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Does the Belt and Road Initiative Stimulate Chinese Exports? The Role of State-Owned Enterprises

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Abstract: This paper evaluates firms' exporting responses to BRI and considers their heterogeneity in ownership types, product types, regional origin and trade mode. This is done by analyzing firm-product-destination level customs data from 2011 to 2015 in a gravity model framework. Our empirical results show that aggregate export behavior did not change significantly after BRI. However, ownership matters when evaluating firms reactions. SOEs increase their total exporting and average export value (the intensive margin) to BRI countries, while private domestic firms show no reaction to BRI at any margin. Further, our results on regional heterogeneity suggests that "open through the west", i.e., boosting the development of western regions in China, did not appear to work in the short term. Our findings show clearly the implications of BRI's impact from firm level perspective.

Keywords: belt and road Initiative, firm's export, extensive margin, intensive margin, state-owned firms

JEL Classification: F10, O24

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1 Introduction

The “Belt and Road Initiative” (BRI) is an unprecedented endeavor by the Chinese government to invest massively in roads, railroads and other infrastructure to create something akin to the legendary Silk Road that connected East and West for almost two millennia until the 18th century. This new initiative, by creating new infrastructure accompanied by other economic policies represents the Chinese ambition to connect China to overseas markets via establishing trade routes through Asia, Africa and Europe. Ultimately, it is aimed at facilitating trade and investment between China and the countries involved in BRI, fostering economic development in China but also in its partner countries (NDRC, 2015).¹

Also known as One Belt One Road (OBOR), BRI is the umbrella term for two distinct yet related initiatives, the “*Silk Road Economic Belt*” and the “*21 Century Maritime Silk Road*”, which altogether cover 64 countries as node countries excluding China.² The *Silk Road Economic Belt* plans to link China with south east Asia, south Asia, Central Asia, Russia and Europe by land, while the *21st century Maritime Silk Road* connects China’s coastal regions with south east and south Asia, the South Pacific, the Middle East and Eastern Africa, all the way to Europe. The BRI project covers regions accounting for more than 30% of the collective GDP and more than 60% of the total population of the world (Huang, 2016).

The official beginnings of the BRI can be traced back to specific dates. In September and October of 2013 respectively, China’s president Xi proposed the “*Silk Road Economic Belt*” in Kazakhstan and the “*21 Century Maritime Silk Road*” in Indonesia.

¹ Chaisse and Matsushita (2018) also discuss the wider strategic implications for China and the world of the BRI initiative.

² The country-list is shown in Table A1 in the Appendix. The countries that are included as BRI node country are determined by the official document <Vision and proposed actions outlined on jointly building Silk Road Economic Belt and 21st-Century Maritime Silk Road> released by China’s National Development and Reform Commission, Ministry of Foreign Affairs, Ministry of Commerce jointly, which is the same as Institute of Industrial Economics in Chinese Academy of Social Science defined in their publication <“The Belt and Road” National Industrialization Process Report> in 2016. The official link of this document is <http://www.mofcom.gov.cn/article/resume/n/201504/20150400929655.shtml>

In November 2013, the Belt and Road Initiative was officially taken up as a national policy.³

In this paper, we use this announcement date 2013 to investigate the impact of BRI on Chinese exports. While details of the initiative were only announced in 2015 we argue that, from 2013, Chinese firms as well as government at different levels were aware of the proposed policy. Thus, firms may be expected to anticipate the initiative and act accordingly.⁴ By the same token, it is unlikely that the initiative was widely or officially expected before 2013. While Xi became president of China's military commission in November 2012, he only assumed the presidential office in March 2013. BRI is a new programme advocated by the government he leads, i.e. this initiative was not mentioned by the government before. Hence, BRI could not be expected before 2013.⁵

Our is, to the best of our knowledge, the first study on BRI that uses firm level customs data, which allows us to investigate the role of firm level heterogeneity. After all, it is firms who engage in trade rather than countries, hence, evaluating firms' exporting responses towards BRI, and considering their heterogeneous responses, is crucial for understanding the overall effect of BRI. More specifically, we use Chinese export information from customs data for the period 2011 – 2015, covering two years prior and two after the set-up of BRI. The customs data is at the firm-product-destination level and this allows us to calculate export flows to partner countries for different ownership types (state-owned enterprises vs others) and

³ In the official document named <Decision of the Central Committee of the Communist Party of China on Some Major Issues Concerning Comprehensively Deepening the Reform>, which shows the reform direction in the next five years.

