-0.14	-0.01/0.15
RIRAz	0.00/-0.03	-0.12/-0.07	0.23/-0.01	-0.10/-0.02
OilPr	-0.13/-0.03	0.25/0.39	-0.37/-0.14	0.28/0.21
MetPr	-0.24/-0.13	-0.07/0.07	-0.36/-0.22	0.05/0.12
InvCon	-0.05/0.20	-0.04/0.06	-0.18/0.10	0.01/0.22
InvCon _{t-1}	0.54**/0.33	0.13/0.17	0.52*/0.19	0.03/0.09
IncCon _{t-2}	-0.39/-0.55**	0.01/0.06	-0.40/-0.62**	0.03/0.27
InvCDIS	0.07/0.07	-0.16/0.14	0.14/0.03	-0.54**/-0.46*
EFCh	0.49**/0.12	-0.15/-0.40	0.71**/0.50*	-0.18/-0.23
EFAz	0.51**/0.15	-0.19/-0.37	0.76**/0.29	-0.15/-0.35
TFCh	-0.18/-0.09	0.33/0.00	-0.24/-0.05	0.32/-0.09
TFAz	0.04/0.06	-0.02/0.01	0.26/0.39	0.28/0.23
IFCh	-0.23/-0.39**	-0.27/-0.34	-0.35/-0.32	-0.18/-0.14
IFAz	0.15/-0.04	0.20/0.13	0.04/-0.23	0.05/0.12
EFCh _{t-1}	0.12/0.16	0.05/0.33	0.11/0.19	0.19/0.50**
EFAz _{t-1}	-0.11/0.02	0.04/0.29	-0.08/-0.06	0.21/0.48**
TFCh _{t-1}	0.14/0.21	-0.18/-0.11	0.38/0.30	-0.11/-0.05
TFAz _{t-1}	0.11/-0.09	-0.25/-0.34	0.56**/0.10	-0.16/-0.03
IFCh _{t-1}	0.10/0.23	0.35/0.29	0.09/0.22	0.12/0.13
IFAz _{t-1}	-0.19/-0.08	-0.15/-0.02	-0.05/0.00	0.02/0.16

Within **regression analysis** OLS method is used for unweighted cases and then robustness is checked by using weighted cases, where more recent years receive higher weight (e.g., 1997 is assigned weight 7 and 2022 – weight 32). Significant under weighted cases are not estimated as the number of cases is artificially inflated.

According to regression analysis results (see tables 5-7), Chinese total exports to Azerbaijan depend positively on general competitiveness of Chinese exports worldwide. China's nominal GDP growth in dollars (positively) and the real interest rate in China (negatively) significantly influence bilateral exports only when they are considered separately and when the outliers (extraordinary fast growth of Chinese exports to Azerbaijan in 2002-2003) are disregarded. When the outliers are left in the sample the two effects are marginally significant. GDP growth is a proxy for export capacity, and high interest rates may curb export financing.

Table 5: Regression models for China's exports to Azerbaijan

Y	ExpAz	ExpAz	ExpAz	ExpAz	ExpAz	ExpAz	ExpText	ExpText	ExpMet	ExpMet
b₀	2.33/ 1.41 (4.4)	5.37 (3.4)	-4.40 (5.6)	-9.35 (4.4)	9.57/ 6.90 (6.3)	4.87 (5.0)	3.04/ 2.45 (3.8)	4.91 (3.6)	0.87/ 1.03 (0.55)	0.77 (0.49)
b_{ChExpW}	0.49/ 0.53 (0.18)**	0.69 (0.14)***								
b_{ChExpW} (Text)							2.28/ 2.88 (1.0)**	2.55 (0.9)**		
b_{GDPndCh}			0.42 (0.20)*	0.45 (0.15)***						
b_{RIRch}					-0.71/ -0.68 (0.38)*	-0.72 (0.29)**				
b_{RIRAz}									-0.32/ -0.38 (0.17)*	-0.36 (0.15)**
b_{IFChI-1}									-0.14/ -0.16 (0.07)*	-0.15 (0.06)**
R²	0.23** /0.27	0.49***	0.14 /0.18*	0.27***	0.13* /0.16	0.22**	0.17** /0.22	0.24**	0.26** /0.28	0.35**
N	27	26/2004	27	25/2002, 2003	27	25/2002, 2003	27	26/2004	24	23/2012

