TRADE EFFECTS OF THE NEW SILK ROAD[1]

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Abstract

This paper takes a first look at the trade effects of China's Belt and Road Initiative (BRI), also referred to as the New Silk Road, on the 65 countries potentially involved. The pillar of the initiative consists of a number of infrastructure investment projects to improve the land and maritime transportation in the BRI region. We first use geo-referenced data and geographical information systems (GIS) analysis to compute the bilateral time to trade before and after the Belt and Road Initiative. Then, we estimate the effect of improvement in bilateral timeliness to trade on bilateral export values and on trade patterns using a gravity model and a comparative advantage model similar to Nunn (2007). We use physical geography features of transit countries as instruments of bilateral trade time to address the endogeneity between trade and infrastructure. We find that (i) the BRI would have sizeable effects on trade flows among participating countries; (ii) these effects would be magnified if deeper trade agreements complement the upgrading in transport infrastructure; (iii) products that use time sensitive inputs, and countries that are highly exposed to the new infrastructure and that are integrated in the global production chains have larger trade gains.

Keywords: Belt and Road Initiative, Transport Infrastructure, GIS Analysis, Trade Flows, Time Sensitivity, Input-output Linkages

[1] The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

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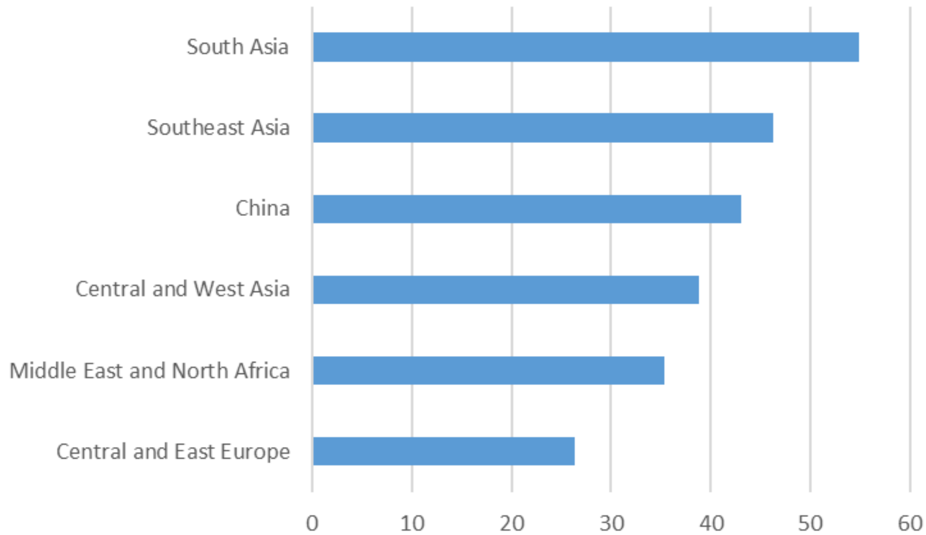
1. Introduction

In 2013, President Xi of China proposed the Belt and Road Initiative (BRI) during his visit to Kazakhstan and Indonesia as an initiative to strengthen economic integration and policy coordination in the Eurasia region. This ambitious project aims at improving transportation infrastructure, lowering trade barriers, deepening financial cooperation, and encouraging cultural exchange and political stability in the region. The backbone of this initiative is a series of transport investment projects, which are proposed along its two pillars: (i) the Silk Road Economic Belt (SREB), and (ii) the 21st Century Maritime Silk Road (MSR) (Figure 1). Specifically, the "Belt" links China to Central and South Asia and onward to Europe, while the "Road" links China to the nations of South East Asia, the Gulf Countries, East and North Africa, and on to Europe. Six economic corridors have been identified: (1) the China-Mongolia-Russia Economic Corridor; (2) the New Eurasian Land Bridge; (3) the China–Central Asia–West Asia Economic Corridor; (4) the China–Indochina Peninsula Economic Corridor; (5) the China-Pakistan Economic Corridor; and (6) the Bangladesh-China-India-Myanmar Economic Corridor (Figure 2).

This paper offers a first assessment of the impact of the new and improved BRI transport infrastructure on trade flows of BRI countries.[3] Specifically, we examine the potential trade

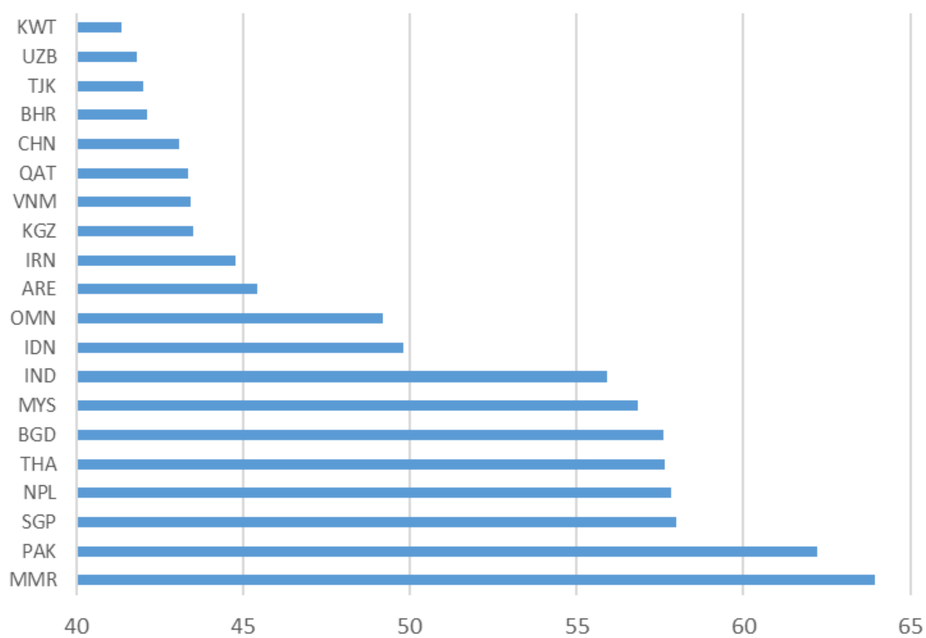
[3] There is no official list of "BRI countries". In this paper, we focus on a list of 65 countries that geographically locate along the Belt and Road as proposed by China (see

Figure *5*: Change in travel time (%) by region due to Belt and Road initiative



Authors' calculations using bilateral trade time and distance by rail and sea mode before and after Belt and Road proposed interventions obtained using GIS analysis and Google's Landbridge map.