⁴ There is also evidence that local governments, in particular in Western and Central provinces started to take action from late 2013, to encourage firms to participate in BRI. Take Shanxi Province as an example, the government of Shanxi province organize the Fifth Eurasian Economic Forum and made joint statement with mayors from Italy, Turkmenistan, Armenia et al. about cooperation under the framework of BRI in September of 2013. They have linked freight line "Chang-An" connecting Xi'an and Zhem in Kazakhstan with China-Euro Express Railway in December of 2013. An experimental aviation area, targeting to become an aviation hub for Silk Road, is permitted by central government of China to set in Xi'an in June of 2014. Several schools on Central Asia are established and encourage exchanging students from Central Asia countries at the beginning of 2014. This information is from the article that the provincial secretary of Shanxi published in China Daily in September of 2014. The link is <http://politics.people.com.cn/n/2014/0909/c1001-25621879.html>.

⁵ We searched the Chinese newspaper database of CNKI, which covers almost all the mainstream and local newspapers, for reports on BRI or "Silk Road Economic Belt" or "Maritime Silk Road" or any similar programme under the name of "Silk Road". None were found before September 2013.

different product types (capital vs other goods). Since one of the aims of BRI is to boost development of the somewhat backward Western and Central regions in particular, we also distinguish exports by regional origin within China.

Our empirical approach is couched in a difference-in-differences setting where we compare exports to BRI “node countries” before and after the announcement to a control group of other trade partners. We include time-varying controls as well as partner-country and year fixed effects which control for selection (by China) of countries into the BRI. Note that this selection, certainly in the beginning of the programme, was mainly based on geographic characteristics.

The reasoning why BRI may be expected to boost exports comes from the details of the implementation of the initiative. These details on the design of the BRI initiative were released by China’s National Development and Reform Commission, the Ministry of Foreign Affairs, and the Ministry of Commerce in March 2015⁶. As the plan shows, unlike traditional regional economic integration agreements, BRI has no written terms on market access, tariff reduction or so forth. Building a parallel international economic system is not the intention of China (Huang, 2016). The cooperation mechanism is rather flexible yet entails many aspects that may reduce trade costs or stimulate export activity. It emphasises the facilitation of “connectivity” in five areas through (i) policy coordination, (ii) infrastructure development, (iii) reduction of trade impediments, (iv) financial integration, and (v) exchange of people (see also Du and Zhang, 2018; Huang, 2016).

Bilateral coordination of economic and other policies between China and BRI node countries helps to reduce political and policy uncertainty. This, as Handley (2014) and Handley and Limão (2017) show can be expected to impact positively on bilateral trade. The construction of transportation, energy and communication facilities are the main areas of infrastructure development related to BRI. Such infrastructure can reduce trade cost, e.g, costs of transportation or communication and boost trade (e.g.,

⁶ The name of this official document is <Vision and proposed actions outlined on jointly building Silk Road Economic Belt and 21st-Century Maritime Silk Road>

Donaubauer et al., 2018). This effect may only be apparent in the medium to long run, however, due to construction time. Still, in the short run, since the infrastructure construction projects in many cases involve Chinese firms, they may import intermediate goods (equipment, machinery, etc.) from China, thus boosting China's exports also in the short run. Reductions of trade impediments include customs cooperation elimination of trade barriers between China and BRI countries, which have the potential to reduce variable trade costs. In terms of financial integration, the main priorities of the Initiative are the provision of finance, including the Silk Road Fund, Asia Infrastructure Investment Bank as well as Chinese foreign aid (Du and Zhang, 2018). These sources provide not only funding for the BRI node countries but also to Chinese firms, potentially alleviating financial constraints and enabling export activity of the firms (e.g., Manova, 2013). Finally, the exchange of people leads to the creation or the enlargement of Chinese ethnic networks in BRI countries, which can also foster trade (Rauch and Trindade, 2002). In sum, the flexible cooperation mechanism set in place with BRI has not only the potential to reduce bilateral trade cost but to also stimulate bilateral trade between China and BRI node countries in other ways.

