Five Stylized facts on Belt and Road Countries and their Trade Patterns

Kaku Attah Damoah[*]

Giorgia Giovannetti[†]

Enrico Marvasi[‡]

Abstract

Since the start of the China-led Belt and Road Initiative, several countries became involved and some of them received investment projects. Using data for the period 2012-2018, we show that pre-existing trade patterns are related to the likelihood to participate in the initiative and receive investments. We summarize our findings into five stylized facts. First, BRI countries with completed projects tend to be poorer and larger. Second, projects are more likely to occur in countries more involved in intermediate trade and exporting intermediates to China. Third, countries that received projects have more diversified export structures and their sectoral specialization overlaps to that of China. Fourth, among middle-high income countries, projects tend to favor those with high levels of intra-industry trade. Fifth, among BRI countries with projects, the complexity or sophistication of goods trade increases faster with income. These findings suggest that the allocation of BRI investments partially reflects the trade patterns, favoring destination with specific characteristics.

Keywords: Belt and Road, China, global value chains, trade in intermediates, centrality, networks.

JEL classification: F14, F15, F21.

Acknowledgements: The authors express their gratitude to the participants of the 2018 Villa Mondragone International Economics Conference, the c.MET05 XV Workshop 2018, ITSG 2019 workshop as well as participants of the following seminars Italian Export Credit Agency (SACE) internal seminar, Productivity and Global Value Chains seminar at Luiss University, and Roma Tre University GDS17 seminar for their comments on previous versions of the paper. All errors remain ours.

[*] University of Florence, via delle Pandette, 32, Florence, Italy; corresponding author, kakuattah.damoah@gmail.com.

[†] University of Florence, via delle Pandette, 32, Florence, Italy and European University Institute, via dei Roccettini, 9, San Domenico di Fiesole, Italy; giorgia.giovannetti@unifi.it.

[‡] University of Florence, via delle Pandette, 32, Florence, Italy; enrico.marvasi@unifi.it.

1 Introduction

Over the past decade, China has put strong emphasis on the connectivity with Central and South Asian countries. However, there has been little improvement in investments in the region, mainly due to political and economic risk. A wind of change started to take effect with the official announcement of the Belt and Road Initiative (BRI) by Xi Jinping in 2013. The BRI represents the Chinese Government effort to enhance and deepen international economic relations in the region. It is also China's most ambitious geo-economic and foreign policy initiative in decades. It combines a land-based Silk Road Economic Belt and a sea-based 21st Century Maritime Silk Road therefore creating a network of connectivity across Central, Western and Southern Asia, reaching out to the Middle East, Northern and Eastern Africa.

Infrastructure development is the most explicit and visible aspect of the Belt and Road Initiative. The importance of the infrastructural investments is also related to the fact that eight Central Asian countries are landlocked (about one-fifth of the 44 landlocked countries in the world) and Uzbekistan is doubly-landlocked countries (i.e. all its neighbors are also landlocked) a situation hampering trade and investment and de facto isolating a country. The BRI has mostly involved building roads, rails, and ports to connect countries (Andornino 2017). Through infrastructure development, the BRI has the potential to enhance regional trade and Global Value Chain (GVC) development, policy coordination, trade facilitation, financial integration as well as capital and labour mobility. The initiative has the potential to lift untapped trade participation of countries involved through production networks and intermediate trade.

Despite some criticism, thanks to the BRI, in 2016, Chinese enterprises signed 7961 new contracts for BRI-related projects, with initiatives spread unevenly across countries. According to China's Ministry of Commerce (Mofcomm), this amount represents a 30.7% increase year on year, accounting for 51% of China's total foreign contract projects in the period (Mofcomm, 2017). More than 300 major infrastructure projects, including roads, railways, dry ports, and seaports, have been completed since the inception of BRI up to September 2018.[1] Roads account for almost two-thirds of infrastructural projects, while railways, dryports and seaports account for about 10-15% each. More than sixty countries are somehow connected to the BRI. Their combined Gross Domestic Product is $23

[1] The reported figure excludes infrastructure projects in phases other than completed such as those planned, initiated, and/or under-construction.

trillion (30% of world GDP), their population approximately 4.4 billion people (around 60% of the world population).

Among the economic motives behind the BRI, international trade and global value chains considerations play a non-negligible role. Yet, the empirical evidence on BRI-related projects is scant. It is unclear whether and to what extent the current geographical distribution of completed projects reflects the existing economic relations. In particular, the relation between BRI investment projects, trade flows and comparative advantages did not receive much attention. This relation is not obvious. Different situations may arise: projects allocation may or may not be related to countries' specialization and role in production networks. Similarly, investments may favor countries with a specialization similar to China thus reinforcing the existing patterns or, on the contrary, they may favor sectoral diversification. Similarly, we do not know whether or to what extent direct trade linkages with China matter or if countries' export capabilities in terms of complexity or sophistication of exported products represent a relevant factor. It seems plausible that trade patterns considerations are one of the drivers of BRI projects and that whether investments follow the existing patterns is ultimately an empirical question.

This paper addresses these questions and gathers some stylized facts on the BRI countries and their trade patters at the launch of the BRI. We examine whether BRI infrastructural investments favor countries that are more involved in intermediate trade and/or trade more intensely with China, we then assess whether sectoral specialization plays a role, and finally consider how BRI countries differ in terms of intra-industry trade and exports sophistication.

We summarize our findings into five stylized facts. First, BRI countries are relatively poor and large. Second, their intermediate export is skewed towards China, while the same does not apply to intermediate import. Third, their exports are more diversified, and their sectoral specialization overlaps with that of China. Fourth, high-income BRI countries are more involved in intra-industry trade. Fifth, exports and imports sophistication of BRI countries increases faster with income per capita relative to other countries.

Our findings highlight that BRI investments are closely related to trade patterns and production fragmentation. BRI investments will contribute to strengthen the regional GVC and related production networks, but also provide a reliable base of suppliers to China, which in turn may be able to upgrade its production. If this is the case, then the Belt and Road Initiative is a win-win strategy.[2]

[2] There are many problems with the BRI that we do not address here (e.g. debt, finance, geopolitical), see for instance Brakman et al. (2019) and Anastasiadou (2019).

The rest of the paper is organized as follows. Section 2 describes data sources. Section 3 describes the evidence and provides the stylized facts. Section 4 includes a discussion of our findings, while Section 5 concludes

2 Data sources

Our analysis is mostly based on trade data, with a focus on trade in intermediate products and on the BRI countries. The source of the trade data is the Eora multi-regional input-output tables (Eora-MRIO) for the year 2012, before the start of BRI. The use of input-output tables allows us to consistently focus on trade in intermediates. Our definition of trade in intermediates refers to sector-to-sector exchanges and reflects the endogenous input-output structure of trade. The Eora database, contrary to other sources, has a wide country coverage, including low and middle-income countries. Each Eora input-output table includes 187 countries and 26 sectors; hence, the intermediate block has 26 times 187 cells, for a total of more than 23.6 million country-sector-to-country-sector observations. In most of the empirical analysis, we elaborate and organize the data and the variables so to operate at the country-sector level, with 4862 country-sector observations. Other country level variables, such as GDP per capita are taken from the World Bank Doing Business and World Development Indicators (WDI).