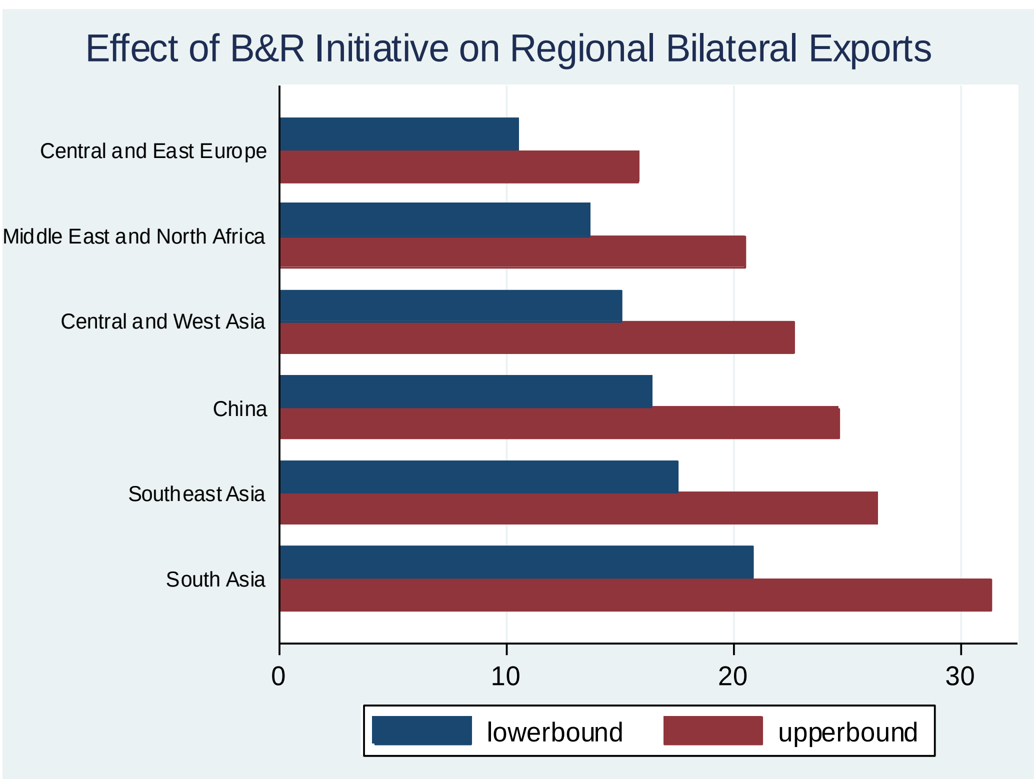
Figure 6: Largest changes in travel time (%) for countries due to Belt and Road Initiative



effects of the BRI using a combination of geographic and econometric analysis. First, we use georeferenced data and geographical information systems (GIS) analysis to compute the bilateral trade time between capitals, ports and major cities (>100K) in the Belt and Road countries before and after the proposed interventions. Second, we use a gravity model (Head and Mayer, 2014) to estimate the total effect of bilateral trade time on bilateral exports and a comparative advantage model similar to Nunn (2007) to estimate the impact of bilateral time to trade on the export pattern in time sensitive products and in products that rely on time sensitive inputs. The trade impacts of BRI are calculated by combining the above GIS and econometric estimates.

An important issue in the estimation of the trade effects of transport infrastructure is endogeneity. The plan to invest in these infrastructure projects could be driven by China's rising

Figure 7: Effects of the Belt and Road Initiative on Total Exports (regional)



Tables

Table *1*).

trade prospects with the BRI countries. We address the potential endogeneity between infrastructure and trade in different ways. First, we eliminate nodal countries and the extractive sector from the analysis. Intuitively, if the goal of the BRI is for China to access larger markets or to secure energy supplies, an analysis focused on transit countries and non-energy sectors should mitigate endogeneity problems. Second, we use an Instrumental Variable (IV) approach. Specifically, we employ the physical geography features of transit countries along any trade route as instruments for the bilateral transport time between the trading partners. Third, in the comparative advantage model we can introduce a richer set of fixed effects, including country-pair and country-sector that control for other sources of omitted variable biases. We also test the complementarity between transport infrastructure improvements and trade reforms. Specifically, we augment the gravity model to introduce an interaction term between the "depth" of bilateral trade agreements and the bilateral time to trade.

The results from the econometric analysis confirm that there is a negative relationship between trading times and trade: a one percent decrease in trading times increases export between 0.4 and 0.5 on average. In addition, trading times are particularly important for time sensitive products that are used as inputs in production processes, suggesting that improvements in trading times are key in the presence of global value chains. Last, we find that deeper trade agreements would magnify the trade impact of a reduction of time to trade due to new and improved transport infrastructure.

The results using network analysis on trading times improvements under the BRI suggest that BRI reduces time to trade by 38 percent on average. An upper-bound estimate is that trade increases by 21.5 percent on average. This assumes that trade in all products can switch transportation modes relatively easily to take advantage of the improved rail links. A plausible lower-bound estimate, which assumes that products cannot switch transportation mode, is that trade increases by 14.4 percent on average. Largest reductions in time to trade (and improvements in trade) are predicted for countries in South Asia, and East Asia and the Pacific, including China, and for products that use time sensitive inputs.

While there is much debate surrounding the Belt and Road Initiative, little rigorous economic analysis that has been done so far. An exception is the study by Villafuerte, Coron and Zhuang (2016) that use a Computable General Equilibrium (CGE) model to assess the impact of the BRI on trade and economic growth. Differently from the CGE approach, our paper builds on a number of recent econometric trade studies. First, there is a recent literature that aims at assessing the impact that reduction in time to trade, for instance due to trade facilitation reforms or infrastructure improvements, have on trade flows (e.g. Djankov, Freund and Pham, 2010; Hummels and Shauer, 2013; and Baniya, 2017). Second, several recent studies have analyzed the trade effects of infrastructure projects (Donaldson, 2012; Duranton, Morrow and Turner, 2013; Alder, 2015). Finally, a subset of this literature also relies on georeferenced data and GIS analysis to assess the trade and the spatial effects of transport infrastructure (e.g. Roberts, Deichmann, Fingleton and Shi, 2010; Volpe Martincus, Carballo and Cusolito, 2016).

The rest of the paper is organized as follows. Section 2 presents the GIS analysis, while the econometric strategy and results are discussed in Section 3. Section 4 outlines the trade impact of the BRI. Concluding remarks follow.

2. Using network analysis to estimate trading times

Rather than a simplified measure of the travel/trade time such as a straight-line distance between to capitals, we use georeferenced data and GIS analysis on a country's transport network to derive our estimates. Specifically, we use a network analysis to get realistic measures for the time it takes to go from one country to another taking into account quality and quantity of infrastructure, physical obstacles (rough terrain) or other barriers (border delays), and relative performance measures (e.g. rail service frequency). The main objective of this network analysis is to quantify the connectivity between capitals, ports and major cities (>100K) of BRI countries before and after various planned interventions. An important caveat is that incorporating these interventions is challenging on multiple levels. The projects and timelines are not always clearly defined, and there is some disagreement between sources.