Notes. In tables 5-7 the coefficients for unweighted and weighted cases are separated with a slash (/). The significance according to t-and F-test is mentioned for unweighted cases:

*** at $p < 0.01$, ** at $p < 0.05$, * at $p < 0.01$. Standard errors are in brackets. The last row contains the number of years, as well as outlier years after a slash (/), when they are excluded from a sample.

China's exports of textile products to Azerbaijan positively depends on general competitiveness of Chinese exports worldwide, i.e. they are rather supply-driven. China's exports of metals to Azerbaijan negatively depend on the high real interest rate in Azerbaijan limiting demand for imports and on improvement of investment freedom in China. The latter is counterintuitive (on the other hand, the shorter-term effect is insignificantly positive according to the correlation). No significant factors were found for the bilateral exports of Chinese machinery in general and industrial machinery in particular. Chinese exports of electronic and electric appliances to Azerbaijan are dependent either on price competitiveness (negative effect when real exchange rate of renminbi increases) or China's nominal GDP (export capacities).

China's exports of road vehicles to Azerbaijan may positively depend on total import demand in Azerbaijan for foreign vehicles (i.e. they are demand-driven) or negatively on real interest rates in both countries. But the shorter time series in case of road vehicles make the results less reliable. The effects are significant only in one-factor models. It is also possible to create models with significant positive effect of oil prices and negative effect of investment freedom in Azerbaijan particularly for the exports of road vehicles, but they are less substantiated with theory and may be a result either of spurious correlations or substantial correlations with the interest rate in China (-0.76 and 0.61).

China's total imports from Azerbaijan depend on economic freedom in either China or Azerbaijan or in both. These factors are too strongly correlated with each other (0.72) to tell which one of them is more important. The coefficients vary between 2.5 and 3.7 and are very significant in all model specifications, under weighted and unweighted OLS method and regardless whether outliers are in the sample. Adding the factor of investment or construction projects financed by China in Azerbaijan leads to a smaller sample, because the data has only been available since 2005. . The short-term effect (with 1 year lag) on the imports is positive, while a longer-term effect (2 year lag) is a negative one. The total effect seems to be closer to a neutral one.

The imports of petroleum and related products constitutes the main part of the total imports by China from Azerbaijan. Therefore the models for this sector are very similar to the models for the total imports (table D) with a similar magnitude of coefficients, although they are calculated using a shorter time period. The imports of chemical products negatively depend on investment from China, but the result is preliminary considering very limited time period for analysis (since 2009), which does not consider lagged effects. A model for imports of ores and metals has not been created because no significant correlations were found for the factors considered.

Specifically growth of bilateral China's imports from Azerbaijan turned out to be independent, or at least insignificantly dependent, in the short run on changes in overall export competitiveness of Azerbaijan (exports worldwide), overall demand in China (imports from all over the world), business cycles, exchange rates, prices, interest rates, trade and investment freedom (some after controlling for changes in general economic freedom and bilateral investment links). It does not mean that they all are not important, but the analyzed limited number of time periods under annual data periodicity is not enough to prove existence of their effect. Another explanation may be specific structure of the imports (predominantly fuel), which may have larger importance of other specific factors unlike ordinary trade.