Regarding the BRI, our analysis considers the six land corridors, encompassing the central cities along the international routes and the economic industrial parks (as cooperation platforms):

1. the China–Mongolia–Russia Corridor
2. the New Eurasian Land Bridge
3. the China–Central Asia–West Asia Corridor
4. the China–Indochina Peninsula Corridor
5. the China–Pakistan Corridor, and
6. the Bangladesh–China–India–Myanmar Corridor.

We focus on transport infrastructure projects completed between 2013 and 2018. The data on infrastructural investments are taken from the Reconnecting Asia project of the Center for Strategic and International Studies (CSIS). This project maps five infrastructural projects types – road, rail, seaports, intermodal facilities, and powerplants – geographically spread in Eurasia countries. This database represents our source for the identification of the countries involved in the BRI; these countries can be further divided into those with completed projects and the participants with no

completed projects so far. A list of member countries, geographic scope as well as related organizations, initiatives, projects and events is available on the website.[3]

In what follows, we concentrate on the trade figures for the year 2012, a year before the 2013 official announcement of the Belt and Road Initiative. This allows us to describe the pre-existing trade patterns and to investigate their relationship with the subsequent BRI investments completed between 2013 and 2018.

3 Stylized facts

Trade between China and its Central Asian partners increased substantially in the last fifteen years. Back to 2000, the BRI countries only constituted 13% of China's exports and 19% of China's imports, by 2015 the two shares have reached 27% and 23% respectively. The largest trading partners for China along the Belt and Road area are ASEAN countries (12% of China's total exports and 11.58% of total imports) with a relatively balanced trade payment, partly because of their complementarity on value added chain. China's second largest trading partners within the BRI area are countries in the Middle East (from where China mainly imports oils). South Asia is the third largest trading partner along the road and has a very unbalanced bilateral trade as well as a complex product structure. Central Asia, Central and Eastern European countries and Mongolia added up together account for less than 3 percent of China's external trade. Production and exports from Central Asia currently are concentrated in oil, minerals, and agricultural products, although there is considerable diversity among the countries and some countries are specialized in manufacturing, typically textiles and machinery.

Starting a project in one country rather than in another represents a clear signal of preference or of higher expected return. The main recipients are likely to be the most strategic countries for the initiative. Are these richer countries? Or are these intermediate products producers? Or raw material providers, or large and increasing destination markets? To select the main patterns, we separate the BRI countries into two groups: those that are potentially involved in the BRI, but still see no active projects; and those with completed projects. We thus study the trade characteristics of BRI countries with completed projects vis-à-vis BRI countries where projects are not yet completed and compare them to a third residual group, i.e. the "non-BRI countries" (i.e. countries excluded or not yet included in the BRI).

In what follows we single out five stylized facts connecting BRI investments to the income per capita level of the destination countries.

[3] See https://reconnectingasia.csis.org/database/initiatives/one-belt-one-road/

3.1 GDP per capita and population

Let us first consider the income level of BRI and non-BRI countries by comparing their average GDP per capita as reported in Table 1. BRI countries are relatively poor compared to the world average income per capita. This fact could be partially due to the geography of the BRI, involving landlocked Western and Central Asian countries. However, BRI countries are very heterogeneous.

The income gap between countries with completed projects and the other BRI countries is even larger. The income of the former is less than half that of the latter. Income per capita of the project recipients is about half the world average, while that of the BRI countries with no completed project is 5 thousand dollars higher that the world average. Considering that many projects involve roads, rails and ports, these numbers suggest that investments seem to go where the infrastructure is more lacking and perhaps the return on each dollar spent is likely to be higher.

The opposite trend emerges when we consider population. BRI countries are larger than the world average, however, this result is driven by India; excluding India, BRI countries are close to the world average population. Among BRI countries, the presence of India, a large country which is among the project recipients, confirms the evidence that projects tend to go towards large countries. The effect of country size may be related to gravity forces (proportionality with the "mass") and to the fact that projects may yield greater returns in larger markets.

Table 1: Income and population of BRI countries

	Per Capita GDP (2012) (US dollar)	Population (2012) (mln)	Population excl. India (2012) (mln)
BRI countries	10627	50.2	29.9
of which			
completed projects	*7700*	*62.5*	*35.8*
non-projects	*19603*	*12.4*	*12.4*
non-BRI countries	16927	35.3	35.3
Total	14693	40.6	33.5

Note: Projects refers to BRI countries with at least one completed infrastructure projects, while non-projects refer to BRI countries without any completed projects.
Source: authors' elaborations based on CSIS and WDI.

Stylized fact 1. (Income and size) *BRI countries are relatively poor and large. Among them those with completed projects tend to be poorer and larger.*

3.2 Trade in intermediate goods

Let us now focus on trade in intermediate goods singling out the shares of total intermediates exported to China and imported from China.[4] Larger shares of intermediates in total trade could suggest a stronger participation in production networks. Descriptive statistics are reported in Table 2. At the world level, trade in intermediates represents about 71% of total export and 64% of total import (country-sector average). BRI countries trade slightly less intermediates, but they trade more with China. Within BRI countries, those with projects trade more intermediates, export more to China, but import less from China. This evidence is in line with the idea that BRI projects may allow China to develop its suppliers' network, freeing internal resources for upgrading, while at the same time helping industrial development in the recipient countries.

Table 2: Intermediate exports and imports shares

	Export	Import	Export^{CHN}	Import^{CHN}
BRI	70.1%	63.5%	4.2%	5.0%
of which				
projects	*71.2%*	*64.4%*	*4.6%*	*4.9%*
non-projects	*66.9%*	*61.0%*	*3.1%*	*5.5%*
non-BRI	71.4%	64.2%	3.6%	4.8%
Total	70.9%	63.9%	3.8%	4.9%

Note: Projects refers to BRI countries with at least one completed infrastructure projects, while non-projects refer to BRI countries without any completed projects.
Source: authors' elaborations based on Eora and CSIS.