Locations are in some cases only available as generalized features on very small-scale continental maps. An additional complication is the fact that the initiative includes some efforts that are not easily introduced to the network: improving efficiency of customs, reducing border delays, and upgrading of existing port and rail infrastructure.

Typically, a network solution involves finding the shortest path between two locations, where the length of a path is the sum of a cumulative variable such as travel time (hours) or distance (km). For travel time, routing is determined by minimum time cost path, where travel time is a function of physical length and speed. We assess the time to trade with the transport network in 2013 (i.e. before the official launch of BRI), and with the updated transport network (i.e. including the new BRI segments), assuming a higher speed for the parts of the existing network that will be updated. Baseline uses existing rail (50 kph) and sea routes (25 kph), while the improved scenario includes proposed new rail links and main rail along economic corridors at the increased speed (75 kph) in addition. For distance, routing is determined by minimum distance path, using physical length as impedance. The distance obtained from the GIS analysis is then combined with the speed information along each segment of the route to compute the travel time for the econometric analysis.

i. Inputs

The network includes road, rail and some rail ferry features from Delorme Atlas of the Earth (DAE), 2015 release. Proposed railroad and maritime links are added from the Landbridge[4] schematic map (Figure 3), and lengths are scaled by 110% to account for lack of feature definition. Additional connectivity to selected ports is added using Global Shipping Routes (CIA and ESRI, 2012). The origins and destinations are capitals, ports and major cities of BRI countries and Rotterdam, representing the entry point for China and other East Asian countries to Western Europe via sea route.

A complication is that the choice of route can also depend on other factors, in particular the monetary cost determined by the mode of transportation (railway or maritime). Ideally, the

[4] Kml downloaded from Google MyMaps at: https://www.google.com/maps/d/viewer?mid=1o_INAtJ4GuAqwh7MNs9zwjEfMwo&hl=en_UShttp%3A%2F%2Fnewparadigm.schillerinstitute.com%2Four-campaign%2Fbuild-the-world-land-bridge.

choice of rout would trade off the shorter trade/travel time of railway connectivity and the cheaper monetary costs associated to maritime travel. In the GIS analysis, we account for this trade off by focusing on two extreme scenarios. In the first scenario, we assume a high preference for using maritime links whenever available.[5] The intent is to simulate an alternative maritime route, where land connectivity exists, without explicitly defining the tradeoff between time cost and monetary cost, while at the same time maximizing the number of "connected" country pairs. In the second scenario, we remove this preference for maritime transport, implicitly allowing for full modal substitution between maritime and railway transport whenever the time/distance is lower transporting goods by land. We see these scenarios as providing a lower and an upper-bound to our estimates.

ii. Outputs

The network is solved for each origin-destination (OD) pair, where routing is determined by shortest path or time cost adjusting for the preference parameters. Outputs for each pair of cities or ports are provided as distance (km), travel time (hours), and distance by mode (maritime, and rail along economic corridors or other land). Cities that are not connected to the modal network even after BRI improvements are not present in the output. As we undertake the analysis before the BRI (i.e. in 2013) and after the BRI transport improvements (Figure 4), we have the following outputs:

1. Pre-BRI with no maritime preference: This gives the shortest distance for most city pairs. Also, the rail route is mostly used under this assumption, and it includes maritime links only when it is required for essential connectivity.

2. Pre-BRI with high preference for maritime links: This assumption forces the use of sea route option more often for most city pairs, which can be significantly longer in length than that while using the land route. However, this scenario is useful to incorporate the preference for cheaper maritime routes to expensive but faster rail routes. This exercise is essential in our case, because most of the goods traded by land or sea between China and Europe (long distance

[5] The restrictions parameter is implemented at a feature-level in Network Analyst to prohibit entirely, avoid, or even prefer particular network elements. Trade-off in cost, determined by the routing algorithm, is not clearly defined in the documentation.

trade) could be non-time sensitive and heavy goods. Also, the importance of time to trade might diminish with trade distance.

3. Post-BRI with no maritime preference: This gives the shortest distance when new BRI links are used, and includes maritime links that are a part of the shortest overall route between city pairs. Note that the routes may be longer than baseline if the land along the economic corridors are used for some city pairs due to such a preference assumption; however, since the speed is higher in these routes, the travel time is shorter compared to the baseline scenario.

4. Post-BRI with high preference for maritime links: This uses the sea route alternative more often for most city pairs. Note that the distance might be longer than the baseline for some city pairs if the rail links along the economic corridors are used. However, since the speed is higher in these routes along the economic corridors, the travel time is shorter compared to the baseline scenario.

Number of borders crossed can affect transit time, and this may vary greatly depending on the border in question. Although this is not accounted for in the routing, the number and identity of borders (transit countries) crossed is computed for each route so that costs can be added in the econometric analysis. This information is also used in the IV estimation discussed below. The summary statistics for the trading times pre-BRI that are used in the empirical analysis are presented in

Table 2.

3. The impact of trading time on trade

i. Methodology

We investigate how time to trade affects trade volumes. Longer time delays act as a tax on exports, especially in the context of global value chains, where goods need to be shipped on time in order to ensure that production processes are not disrupted. We begin by estimating the following augmented gravity equation:

$$\ln X_{ijg} = \beta_0 + \beta_1 \ln GisTime_{ij} + Gravity_{ij} + \ln PTA\ Depth_{ij} + \mathrm{X}_{ij} + Controls_{ijg} + \mu_i + \pi_j + \eta_g + \lambda_{ig} + \gamma_{jg} + \varepsilon_{ijg}$$

(1)

where the *i,j and g* subscripts correspond to the exporter and the importer, and the hs6 product respectively; the dependent variable Exp_{ijg} represents bilateral exports of product *g* from country i to country j; $GisTime_{ij}$ represents our variable of interest and is calculated as the log of the minimum time it takes to transport a good from country i to country j[6]; the coefficient of this variable represents the elasticity of exports to variations of trading time. $Gravity_{ij}$ includes a set of gravity-type variables associated with the exporter and the importer such as distance, sharing the same official language or border or past colony/colonizer relationship and the strength of market penetration; $\ln PTA\ depth_{ij}$ captures the level of depth of preferential trade agreements between the exporter and importer. X_{ij} is a set of dummy variables representing respectively the existence of a preferential trade agreements in force and their respective levels of depth. These variables control for group effects of different intervals of PTA depth levels in the regression analysis. The $Controls_{ijg}$ variable includes a series of interactions between exporter and importer specific factor endowments, and product specific factor intensities Finally, we include an extensive set of fixed effects: exporter (μ_i), importer (π_j) and product (η_g) specific fixed effects control for any effect on trade due to individual country specific and product specific characteristics. Moreover, exporter-product (λ_{ig}) and importer-product (γ_{jg}) specific paired fixed effects control for factors such as comparative advantage; foreign industrial demand for intermediate inputs that can increase the exports; availability of intermediate inputs in the local economy that can raise the industrial expenditure on inputs and thereby raising the production and exports; market potential and trade intensity and agglomeration forces or co-location effects (see Hummels and Hillberry, 2001).