Table 6: Regression models for China's exports to Azerbaijan

Y	ExpElec	ExpElec	ExpElec	ExpElec	ExpRoad	ExpRoad	ExpRoad	ExpRoad	ExpRoad	ExpRoad
b₀	12.8/ 14.5 (4.0)***	12.8 (3.4)***	-0.17/ -0.14 (0.52)	-0.33 (0.34)	0.19/ 0.26 (0.66)	0.57 (0.59)	1.38/ 1.23 (0.85)	1.32 (0.54)**	1.64/ 1.66 (0.88)*	1.59 (0.54)***
b_{AzImpW} (Road)					62.3/ 66.6 (21.7)**	52.0 (19.0)**				
b_{GDPndCh}			0.046/ 0.052 (0.019)**	0.070 (0.013)***						
b_{RER}	-12.2/ -13.8 (4.0)***	-12.0 (3.4)***								
b_{RIRch}							-0.12/ -0.11 (0.050)**	-0.12 (0.03)***		
b_{RIRAz}									-0.77/ -0.75 (0.31)**	-0.79 (0.20)***
R²	0.27** /0.35	0.34**	0.19** /0.23	0.58***	0.31** /0.30	0.31**	0.26** /0.24	0.48***	0.26** /0.23	0.51***
N	27	26/2014	27	24/2007, 2009, 2014	20	19/2013	19	17/2012,2013	20	18/2012,2013

Table 7: Regression models for China's imports from Azerbaijan

Y	Imp	Imp	Imp	Imp	Imp	Imp	Imp	Imp	Imp	ImpChem	ImpChem
b_0	0.67/ 0.82 (2.4)	1.52/ -2.35 (2.4)	-2.59 (2.6)	-1.82 (2.6)	-0.83/ -1.07 (3.0)	1.12 (2.6)	-1.06/ -1.18 (2.9)	1.07 (2.4)	3.12/ 2.98 (1.4)**	4.29 (1.1)***	
b_{EFCh}	2.71/ 3.21 (0.96)***	2.80/ 3.61 (0.92)***			2.73/ 2.82 (0.85)***	2.82 (0.71)***					
b_{EFAz}			2.54 (0.85)***	2.54 (0.82)***			3.41/ 3.42 (1.0)***	3.67 (0.80)***			
$b_{InvCont-1}$					14.3/ 13.8 (4.0)***	13.3 (3.3)***	9.22/ 9.00 (4.3)*	7.70 (3.4)**			
$b_{InvCont-2}$					-8.13/ -7.52 (4.2)*	-8.97 (3.4)**	-9.34/ 8.88 (4.0)**	-10.2 (3.1)***			
$b_{InvCDIS}$									-9.10/ -8.68 (4.1)**	-11.9 (3.2)***	
R^2	0.24*** /0.37	0.28***	0.26*** /0.43	0.29***	0.72*** /0.76	0.81***	0.73*** /0.76	0.84***	0.30*** /0.29	0.56***	
N	27	26/2018	27	26/2018	16	15/2018	16	15/2018	14		13/2012

Conclusion.

The Belt and Road initiative (BRI) became a strategic instrument for strengthening investment and trade cooperation between China and Azerbaijan. It facilitated development projects in a number of industries, especially in energy and infrastructural sectors. Besides economic motivation to enhance exporting capacities and ensure supplies of resources, it may substantially contribute to development of both countries by the synergy of local competitive advantages and engaging foreign capital from China. A positive contribution to development in particular can be achieved through extending exports in the accordance with comparative advantages of both countries. This effect can be an element of win-win scenario for the participating economies considering the mutual benefit principle of the BRI.

China exports mostly machinery, vehicles, metal and textile products to Azerbaijan using largely road and air transport. In exchange Azerbaijan exports predominantly liquid fuels using sea vessels and pipelines. There is still more potential for China to export there, especially electric and electronic machinery. Meanwhile, Azerbaijan may diversify its exports to China by selling fruits, precious metals and chemical products.

Chinese exports to Azerbaijan depend on the overall export dynamics of China worldwide (especially in case of textile products) and/or on export capacity in China proxied by its GDP (especially in case of electronic products). Price competitiveness factors (proxied by real exchange rate) are important for the bilateral exports of electronic products. Real interest rates are likely to curb Chinese exports of metals and road vehicles (which are rather investment and consumer durable goods respectively). Chinese imports from Azerbaijan depend positively on economic freedom in either China or Azerbaijan, while the effect of large Chinese investment and construction projects in Azerbaijan is mixed, positive and negative, depending on the time lag considered.

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