Stylized fact 2. (Intermediate trade) *BRI countries with completed projects are more involved in intermediate trade than other countries. Their intermediate export is skewed towards China, but the same does not apply to intermediate import.*

3.3 Specialization and revealed comparative advantage

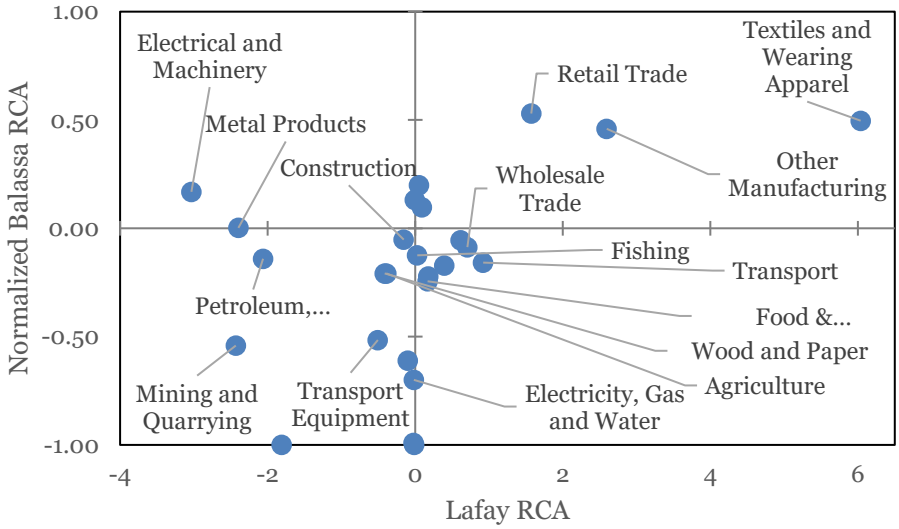
Intermediate trade relations provide a first indication that production linkages matter, however the aggregate numbers overlook sectoral heterogeneity and countries' comparative advantages. Hence, we now investigate whether countries with completed projects share common sectoral specialization patterns. To this aim, we compute two revealed comparative advantage indexes (RCA), the Balassa (1965) index, considering relative sectoral export shares (we use the normalized version), and the Lafay (1992)

[4] Based on the Eora MRIO tables, trade in intermediate goods refers to the inter-sectoral international block-matrices of the tables.

index, which measures the sectoral contribution to the overall normalized trade balance. While the Balassa index only takes into account exports, the Lafay index also considers imports, thus being more suitable when GVC and intra-industry trade (IIT) are pervasive. The two indicators tend to identify the same sectors of specialization, yielding similar distributions of comparative advantages.[5]

Figure 1 reports the Lafay RCA index for China together with the Balassa index. Both indexes signal a strong specialization in textile, other manufacturing, and retail trade. The only sector which seems to have different results when looking at the two indices is electrical and machinery. This is likely to be due to trade in intermediate goods, which we investigate later.

Figure 1: RCA sectors for China



Source: authors' elaborations based on Eora and CSIS.

A property of the Lafay index is that it sums to zero. This is useful to investigate the so-called polarization, that is the strength of (de)specialization. RCA polarization measured by the sum of positive Lafay indexes is reported in Table 3: a lower value signals a more diversified economy. To this regard, BRI and non-BRI countries are very similar; however, BRI countries with projects tend to have a more diversified trade structure. This could suggest that investments do not seek a specific sectoral specialization.

[5] The two indexes are in line for 82% of the country-sector observations. See the appendix A3 for details.

Table 3: RCA polarization

	Cum. positive Lafay RCA
BRI	19.713
of which	
projects	*18.525*
non-projects	*23.128*
non-BRI	19.588
Total	19.630

Note: Projects refers to BRI countries with at least one completed infrastructure projects, while non-projects refer to BRI countries without any completed projects.
Source: authors' elaborations based on Eora and CSIS.

Although countries that received investments do not have a particularly strong specialization in few sectors, projects may follow a specialization rationale. The hypothesis we want to investigate is whether projects tend to favor countries whose specialization is similar to that of China. In this case, carrying out an infrastructural project could suggest that China would like to move up the Global Value Chain to possibly more value-added rich phases of production.

To assess similarity in specialization, we use two measures: i) the shares of country-sector observations for which the sign of the RCA indexes coincides with that of China; ii) a continuous RCA overlap index – that varies from 0 to 1 - measuring the degree of similarity in sectoral specialization with China (Table 4).

Table 4: RCA overlap with China

	RCA same sign (Balassa)	RCA same sign (Lafay)	RCA overlap (Balassa)	RCA overlap (Lafay)	Aggregate RCA overlap (Balassa)	Aggregate RCA overlap (Lafay)
BRI	0.527	0,551	0.748	0.870	0.400	0.467
of which						
projects	*0.528*	0,559	*0.752*	0.872	*0.409*	*0.496*
non-projects	*0.522*	0,531	*0.737*	0.865	*0.374*	*0.383*
non-BRI	0.476	0,556	0.706	0.848	0.299	0.448
Total	0.493	0,554	0.720	0.855	0.333	0.454

Note: Projects refers to BRI countries with at least one completed infrastructure projects, while non-projects refer to BRI countries without any completed projects.
Source: authors' elaborations based on Eora and CSIS.

The first two columns show the shares of country-sector observations with a specialization similar to China; the third and fourth columns show the overlap indexes. On average, BRI countries have a relatively high degree of overlap with China, with countries that received projects showing a slightly larger overlap. While this may suggest that investments tend to favor countries with a specialization close to that of China, at this level of analysis the evidence does not seem particularly strong.

The above evidence is based on averages of country-sector overlap indexes. As a check, we compute country aggregate overlap indicators (last two columns). Results are qualitatively similar and even stronger, although the degree of overlap is lower (by construction). BRI countries overlap relatively more with China, with countries that

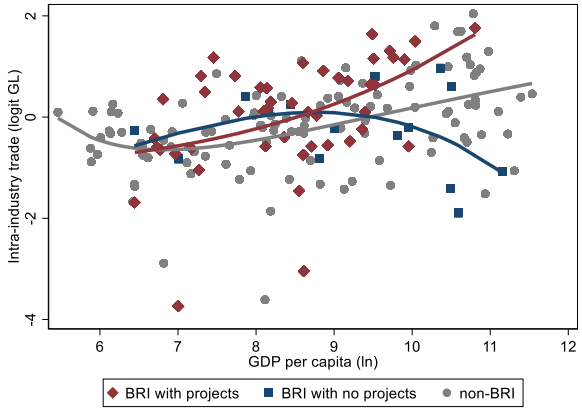
received projects showing a particularly high degree of overlap, especially as measured by the Lafay index, i.e, accounting also for intermediate imports.