Table 3 presents the results for equation 1, for a set of 62 countries and 5025 HS-6 products in 2013 for the two types of models that are used to calculate the transportation times between country I and country j. Regressions are estimated both using a linear model (OLS) and Poisson pseudo maximum likelihood model (PPML) in order to take into account for zero trade flows.

[6] The calculation and aggregation of the variable GIS time is presented in section 2.

The results confirm the negative relationship between trading time and exports. A one percent increase in trading times decreases exports by 0.5 percent on average (see columns 1 and 3). PPML results are slightly smaller and suggest that a one percent increase in trade times decreases trade by 0.4 percent (see columns 2 and 4).

ii. Robustness checks

The previous results might be subject to endogeneity deriving from reverse causality problem. Specifically, the time to export variables are likely to be correlated with country exports. An improvement of rail or ports infrastructure and administrative time costs has positive effects on exports. However, trade partners that have better trade prospects or that wish to improve their current trade volume will also invest more on such trade facilitating infrastructure. Such incentives of infrastructure reform is clear in the case of Belt and Road initiative as discussed earlier. In particular, the rising trade prospect of China with BRI countries, China's over-capacity in heavy manufacturing industries and the intention to secure energy supplies, and transport infrastructure being the biggest bottleneck to regional integration in Eurasia are some of the major incentives.

To control for reverse causality, we use three different types of robustness checks. First, we estimate the regressions excluding the nodal countries in the BRI which are those that are trading more between them. Second, we re-estimate the regressions excluding the extractive industries, to control for the fact that improvements in infrastructure could be related to the necessity for the east to get access to natural resources in the central Eurasia. Third, we perform and instrumental variables estimation and instrument time to trade using a set of geographical variables.

Our instruments are taken from Nunn and Puga (2009) and represent by the terrain ruggedness index, percentage of moderately to highly rugged land area, and the proximity to the coast (percentage of land area within 100km of the nearest ice-free coastline) from These are valid instruments, because, first, these geographical features are clearly exogenous to trade as countries are naturally endowed with such geographical features. Next, these geographical features affect the ability of bilateral trade partners to transport goods on time, because trade routes that are highly rugged (presence of rough and uneven land surfaces) tend to have lower quality of land transportation infrastructure; while, trade routes that are closer to the coast tend to have well established maritime ports and infrastructure. Hence, trade routes that are less rugged and near the coast have lower bilateral time to trade. This intuition is validated by our first stage results in Table 4. Further, the geographical features have no direct effect on the exports of the country; hence they are excludable.

The results presented in

Table *5* confirm the negative impact of trading times on export values. Specifically, the results excluding nodal countries and extractive products are very similar to the ones of the baseline regression and suggest that a one percent decrease in trading times increase trade by 0.52-0.54 percent on average (see columns 3 4 7 and 8). The IV results are slightly smaller and show that a one percent decrease in trading times increase exports by 0.41-0.46 percent, depending on the model of estimation used (see columns 2 and 6).

iii. Time sensitivity and export delays

Time delays should have a greater effect on exports of time sensitive goods. In this section we examine how an ability of bilateral trade partners to transport goods on time determine their comparative advantage in products that are time sensitive and that value timely delivery of their inputs. Following Nunn (2007), we adopt an empirical specification that explains export values by the interactions of exporter-importer specific characteristic with a product specific characteristic. In particular, we estimate the following specification:

$$lnX_{ijg} = \beta_0 + \beta_1\, lnGisTime_{ij} * t_g + \beta_2\, lnGisTime_{ij} * \tilde{t}_g + Controls_{ijg} + \mu_i + \pi_j + \eta_g + \rho_{ij} + \lambda_{ig} + \gamma_{jg} + \varepsilon_{ijg} \quad (2)$$

where $\beta_1 * t_g$ represents the direct effect of infrastructure reforms, while $\beta_2 * \tilde{t}_g$ represents the indirect effect of transportation infrastructure reforms arising through the input-output linkages. The direct effect of reforms comes from the improvement in the ability to transport the final products to the consumers or end users on time, whereas, the indirect effect of such reforms comes from the improvement in the ability to access the intermediate inputs on time. Hence, a one percentage change in bilateral time to time leads to the change in the bilateral export pattern by: $(\beta_1 * t_g + \beta_2 * \tilde{t}_g)$%.

Here, we are assessing two different comparative advantage patterns. The first comparative advantage arises due to the direct effect ($\beta_1 * t_g$) of timeliness in trade, while the latter arises due to the indirect effect ($\beta_2 * \tilde{t}_g$) of timeliness in trade. This also enables us to compare the size of the direct and the indirect effects of transportation infrastructure reforms on the trade pattern. The coefficients of these interaction terms capture only the effect of country's characteristic on the trade pattern and not on the export values. The latter effect is fully captured after taking into account the exporter-importer fixed effects.

The results presented in table 6 show that the impact of trading times is relatively higher for products that are time sensitive and that use time sensitive products. In addition, the indirect time effect (time to trade impact on products that use time sensitive inputs) is always higher that the indirect effect (time to trade impact on time sensitive products) suggesting that improving trading times is particularly important in a world of global value chains where (time sensitive) inputs are imported for production.

iv. Deep agreements and trading times

In this sub-section, we assess the complementarity between our variable of interest, trading times, and the level of depth of preferential trade agreements signed between countries. We introduce an interaction term between trading times and the level of depth of an agreement to investigate whether the positive impact that improvements in infrastructure could have on trade (through decreases in export times) are higher for country-pairs that have better institutions and that share a common regulatory framework in trade related disciplines such as investment, intellectual property rights, competition policy, technical barriers to trade, amongst others. The results presented in Table 7 confirm the complementarity between deep agreements and trading times: the negative impact of trading times is diminished for country-pairs that are involved in deeper agreements compared to country pairs that have shallow agreements.

4. Assessing the potential impact of BRI on trade

In this section we use the coefficient estimates from the gravity regression to assess the potential impact of BRI improvement on export flows. We use the GIS analysis to estimate the improvements in time that derive from the BRI. Table 6 shows that the Belt and Road initiative would both create new land and maritime connections in the Eurasian region, and reduce trade time along the existing rail and maritime links by 38 percent, on average (which corresponds to a reduction of 101 hours of travel time on average). Average trade time reductions for individual regions range between 26 percent and 55 percent (Figure 5). We also find that the Belt and Road initiative induces a substitution towards land mode (fall in share of sea mode by 25 percentage points), particularly towards the land along economic corridors (Table 6). Largest reductions in time to trade are predicted for countries in South Asia, and East Asia and the Pacific, including China (Figure 5 and Figure 6).[7]

Once the improvements in trading times are applied to our regression results we find that BRI improvements would significantly increase total Eurasian trade. A plausible upper-bound estimate is that trade would increase by 21.5 percent. This assumes that faster trade times benefit both consumers (direct effect) and producers (indirect effect), and that trade in all products can switch transportation modes relatively easily to take advantage of the improved rail links. A lower-bound estimate is that trade would increase by 14.4 percent assuming relatively difficult substitution between modes. Belt and Road improvements would lead to significant trade gains for most countries in South Asia, and East Asia and the Pacific, including China (Table 7). The gains would be largest for Myanmar, Pakistan, Singapore, Afghanistan, Nepal, Bangladesh, India and Indonesia, where exports would increase by 19 to 24 percent (lower-bound estimates). All regions would experience substantial trade gains (Table 7) from 16 to 21% (lowerbound estimates). In addition, we find that sectors that value timely delivery of inputs (motor/vehicle parts, and machinery and electronic parts, meat and livestock, other manufacturing, and chemicals and ferrous metals) experience the largest effect (15% to 29%) on the trade pattern (*Table 8*).

[7] However, the GIS analysis conducted in this paper has a few limitations. The input GIS data lack detailed descriptive information that could affect routing, such as rail gauge, freight vs passenger lines, service frequency and port facilities. Next, output is limited to routes between BRI capitals, ports and major cities, which may not be the main centers of trade for some commodities. Also, road and air transport features, and important modes of transit for higher value commodities were not included.

5. Conclusion

This paper is the first to examine the effects of the Belt and Road Initiative of China on the bilateral time to trade, and the resulting trade impacts for the Belt and Road countries using a combination of geographic and economic analysis. We particularly focus our analysis on the land and maritime transportation infrastructure reform that improve the connectivity of the 65 countries (plus China) that will potentially participate to the initiative.

We find that differences across the impacts realized by countries reflect both the extent of the exposure to the new infrastructure, and the export structure of the country. In general, the biggest trade gains stem from improvements in trade times for inputs whose timely delivery is highly valued by producers. That is, countries that are more integrated in global value chains tend to benefit more from reductions in trade times. We find that the BRI would both create new land and maritime connections in the Eurasia region and reduce trade time along the existing transport links by 38 percent. We also find that BRI induces a substitution towards land mode, particularly towards the land along economic corridors. Largest reductions in time to trade are predicted for countries in South Asia, and East Asia and the Pacific, including China. Belt and Road improvements would also significantly increase total Eurasian trade by 14.4% to 21.5%, and would lead to significant trade gains for most countries in South Asia, and East Asia and the Pacific, including China. Finally, we find that deeper trade agreements would magnify the trade impact of a reduction of time to trade due to the BRI infrastructure projects, indicating that trade cooperation should complement infrastructure cooperation.

This is admittedly a first attempt to investigate the trade impact of the Belt and Road Initiative. An important caveat is that significant uncertainty attaches to our estimates. The BRI is a fluid project: the details of infrastructure investments are not known, and specifics will obviously affect how the BRI will impact the time to trade and, ultimately, trade flows.

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Google Landbridge Maps downloaded from:

https://www.google.com/maps/d/viewer?mid=1hxkPxEaSZto4a80jrAU-c4iO3EA&hl=en_US&ll=57.26363612483125%2C163.2879036467285&z=2