Stylized fact 3. (Sectoral specialization) *BRI countries with completed projects have diversified exports relative to other countries and their sectoral specialization overlaps with that of China.*

3.4 Intra-industry trade

To better investigate product differentiation and production fragmentation, let us focus on intra-industry trade (IIT). This is particularly relevant for China since the country is a major importer of manufactured inputs used in the production of its own exports. In this context, intra-industry linkages typically constitute the larger share of trade, especially with broader sector definition (as in Eora). By investigating IIT, we are able to keep track of product differentiation and production fragmentation concerning trade flows within broadly defined sectors. The most commonly used IIT indicator is the Grubel & Lloyd (1971, 1975) index (GL; see the Appendix A3 for details). Plotting GL against GDP per capita, as in Figure 2 reveals a positive correlation: richer countries tend to trade more within sectors. In the figure, however, we see that middle-high income BRI countries with completed projects tend be more involved into intra-industry trade than their income level would imply. Table 5 report the statistics also by income group (World Bank definitions).

Figure 2: Intra-industry trade and GDP per capita.



Source: authors' elaborations based on Eora, CSIS and WDI.

Table 5: Intra-industry trade by BRI participation and income.

	All countries	by income level (GDP per capita)				
		Bottom 10% (<700$)	Low income (Med=600$)	Middle income (Med=3,600$)	High income (Med=35,000$)	Upper 10% (>45,000$)
BRI countries	0.50	0.29	0.33	0.48	0.60	0.50
of which						
completed projects	*0.52*	*0.16*	*0.28*	*0.48*	*0.72*	*0.85*
non-projects	*0.44*	*0.43*	*0.37*	*0.49*	*0.43*	*0.32*
non-BRI countries	0.47	0.38	0.39	0.42	0.57	0.53
Total	0.48	0.38	0.38	0.45	0.57	0.52

Source: authors' elaborations based on Eora, CSIS and WDI.

Stylized fact 4. (Intra-industry trade) *Upper-middle-income BRI countries are more involved in intra-industry trade relative to non-BRI countries. The share of intra-industry trade is much higher for upper-middle-income BRI countries with projects and increases faster with income.*

3.5 Export and import sophistication

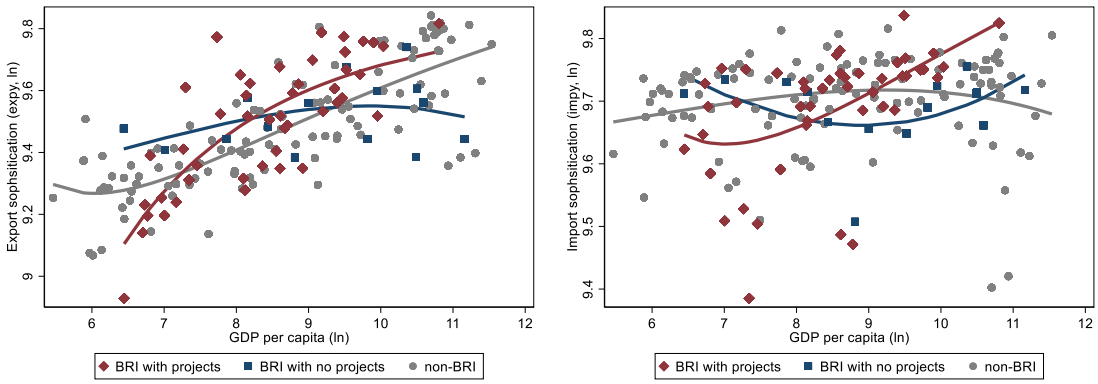
The above analysis shows that the allocation of BRI projects is associated with the pre-existing trade patterns. The type of goods traded may also matter. The import-export bundle of goods of a country is related to its stage of development. Part of the existing literature has suggested that more advanced countries supply on average more complex or sophisticated products. China is a renown outlier in this pattern (a finding that has been summarized by Rodrik (2006) as "China is special"). Rodrik (2006) and subsequent studies highlights the fact that China's export is particularly sophisticated conditional on its level of development. We build on Marvasi (2013) to investigate whether export and import sophistication are associated with BRI involvement.

Figure 3 shows export and import sophistication. As expected, exports sophistication is more variable than import sophistication, reflecting more closely the income level.[6] Import sophistication tends to be higher than export sophistication, indicating that less developed countries tend to import relatively sophisticated products exporting less sophisticated ones, while more advanced countries trade highly sophisticated products. Consequently, the gap between import and export sophistication decreases with income. The figure suggests that we can generalize the "China is special" finding to middle-income BRI countries. To this regard, the BRI may contribute to create a group of interconnected sophisticated exporters. Marvasi (2013) shows that China's surprisingly high level of sophistication is due to intermediates, for which export

[6] See Rodrik 2006.

sophistication surpassed import sophistication in the early 2000s. Over time, the increasing export sophistication signals China's upgrading. However, such improvement also implies that, relative to its income, China is becoming "less special". This adds to the possibility that the BRI can help China upgrade its suppliers' network.

Figure 3 – Export and import sophistication.



Source: authors' elaborations based on Eora and WDI.

Figure 3 shows that middle-high-income BRI countries with completed infrastructure projects have on average higher export and import sophistication, while lower-income countries have lower sophistication. Furthermore, the fitted slope is different compared to BRI countries with no projects, especially at higher income level. Table 6 supports the descriptive statistical evidence.

Table 6 – Export and import sophistication by BRI participation and income.

		by income (GDP per capita)				
	All countries	Bottom 10% (<700$)	Low income (Med=600$)	Middle income (Med=3,600$)	High income (Med=35,000$)	Upper 10% (>45,000$)
			Export sophistication ($)			
BRI countries	13,613	10,302	10,690	13,157	15,414	14,096
of which						
completed projects	*16,637*	*7,545*	*8,437*	*13,143*	*16,359*	*18,334*
non-projects	*13,544*	*13,059*	*12,191*	*13,254*	*14,234*	*11,978*
non-BRI countries	13,253	10,705	11,018	12,528	15,239	14,511
Total	13,371	10,664	10,967	12,800	15,286	14,475
			Import sophistication ($)			
BRI countries	16,243	15,813	16,284	15,894	16,986	17,506
of which						
completed projects	*16,239*	*15,112*	*15,291*	*15,930*	*17,476*	*18,485*
non-projects	*16,254*	*16,514*	*16,945*	*15,648*	*16,374*	*17,017*
non-BRI countries	16,271	16,171	16,043	16,333	16,333	15,814
Total	16,262	16,135	16,081	16,143	16,508	15,960

Source: authors' elaborations based on Eora, CSIS and WDI.