Appendix

Figures

Figure 1: Silk Road Economic Belt and the New Maritime Silk Road

Figure 2: Six economic corridors have been identified

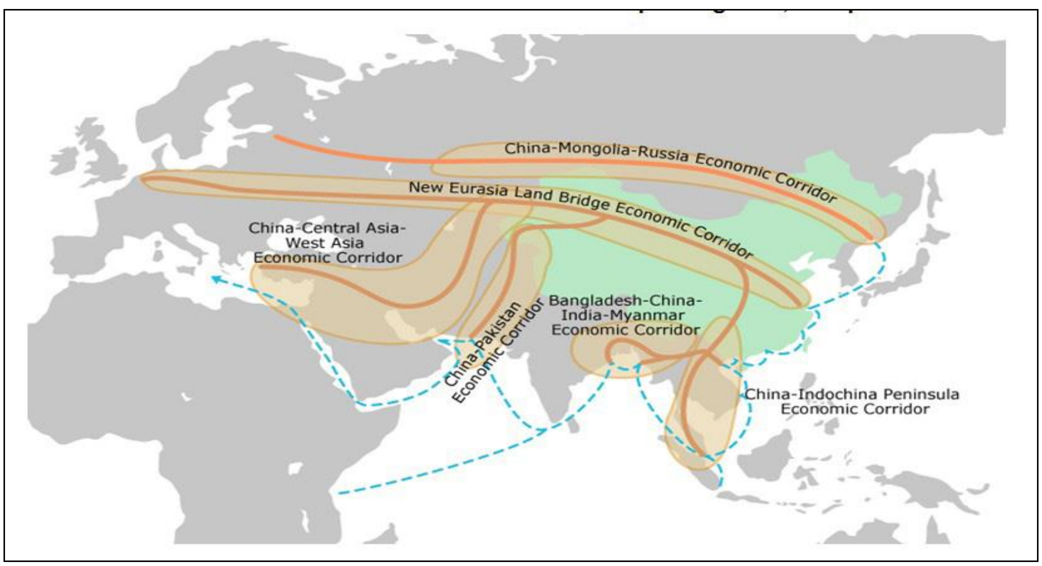
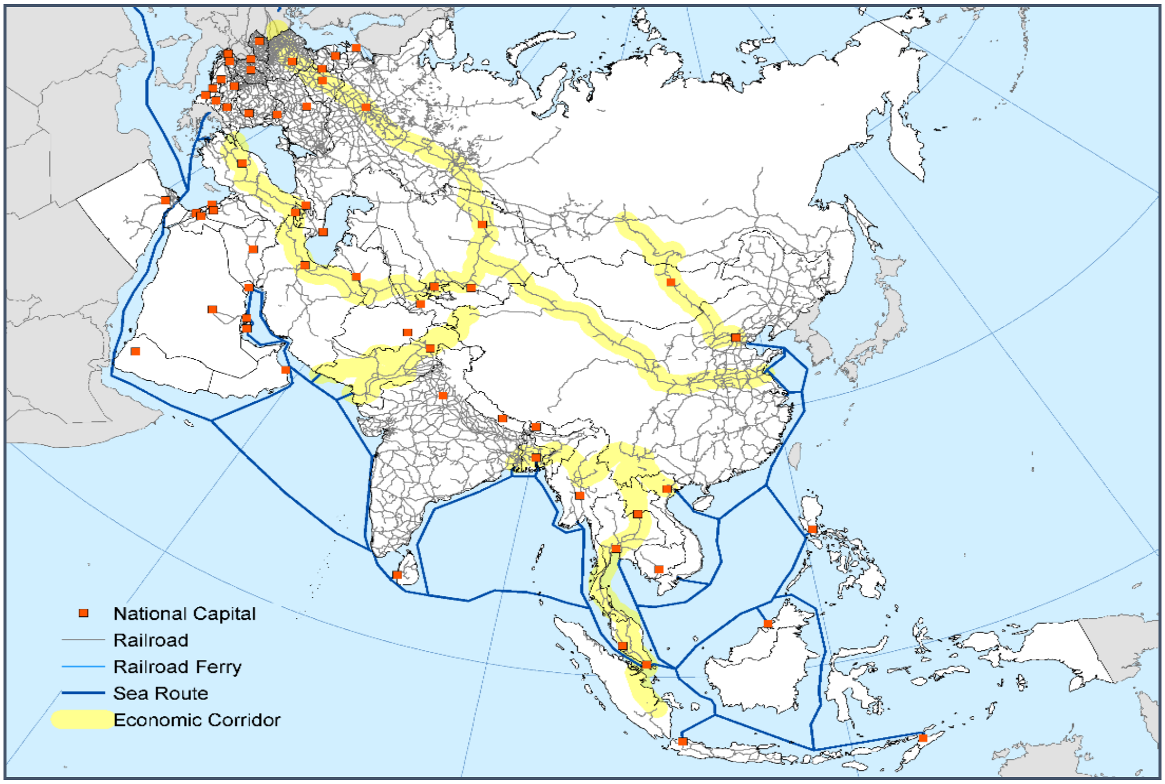
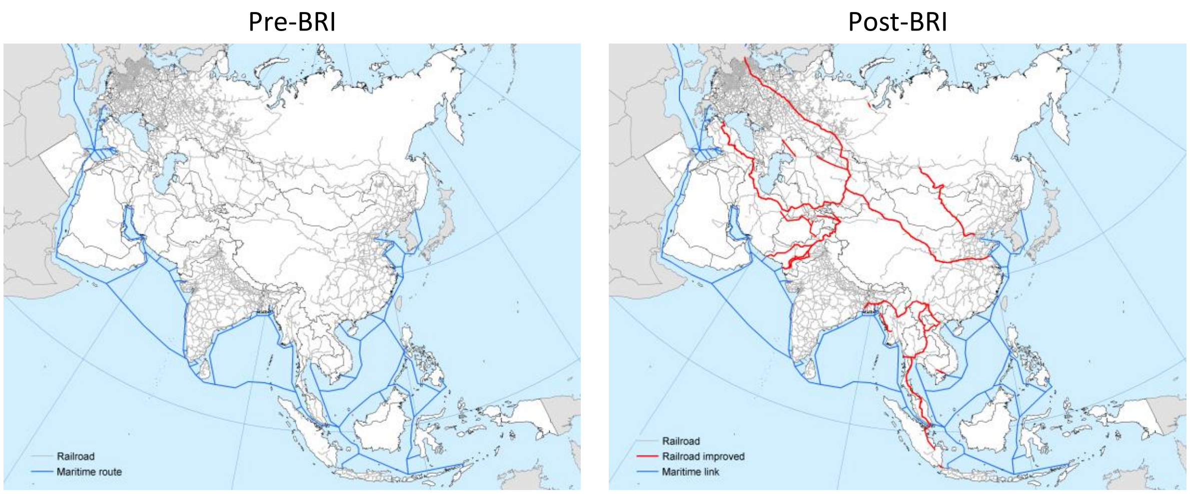


Figure 3: Network elements



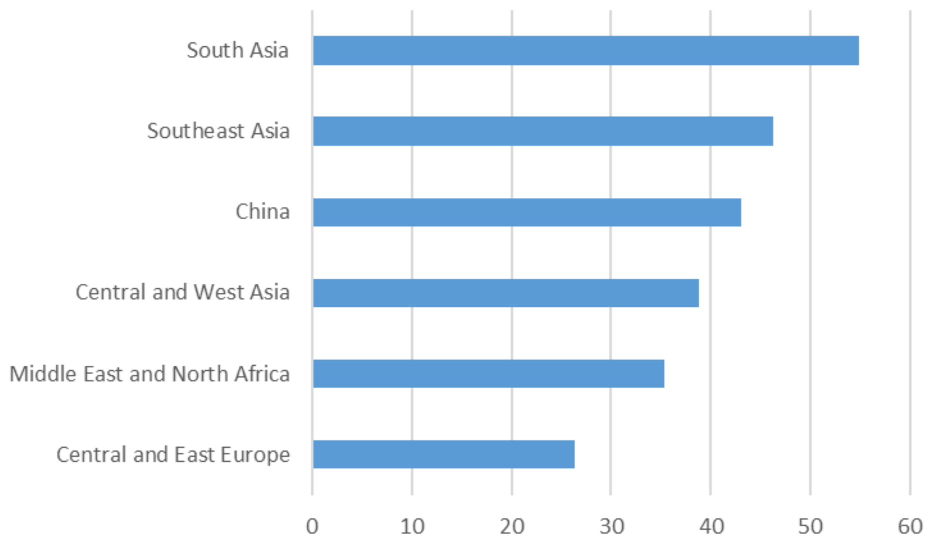
Source: Authors' calculations

Figure 4: Network features



(Baseline network) (Improved scenario)

Figure 5: Change in travel time (%) by region due to Belt and Road initiative



Authors' calculations using bilateral trade time and distance by rail and sea mode before and after Belt and Road proposed interventions obtained using GIS analysis and Google's Landbridge map.

Figure 6: Largest changes in travel time (%) for countries due to Belt and Road Initiative

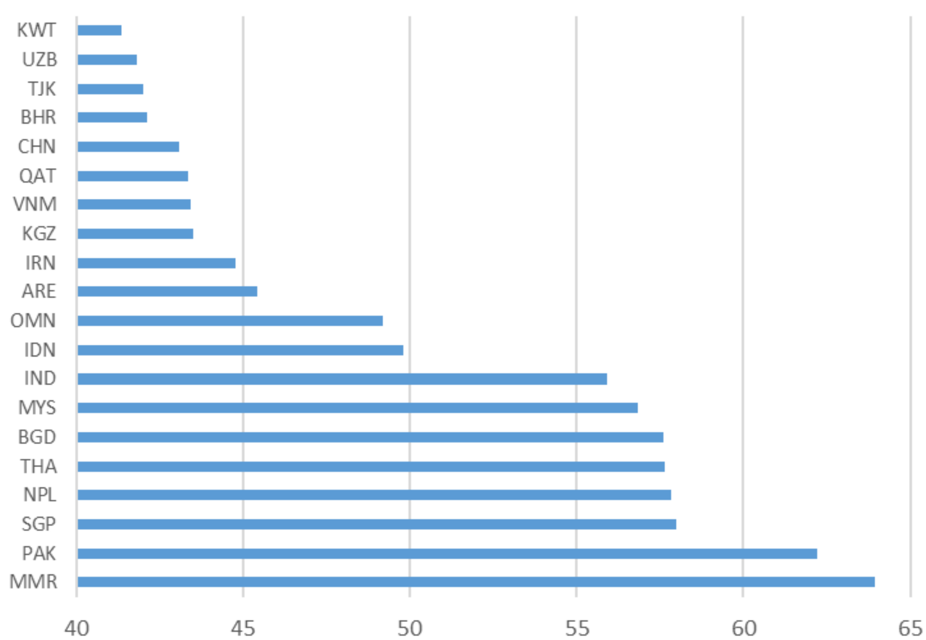
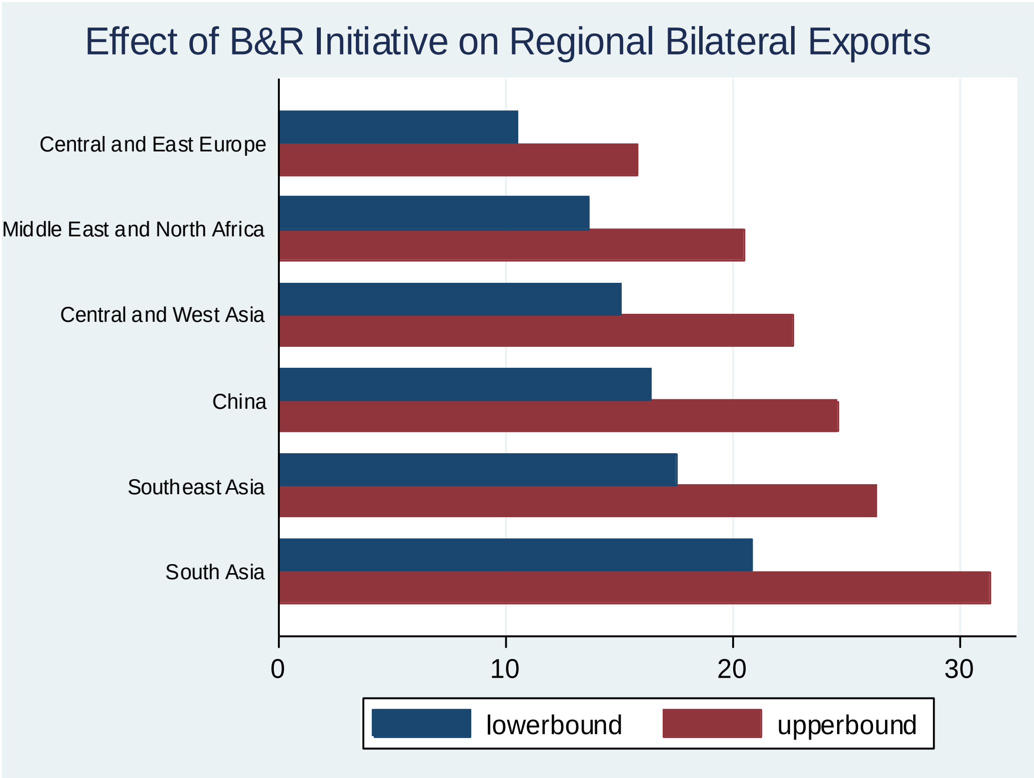


Figure 7: Effects of the Belt and Road Initiative on Total Exports (regional)



Tables

Table 1: Countries geographically located along the Bealt and Road

Region	Belt and Road Countries (besides China)	Number of Countries
Central Asia	Mongolia, Russia, Kazakhstan, Uzbekistan, Tajikistan, Turkmenistan, Kyrgyzstan	7
South East Asia	Indonesia, Cambodia, East Timor, Malaysia, Philippines, Singapore, Thailand, Brunei, Vietnam, Laos, Myanmar	11
South Asia	Nepal, Bhutan, Maldives, Afghanistan, Pakistan, India, Bangladesh, Sri Lanka	8
Central and East Europe	Poland, Montenegro, Macedonia, Bosnia and Herzegovina, Albania, Lithuania, Latvia, Estonia, Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Romania, Bulgaria, Serbia	16
West Asia and North Africa	Iran, Syria, Jordan, Israel, Iraq, Lebanon, Palestine, Egypt, Turkey, Saudi Arabia, United Arab Emirates, Oman, Kuwait, Qatar, Bahrain, Yemen Republic	16
CIS and others	Belarus, Ukraine, Azerbaijan, Moldova, Armenia, Georgia	6

Source: Wang Yiwei, 2015

Table 2: Pre-BRI summary statistics

Version 1
(time minimization)

	Obs.	Mean	Std. Dev.	Min	Max
Travel Distance (km)	3,422	7,569.759	4,804.526	74.85	18,471.85
Travel Time (hours)	3,782	211.9075	135.4529	1.496154	471.52

Version 2
(time minimization with maritime preference)

	Obs.	Mean	Std. Dev.	Min	Max
Travel Distance (km)	3,422	7,678.57	4,826.794	74.85	18,638.74
Travel Time (hours)	3,782	269.164	191.7247	1.496154	699.6442

Table 3: Effects of Time to Trade on Trade Values

	Version 1		**Version 2**	
	OLS	PPML	OLS	PPML
	(1)	(2)	(3)	(4)
GIS Time	**-0.567*** **	**-0.427*** **	**-0.524*** **	**-0.380*** **
	(0.0366)	**(0.0235)**	**(0.0317)**	**(0.0208)**
PTA Depth	0.0221***	0.0133***	0.0200***	0.0121***
	(0.0027)	(0.0017)	(0.0028)	(0.0017)
Observations	1,138,486	2,666,696	1,138,486	2,666,696
R-squared	0.635	0.561	0.635	0.559