Stylized fact 5. (Exports sophistication) *Exports and imports of low-middle-income BRI countries with completed projects have low-sophistication levels. Sophistication of BRI countries with projects increases faster with income per capita relative to other countries.*

3.6 Robustness checks

We now further investigate the evidence emerged above on the correlation between the BRI involvement with the intermediate trade shares and RCA indexes. To this aim, we run a set of simple descriptive OLS regressions in which we control for GDP per capita. We are interested in the BRI and projects dummies, which provide an indication of the conditional means. Let us start with a set of country-sector regressions and estimate:

$$y_{ij} = \alpha + \beta_1 I_i + \beta_2 X_i + \gamma_j + \varepsilon_{ij}$$

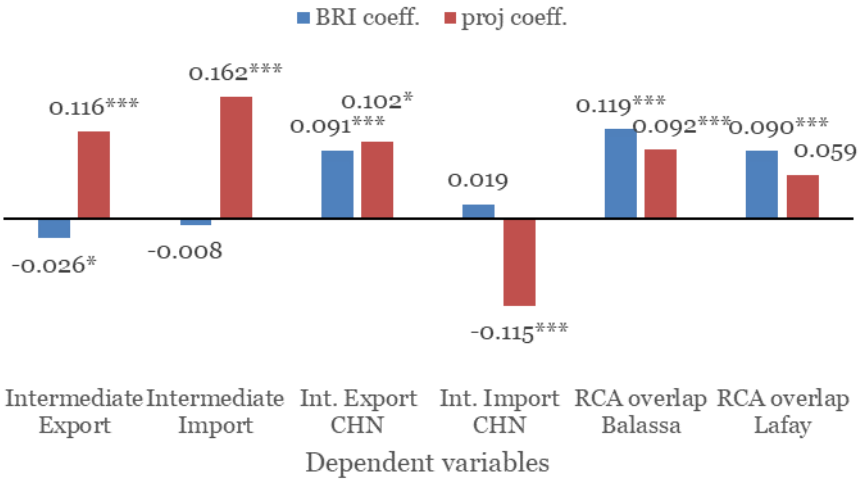
where the dependent variable y_{ij} is alternatively: intermediate export (i) and import share of total trade (ii), China's share of intermediate export (iii) and import (iv), the two RCA overlap indexes based on Balassa (v) and Lafay indicators (vi); I_i is a dummy indicating whether country *i* is part of BRI or otherwise. In a second specification on BRI countries only, we control for whether the country has received projects or otherwise; X_i are country-level controls, i.e. GDP per capita (replacing GDP per capita with a logistics index does not affect the results; the two variables are positively correlated); γ_j denote sector fixed effects and ε_{ij} is the error term.

All the results are in line with the previous evidence based on simple averages, suggesting that the above stylized facts hold also controlling for GDP per capita and sector characteristics.[7] On average richer countries export less intermediates, while importing more of them. This confirms the idea that countries at a higher stage of development tend to occupy downward segments of GVCs. Let us focus on our variables of interest and refer to Figure 4 depicting the coefficients of the BRI and project dummies from the respective regressions (see the appendix for complete regression tables). In the Figure, we see that the BRI dummy coefficient on intermediate export is negative while that on import is non-significant, meaning that BRI countries tend to export fewer intermediate products than their income level would predict. The project dummy coefficients on intermediate export and import are both positive, showing that, contrary to other BRI countries, those that received projects tend to export and import more intermediates. This seems to suggest that BRI investments and production networks are

[7] Detailed results are below in the Appendix.

closely related. With respect to the share of China as a destination or source of intermediate products, results indicate that on average richer countries trade more intermediates with China. This effect is higher for import from China: BRI countries export more intermediates to China, but do not import more from China (see the BRI dummy coefficients on intermediate export and import with China.). This evidence is even stronger for BRI countries with completed projects. They export more intermediates to China but import less (the project dummy coefficient is positive on intermediate export to China while it is negative on intermediate import from China). This suggests that investments may favor countries that are in a better position to supply intermediates to China, rather than countries that demand inputs. Finally, BRI countries and China have relatively similar specialization; this holds for countries with projects as well (see the BRI and project dummy coefficients for RCA overlap in Figure 4). BRI investments, thus, tend to reflect China's comparative advantages, perhaps in different segments within the same sectors.

Figure 4 – Estimated coefficients of BRI and projects dummies on different variables.



* p<0.1, ** p<0.05, *** p<0.01; see the appendix for detailed regression tables.
Source: authors' elaborations based on Eora, CSIS and WDI.

We now investigate further the evidence on intra-industry trade, export and import sophistication of BRI countries by means of simple OLS regressions. The econometric specification is based on the previous one, but the analysis is now at the country level. Moreover, interaction terms are introduced to account for the changing relationship with income emerged in the previous analysis.

Columns (1) and (2) of Table 7 report the results for IIT. Model (1) is run on all countries (BRI and non-BRI) and includes a dummy for BRI countries with projects and

a dummy for BRI countries with no projects. Model (2) instead includes BRI countries only. Results are in line with the evidence presented above. The interaction terms provide the most interesting results confirming that IIT increases faster with income among BRI countries with projects and that, among them, higher-income countries are particularly involved in IIT, while the opposite seems to apply to countries that did not receive investments. BRI investments seem to be more likely among more developed countries that are more involved in IIT.

Columns (3)-(4) and (5)-(6) repeat these two specifications for export and import sophistication. Again, the regression analysis confirms the descriptive evidence. In particular for BRI countries with projects both export and import sophistication levels increase faster with income than for the other countries. Other things equal, BRI countries gain sophistication faster or, from a different perspective, investments seem to have favored countries with lower import-export sophistication among less developed countries and those with higher import-export sophistication among more developed countries.

Table 7 – IIT, export and import sophistication of BRI countries.

	(1)	(2)	(3)	(4)	(5)	(6)
	IIT (G&L, logit)		Exp. Soph. (expy, ln)		Imp. Soph. (impy, ln)	
	All	BRI	All	BRI	All	BRI
	b/se	b/se	b/se	b/se	b/se	b/se
GDP per capita (ln)	0.225***	-0.098	0.090***	0.023	0.004	0.001
	(0.049)	(0.182)	(0.007)	(0.024)	(0.004)	(0.015)
Projects	-1.933*	-4.668**	-0.424***	-1.028***	-0.357***	-0.369**
	(1.103)	(2.034)	(0.155)	(0.271)	(0.097)	(0.172)
Projects × GDP per capita	0.259**	0.582**	0.055***	0.122***	0.041***	0.044**
	(0.129)	(0.225)	(0.018)	(0.030)	(0.011)	(0.019)
No-projects	2.735*		0.604***		0.013	
	(1.587)		(0.223)		(0.139)	
No-projects × GDP per capita	-0.323*		-0.067***		-0.003	
	(0.171)		(0.024)		(0.015)	
Constant	-2.096***	0.639	8.700***	9.305***	9.671***	9.683***
	(0.432)	(1.694)	(0.061)	(0.226)	(0.038)	(0.143)
R-squared	0.194	0.206	0.600	0.547	0.108	0.218
N (Countries)	172	61	172	61	172	61

* p<0.1, ** p<0.05, *** p<0.01

4 Discussion

The BRI represents an opportunity for China to strengthen its trade relationships with neighboring countries by developing new export markets in Central, South and Southeast Asian countries as well as secure suppliers for its manufacturing. By virtue of BRI-related investments, existing value chains are likely to be reconfigured in the region with new countries joining whilst participating countries are likely to move along the chain to different value-added phases.

According to Huang (2016), the BRI was promoted as an attempt to sustain China's economic growth and transition towards a more balanced development pattern, while also enhancing the country's role in the international setting. Cai (2017) highlights that China's "comparative advantages in manufacturing, such as low labor costs, have begun to disappear. For this reason, the Chinese leadership wants to capture the higher end of the global value chain. To do this, China will need to upgrade its industry." (pp.8) Also, in the words of Hu Huaibang, Chairman of the China Development Bank: "On the one hand, we should gradually migrate our low-end manufacturing to other countries and take pressure off industries that suffer from an excess capacity problem. At the same time, we should support competitive industries such as construction engineering, high-speed rail, electricity generation, machinery building and telecommunications moving abroad."[8]

The stylized facts that we gathered in this paper are in line with these perspectives and show that pre-existing trade patterns play a role in the allocation of investment projects across countries. Looking at completed projects, our findings suggest that priority was given to relatively poor and large countries whose intermediate trade with China is relatively intense and whose specialization tends to align with that of China.

Promoters of initiative often stress the mutual benefits and the creation of win-win situations. However, not everyone shares such positive attitude towards the initiative. India represents an interesting case, being one of the most important countries in the region as well as one in which skepticism has arisen. Nataraj and Sekhani (2015) and Banerjee (2016) study the case and argue that, despite some distrust towards the initiative, India should welcome the projects as it is likely to gain from trade with China and from infrastructure building, while an ineffective involvement may lead to isolation risks. Yet, the perception of a China-centric approach might create some frictions with other countries involved, as some of their sectors are directly competing with China. This aspect is clearly of primary economic importance for China's trade and development and, therefore, for the entire investment strategy behind the projects.

Whether the BRI will succeed in increasing trade and contribute to the development of the countries involved is an open question. Our results, however, suggest that there is much to gain for BRI countries and that the sophistical level of the exported products might increase very fast, possibly benefiting all the countries involved.

[8] Hu Huaibang, "以开发性金融服务'一带一路'战略 (Using Development Finance to Service the One Belt and One Road Strategy)", China Banking Industry Magazine, 13 January 2016, http://www.cdb.com.cn/rdzt/gjyw_1/201601/t20160118_2187.html. Also cited in Cai (2017).

Infrastructure investments (new roads, railways, ports and communications) reduce transport costs and facilitate the movement of goods and people. Along the BRI corridors, firms will be able to better coordinate production and the division of labor across regions. Landlocked economies will benefit from easier access to important routes. For several of them, participating in GVCs can help a transition from being a supplier of natural resources and raw materials to becoming a manufacturer of goods and services. More generally, developing countries involved in the BRI are likely to be strongly affected by Chinese investments as the returns even to relatively small projects are likely to be large. This is beneficial to the regional GVC and helps China building a reliable base of suppliers.

BRI countries can provide a reliable base of suppliers to China, which in turn may be able to upgrade its productions and possibly alleviate its problems of overcapacity by finding "new" markets (which are also likely to be "grateful" because of the investments). The BRI is likely to reinforce China's comparative advantages by building on the specialization of other countries in the same sectors on different phases.

China is already an important GVC player at the world level and especially in Asia as well as being the main central node in the Asian intermediate trade network. The Belt and Road Initiative provides an opportunity for China to engage other developing countries in GVC trade and benefit from importing intermediate inputs and moving up in the value chain to higher value-added phases. At the same time the BRI is likely to reinforce the inter-regional connections by increasing the importance of strategic countries that are most likely to have a role as gates towards distant relevant markets such as Western Europe.

5 Conclusion

Our paper highlighted and discussed five stylized facts regarding trade along the BRI corridors. Large and relatively poor countries are more likely to have completed BRI-related investment projects. Countries where projects have been implemented and completed have a relatively more diversified export structure than their peers, and their specialization tends to overlap with the one of China. More projects are completed in countries that supply intermediates to China. The pre-existing trade patterns can therefore help explaining the number and value of completed infrastructural investments.

In summary, our findings highlight that the geographical allocation of BRI infrastructural projects is closely related to the pre-existing trade. Opportunities are there, along the "silk road"; to what extent they will be exploited is another matter.

References

Anastasiadou, Irene E. 2019. “Iron Silk Roads: The Geopolitics of Past and Present Initiatives for the Revival of Eurasian Trade through Overland Transport Corridors.” *Cambridge Journal of Regions, Economy and Society* 12 (1): 57–76. https://doi.org/10.1093/cjres/rsy035.

Andornino, Giovanni B. 2017. “The Belt and Road Initiative in China’s Emerging Grand Strategy of Connective Leadership.” *China & World Economy* 25 (5): 4–22. https://doi.org/10.1111/cwe.12211.

Balassa, Bela. 1965. “Trade Liberalisation and ‘Revealed’ Comparative Advantage.” *The Manchester School*. https://doi.org/10.1111/j.1467-9957.1965.tb00050.x.

Banerjee, Dipankar. 2016. “China’s One Belt One Road Initiative – An Indian Perspective.” *ISEAS Yusof Ishak Institute, Perspective*, no. 14: 1–10.

Brakman, Steven, Peter Frankopan, Harry Garretsen, and Charles Van Marrewijk. 2019. “The New Silk Roads: An Introduction to China’s Belt and Road Initiative.” *Cambridge Journal of Regions, Economy and Society* 12 (1): 3–16. https://doi.org/10.1093/cjres/rsy037.

Cai, Peter. 2017. “Understanding China’s Belt and Road Initiative.” *Lowy Institute*, no. March: 26.

Grubel, H. G., and P. J. Lloyd. 1971. “The Empirical Measurement of Intra-Industry Trade.” *Economic Record*. https://doi.org/10.1111/j.1475-4932.1971.tb00772.x.

———. 1975. “Intra-Industry Trade: The Theory and Measurement of International Trade in Differentiated Products.” *The Economic Journal*. https://doi.org/10.1007/s13277-014-2626-1.

Huang, Yiping. 2016. “Understanding China’s Belt & Road Initiative: Motivation, Framework and Assessment.” *China Economic Review* 40: 314–21. https://doi.org/10.1016/j.chieco.2016.07.007.

Lafay, Gérad. 1992. “The Measurement of Revealed Comparative Advantage.” In *International Trade Modelling*.

Marvasi, Enrico. 2013. “The Sophistication of China’s Exports, Imports and Intermediate Products.” In *The Chinese Economy: Recent Trends and Policy Issues*, 181–209. https://doi.org/10.1007/978-3-642-28638-4_9.

Nataraj, G, and R Sekhani. 2015. “China’s One Belt One Road: An Indian Perspective.” *Economic & Political Weekly* 50 (49): 67–71.