Standard errors in parentheses are clustered by exporter-importer pair. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Effects of Geography on Trade Time: 1st Stage Results

	Version 1		**Version 2**	
	(1)	(2)	(3)	(4)
% of Rugged Area	0.0466***		0.0431***	
	(0.00338)		(0.00321)	
Proximity to Coast	-0.0181***	-0.0164***	-0.0182***	-0.0165***
	(0.00273)	(0.00270)	(0.00260)	(0.00258)
Rugged Index		0.858***		0.788***
		(0.0629)		(0.0597)
Observations	3,026,550	3,026,550	3,026,550	3,026,550
R-squared	0.840	0.839	0.844	0.843

Each instrument is average geographical features of transit countries. All regressions include high dimension fixed effects. Standard errors in parentheses are clustered by exporter-importer pair. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Sorting out endogeneity

	Version 1				Version 2			
	OLS	IV	Eliminate CHN-EU	Eliminate Extraction	OLS	IV	Eliminate CHN-EU	Eliminate Extraction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GIS Time	**-0.567*** **	**-0.463*** **	**-0.564*** **	**-0.569*** **	**-0.524*** **	**-0.412*** **	**-0.541*** **	**-0.524*** **
	(0.0366)	**(0.0896)**	**(0.0370)**	**(0.0366)**	**(0.0317)**	**(0.0794)**	**(0.0330)**	**(0.0317)**
PTA Depth	0.0221***	0.0257***	0.0221***	0.0221***	0.0200***	0.0248***	0.0209***	0.0200***
	(0.0027)	(0.0038)	(0.0028)	(0.0027)	(0.0028)	(0.0039)	(0.0029)	(0.0028)
Observations	1,138,486	1,106,409	1,076,307	1,125,433	1,138,486	1,106,409	1,076,307	1,125,433
R-squared	0.635	0.637	0.637	0.633	0.635	0.637	0.638	0.633

Standard errors in parentheses are clustered by exporter-importer pair. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Trade time improvements post-BRI

Version 1	Obs.	Mean	Std. Dev.	Min	Max
Change in Travel Distance (km)	3,422	-699.602	2,341.805	-10,652.7	4,713.20
Change in Travel Time (hours)	3,422	-101.33	94.89	-360.295	0
Change in Land Share along Corridors	3,422	0.278	0.231	-0.386	0.863
Change in Share of Sea Mode	3,422	-0.249	0.282	-0.895	0.418
Version 2					
Change in Travel Distance (km)	3,422	-968.658	2,061.17	-11,198.5	1,859.69
Change in Travel Time (hours)	3,422	-69.680	113.135	-560.27	0
Change in Land Share along Corridors	3,422	0.142	0.232	-0.741	0.863
Change in Share of Sea Mode	3,422	-0.110	0.224	-0.877	0.674

Table 7: Trade effects of time to trade reductions due to Belt and Road Initiative

Countries	Change in Time to Trade (%)	Change in Exports (%) Lower bound	Change in Exports (%) Upper bound
MMR	-62.8691	23.89027	35.83541
PAK	-61.6785	23.43783	35.15674
SGP	-58.5195	22.23742	33.35612
AFG	-57.9091	22.00547	33.00821
NPL	-57.6818	21.91907	32.8786
BGD	-56.9839	21.65388	32.48082
THA	-56.756	21.56728	32.35092
MYS	-55.9647	21.26657	31.89986
IND	-54.8938	20.85965	31.28947
IDN	-49.6172	18.85452	28.28178
KHM	-48.167	18.30344	27.45516
OMN	-47.8882	18.19753	27.2963
LAO	-47.1694	17.92435	26.88653
ARE	-46.3902	17.62826	26.4424

IRN	-45.9477	17.46014	26.1902
KGZ	-45.0447	17.117	25.6755
VNM	-43.7622	16.62962	24.94444
QAT	-43.5243	16.53924	24.80886
CHN	-43.2125	16.42075	24.63112
UZB	-42.8272	16.27432	24.41149
TJK	-42.4571	16.13368	24.20052
TKM	-41.6075	15.81085	23.71627
TUR	-41.4574	15.75382	23.63073
LKA	-40.8875	15.53725	23.30587
BHR	-40.8559	15.52522	23.28783
KAZ	-40.5299	15.40137	23.10206
KWT	-40.3941	15.34974	23.02462
SAU	-39.5742	15.03821	22.55732
ARM	-38.3345	14.56709	21.85064
MNG	-36.4947	13.868	20.802
SYR	-35.7467	13.58375	20.37563
JOR	-33.1387	12.59272	18.88908
RUS	-32.9918	12.53688	18.80532
AZE	-32.4329	12.3245	18.48676
IRQ	-32.2776	12.26548	18.39822
GEO	-32.1577	12.21991	18.32986
TLS	-31.5576	11.99188	17.98781
BGR	-31.0004	11.78015	17.67022
LBN	-29.5049	11.21187	16.8178
BLR	-28.7387	10.92069	16.38103
SRB	-28.3163	10.76019	16.14029
POL	-28.2594	10.73857	16.10785
MNE	-28.211	10.72018	16.08028
CZE	-28.1875	10.71124	16.06686
MKD	-28.065	10.66468	15.99702
PHL	-27.6803	10.51852	15.77777
BIH	-27.6469	10.50581	15.75872
ROM	-27.5681	10.47588	15.71381
SVN	-27.5424	10.4661	15.69916
LVA	-27.4836	10.44377	15.66566
HRV	-27.3316	10.38599	15.57898
HUN	-27.2687	10.3621	15.54315
SVK	-26.984	10.25393	15.3809
ALB	-26.9024	10.22291	15.33436
LTU	-26.5594	10.09255	15.13883
BRN	-26.4625	10.05574	15.08361
UKR	-26.2175	9.962665	14.944
MDA	-25.7848	9.798203	14.69731

Table 8: Trade Effects of Time to Trade Reductions due to BRI across Sectors

Sector	Export Pattern Change (%) Direct Effect	Export Pattern Change (%) Indirect Effect
Chemicals & Fe Metals	11.75386	16.80189
Livestock	14.71907	9.51615
Meat Products	3.475328	13.63915
Other Mnfcs	9.710368	7.28441
Motor Vehicles	10.20102	4.82391
Veg, Fruits & Nuts	11.12579	2.21445
Wood & Mineral Prods	8.476736	3.77853
Processed Food	6.687392	4.56456
Machinery & Electric	6.218016	4.29989
Extraction & Mining	5.154624	4.42358
Textile, Leather & Apparel	5.403296	4.04054
Grains, Fibers, Seeds	1.12784	3.55376