Rodrik, Dani. 2006. “What’s So Special about China’s Exports?” *China &World Economy* 14 (5): 1–19. https://doi.org/10.1007/s11745-004-1336-x.

Appendix

Table A1 – List of BRI countries (September 2018).

Corridors	Countries	Number of Projects
New Eurasia Land Bridge Economic Corridor	Armenia	1
	Azerbaijan	8
	Belarus	7
	Georgia	6
	Kazakhstan	26
	Montenegro	1
	Poland	1
	Romania	2
	Russia	16
	Ukraine	4
China-Central Asia-West Asia Economic Corridor	Afghanistan	4
	Albania	2
	Bulgaria	4
	Croatia	8
	Iran	4
	Kyrgyzstan	21
	Mongolia	2
	Serbia	2
	Tajikistan	16
	Turkey	12
	Turkmenistan	1
	Uzbekistan	4
South-East Asia	Brunei	0
	Cambodia	22
	Indonesia	3
	Laos	11
	Malaysia	2
	Myanmar	2
	Philippines	5
	Singapore	3
	Thailand	6
	Timor-Leste	0
	Vietnam	21
South Asia	Bangladesh	14
	Bhutan	1
	India	18
	Maldives	1
	Nepal	3
	Pakistan	20
	Sri-Lanka	8
Middle East and Africa	Bahrain	1
	Egypt	0
	Iraq	2
	Israel	0
	Jordan	0
	Kuwait	0
	Lebanon	0
	Oman	0
	Palestine	0
	Qatar	0
	Saudi-Arabia	2
	Syria	0
	United Arab Emirates	0
	Yemen	0
Central Europe	Bosnia and Herzegovina	6
	Czech-Republic	0
	Estonia	3
	Hungary	2
	Latvia	2
	Lithuania	0
	Macedonia	0
	Moldova	1
	Slovakia	1
	Slovenia	1

Source: Center for Strategic and International Studies.

Indexes and measures

Revealed comparative advantage indexes

Balassa RCA

The Balassa RCA index is computed as:

$$BRCA_{ij} = \frac{x_{ij}/X_i}{X_j/X}$$

where x_{ij} is exports of sector j of country i, $X_i = \sum_j x_{ij}$ is total exports of country i, $X_j = \sum_i x_{ij}$ is world exports of sector j and $X = \sum_i \sum_j x_{ij}$ is world exports. The index goes from 0 to infinity, with specialization sectors being those with $RCA_{ij} > 1$. Since the index is asymmetric, its normalized version is commonly used. The normalized Balassa index can be computed as:

$$\widetilde{BRCA}_{ij} = \frac{RCA_{ij} - 1}{RCA_{ij} + 1}$$

The normalized index goes from -1 to +1, being centered at zero. Positive (negative) values denote (de)specialization sectors.

Lafay RCA

The Lafay RCA index is computed as:

$$LRCA_{ij} = \left(\frac{x_{ij} - m_{ij}}{x_{ij} + m_{ij}} - \frac{X_i - M_i}{X_i + M_i}\right)\frac{x_{ij} + m_{ij}}{X_i + M_i}$$

where m and M denote imports. The index may take values in (-∞, +∞), with positive values indicating specialization sectors. By construction the index has the property that $\sum_j LRCA_{ij} = 0$.

Balassa and Lafay accordance

The table below show the shares of country-secto observations for which the two RCA indicators signal a comparative advantage (+) or disadvantage (-).

Table A2 – Specialization (+) and despecialization (-) sectors.

		Lafay +	Lafay -	Total
Balassa	+	41.4	8.1	49.6
	-	10.0	40.5	50.4
Total		51.4	48.6	100

Source: authors' elaborations based on Eora and CSIS.

RCA overlap

The overlap index (OI_{ij}) between the RCA_{ij} index of sector j of country i and the respective index for China, $RCA_{CHN,j}$, is computed as:

$$OI_{ij} = 1 - \frac{\Delta RCA_{ij}}{max\{\Delta RCA_{ij}|j\}}$$

where $\Delta RCA_{ij} = |RCA_{ij} - RCA_{CHN,j}|$ is the absolute difference between the indexes, $max\{\Delta RCA_{ij}|j\}$ is the cross-country largest sectoral absolute difference (note that the smallest sectoral absolute difference is zero by construction). For the normalized Balassa index, the $\Delta RCA_{ij}{}_{max} = 2$, since the index goes from -1 to +1. The overlap index goes from zero (no overlap) to one (perfect overlap).

The country-level overlap index can be easily computed, starting from the aggregate absolute difference in RCA with China, as:

$$OI_i = 1 - \frac{\sum_j \Delta RCA_{ij}}{max\{\sum_j \Delta RCA_{ij}\}}$$

Intra-industry trade: GL index

The most used IIT indicator is the Grubel-Lloyd index. For each sector, the index simply considers the degree of overlap between import and export. Its formulation for sector *j* of country *i* is the following:

$$GL_{ij} = 1 - \frac{|x_{ij} - m_{ij}|}{x_{ij} + m_{ij}} = \frac{2min\{x_{ij}, m_{ij}\}}{x_{ij} + m_{ij}}$$

The GL_{ij} index takes values from 0 to 1, where 0 means no IIT, i.e. one of the two trade flows is zero, and 1 indicates the maximum degree of IIT or a prefect sectoral import-export overlap.

Export and Import Sophistication indexes

The export sophistication index takes two steps. First, we calculate product sophistication as the average income level of exporting countries with weights equal to their RCA. A product is thus sophisticated if exported by specialized advanced economies. The index is computed as:

$$prody_j = \sum_i \frac{BRCA_{ij}}{\sum_i BRCA_{ij}} y_i = \sum_i \frac{x_{ij}/X_i}{\sum_i (x_{ij}/X_i)} y_i$$

where y_i denotes GDP per capita and $BRCA_{ij}$ is the Balassa RCA index for sector j of country i.

The country level export sophistication is obtained as a weighted average of the sophistication level of its export bundle.

$$expy_i = \sum_j \frac{x_{ij}}{X_i} prody_j$$

Import sophistication is computed similarly as a weighted average of the sophistication level of a country's import bundle.

$$impy_i = \sum_j \frac{m_{ij}}{M_i} prody_j$$

This way of measuring import sophistication has been proposed in Marvasi (2013) and has the advantage of being based on univocal definition of product sophistication. The fact that product sophistication is based on exports is meaningful since exports reflect more closely the production capabilities of countries and, empirically, countries are more diverse in their export bundles than in their import bundles. The implication of measuring import sophistication in this way is that countries with sophisticated imports are those that buy sophisticated products, that is products that tend to be exported by richer countries. This is particularly useful when input-output linkages matter, since import sophistication is likely to capture the fact that a country obtains its inputs from advanced economies, a fact that may represent itself a source of competitive advantage in GVC.

Detailed regressions

Table A3 – Intermediate export and import shares and OBOR countries.

	(1) Intermediate Export b/se	(2) Intermediate Export b/se	(3) Intermediate Import b/se	(4) Intermediate Import b/se
BRI	-0.026*	-0.018	-0.008	-0.004
	(0.013)	(0.014)	(0.017)	(0.018)
Log GDP per capita	-0.052***		0.060***	
	(0.004)		(0.005)	
Logistics Index		-0.192***		0.179***
		(0.011)		(0.016)
Constant	1.045***	1.132***	0.038	0.023
	(0.043)	(0.044)	(0.048)	(0.052)
Sector F.E.	Yes	Yes	Yes	Yes
R-squared	0.093	0.098	0.115	0.112
N	4471	3951	4472	3952

* p<0.1, ** p<0.05, *** p<0.01

Table A4 – Intermediate export and import shares and projects recipients.

	(1) Intermediate Export b/se	(2) Intermediate Export b/se	(3) Intermediate Import b/se	(4) Intermediate Import b/se
Projects	0.116***	0.140***	0.162***	0.138***
	(0.026)	(0.025)	(0.031)	(0.030)
Log GDP per capita	-0.024***		0.085***	
	(0.009)		(0.011)	
Logistics Index		-0.227***		0.127***
		(0.027)		(0.035)
Constant	0.625***	1.034***	-0.339***	0.040
	(0.100)	(0.099)	(0.112)	(0.113)
Sector F.E..	Yes	Yes	Yes	Yes
R-squared	0.102	0.105	0.101	0.095
N	1586	1508	1586	1508

* p<0.1, ** p<0.05, *** p<0.01

Table A5 – Intermediate trade with China and OBOR countries.

	(1) Intermediate Export^{CHN} b/se	(2) Intermediate Export^{CHN} b/se	(3) Intermediate Import^{CHN} b/se	(4) Intermediate Import^{CHN} b/se
BRI	0.091***	0.101***	0.019	0.030
	(0.029)	(0.031)	(0.021)	(0.020)
Log GDP per capita	0.027***		0.040***	
	(0.009)		(0.008)	
Logistics Index		0.118***		0.199***
		(0.030)		(0.023)
Constant	-1.837***	-1.925***	-2.175***	-2.417***
	(0.111)	(0.130)	(0.090)	(0.086)
Sector F.E.	Yes	Yes	Yes	Yes
R-squared	0.033	0.039	0.085	0.094
N	4471	3951	4472	3952

* p<0.1, ** p<0.05, *** p<0.01

Table A6– Intermediate trade with China and projects recipients.

	(1) Intermediate Export^{CHN} b/se	(2) Intermediate Export^{CHN} b/se	(3) Intermediate Import^{CHN} b/se	(4) Intermediate Import^{CHN} b/se
Projects	0.102*	0.168***	-0.115***	-0.113***
	(0.056)	(0.058)	(0.030)	(0.032)
Log GDP per capita	-0.075***		-0.105***	
	(0.021)		(0.012)	
Logistics Index		-0.096		0.005
		(0.069)		(0.043)
Constant	-0.797***	-1.230***	-0.691***	-1.580***
	(0.229)	(0.244)	(0.138)	(0.146)
Sector F.E.	Yes	Yes	Yes	Yes
R-squared	0.045	0.043	0.090	0.086
N	1586	1508	1586	1508

* p<0.1, ** p<0.05, *** p<0.01

Table A7 – Balassa RCA overlap and OBOR countries.

	(1) nRCA12over~D b/se	(2) nRCA12over~D b/se	(3) nRCA12over~p b/se	(4) nRCA12over~p b/se
BRI	0.152***	0.141***	0.119***	0.108***
	(0.042)	(0.044)	(0.017)	(0.018)
Log GDP per capita	0.060***		0.076***	
	(0.013)		(0.005)	
Logistics Index		0.198***		0.310***
		(0.038)		(0.017)
Constant	-1.051***	-1.169***	-0.164***	-0.407***
	(0.156)	(0.157)	(0.055)	(0.059)
Sector F.E.	Yes	Yes	Yes	Yes
R-squared	0.175	0.154	0.061	0.066
N	4472	3952	4472	3952

* p<0.1, ** p<0.05, *** p<0.01

Table A8 – Balassa RCA overlap and project recipients.

	(1) nRCA12over~D b/se	(2) nRCA12over~D b/se	(3) nRCA12over~p b/se	(4) nRCA12over~p b/se
Projects	0.053	0.014	0.092***	0.062*
	(0.082)	(0.082)	(0.033)	(0.033)
Log GDP per capita	0.040		0.059***	
	(0.030)		(0.012)	
Logistics Index		0.183**		0.341***
		(0.086)		(0.038)
Constant	-0.975***	-1.129***	-0.023	-0.455***
	(0.331)	(0.308)	(0.122)	(0.121)
Sector F.E.	Yes	Yes	Yes	Yes
R-squared	0.156	0.156	0.060	0.067
N	1586	1508	1586	1508

* p<0.1, ** p<0.05, *** p<0.01

Table A9 – Lafay RCA overlap and OBOR countries.

	(1) RCA12lafay~D b/se	(2) RCA12lafay~D b/se	(3) RCA12lafay~p b/se	(4) RCA12lafay~p b/se
BRI	-0.021	-0.007	0.090***	0.089***
	(0.042)	(0.044)	(0.022)	(0.023)
Log GDP per capita	-0.015		0.035***	
	(0.013)		(0.007)	
Logistics Index		-0.031		0.177***
		(0.038)		(0.022)
Constant	-0.251	-0.368**	0.726***	0.509***
	(0.153)	(0.155)	(0.093)	(0.096)
Sector F.E.	Yes	Yes	Yes	Yes
R-squared	0.149	0.136	0.058	0.063
N	4472	3952	4472	3952

* p<0.1, ** p<0.05, *** p<0.01

Table A10 – Lafay RCA overlap and project recipients.

	(1) RCA12lafay~D b/se	(2) RCA12lafay~D b/se	(3) RCA12lafay~p b/se	(4) RCA12lafay~p b/se
Project	0.155*	0.085	0.059	0.024
	(0.081)	(0.081)	(0.037)	(0.039)
Log GDP per capita	0.069**		0.046***	
	(0.029)		(0.015)	
Logistics Index		0.238***		0.276***
		(0.085)		(0.044)
Constant	-1.206***	-1.236***	0.707***	0.336**
	(0.327)	(0.304)	(0.176)	(0.166)
Sector F.E.	Yes	Yes	Yes	Yes
R-squared	0.125	0.124	0.065	0.067
N	1586	1508	1586	1508

* p<0.1, ** p<0.05, *** p<0.01