While some work has already been done on analyzing the implications of BRI for various aspects of trade (viz., China's trade surplus (Chen et al., 2018), overall trade volumes (Li et al., 2019) and node country's export to China (Mao et al., 2019), these studies use aggregate country level data. This makes investigating firm's intensive and extensive export margins, or considerations about firms' heterogeneous responses impossible. We use firm-product level customs data. We are only aware of one other study using firm level data, namely, Du and Zhang (2018) who investigate the implication of BRI for outward direct investment by Chinese firms. They establish that the initiative has substantially boosted Chinese investment into these countries.⁷

Our paper also contributes to a large literature that empirically investigates the causes

⁷ Two other studies look at Chinese outward investment (Kang et al., 2018) and China's inward FDI (Luo et al., 2019) using aggregate data.

and consequences of China's overall export performance using disaggregated data (e.g., Manova et al., 2015; Ma et al., 2014; Jarreau and Poncet, 2012; Girma et al., 2009). We particularly look at the effect of BRI on trading activities. By doing so, we also add further insights on Chinese firm's responses to external policy shocks. While accession to the WTO and its implications for firm's trading activities has attracted plenty of attention (Feng et al., 2017; Fan et al., 2019), we consider a more recent policy change. This also connects our paper to the more general literature that studies how policy shocks such as antidumping (Lu et al., 2013), export promotion programmes (Cadot et al., 2015) or trade agreements (Spilker et al., 2018; Baier et al., 2018) can affect trading firms. Even though the BRI programme indicates a substantial policy change for China from "bringing in" to "going out" (Luo and Zhi, 2019), few studies have investigated its impact on firm's exports.

Our empirical results show that on average Chinese firms' export activity is not significantly affected by BRI. However, behind this aggregate result we discover important heterogeneities. Firstly, we do observe that firms with different ownership types behave differently. An export-enhancing effect of BRI is seen for SOEs and this is driven by an increase in the intensive margin. By contrast, there is little impact of BRI on non-SOEs. We do not, however, discover any differences between exports of capital goods and non-capital goods, even though this may be expected given the focus of BRI on infrastructure (which necessitates capital goods). Furthermore, while BRI was proposed to alleviate regional inequality, we actually find that the already well developed Eastern provinces benefit more than Western or Central provinces. Overall, our study adds new insights on BRI's economic outcomes from the perspective of firms.

2 Methodology and Data

We model the effect of BRI on China's export performance in a gravity model setting,

$$exp_{it} = \gamma BRI_i \times T_t + \alpha_1 \ln GDP_{it} + \alpha_2 \ln pop_{it} + \mu_i + \vartheta_t + \varepsilon_{it} \quad (1)$$

where the dependent variable *exp* is aggregate Chinese exports in year *t* to partner country *i*. This is related to total GDP and population in the partner country, controlling for partner *i* and year *t* fixed effects. Since we have only one exporting country, viz. China, the partner fixed effects captures all unobservable time invariant (over the analysis period) characteristics, e.g., distance, geography, political connections, that may determine trade between China and the partner (e.g., Baier et al., 2014, Rose, 2004), and also selection for the BRI programme.

BRI is a time invariant dummy variable equal to one if partner country *i* is part of the BRI programme. *T* is a dummy equal to one once the BRI programme is established (2013) and zero before that. The interaction of these two variables yields the difference-in-differences estimate of the start of BRI on Chinese exports, γ . Identification of the coefficient rests on the assumption that, conditional on the included time varying characteristics and the partner and year fixed effects, this is random. In the estimation of BRI in the empirical part of the paper we will look for heterogeneity of γ along ownership type, type of export product, and exporter region.

Firstly, we will investigate whether exports by state-owned enterprises (SOEs) are differently affected by the BRI programme than those by private-owned firms. SOEs play a pivotal role in achieving government goals, in an economic system that can be characterized as a state capitalist model with an authoritarian political regime (Du and Zhang 2018). They may therefore be expected to show their “loyalty” to government as political promotion is a main incentive for SOE managers (Kato and Long, 2011). At the same time, some aspects of the BRI policies may be considered especially preferential for SOEs. Financial support for firms is a crucial component of the policy, and there is general agreement that SOEs in general receive more financial support from banks than non-SOEs (Wei and Wang, 1997; Lu et al., 2005; Firth et al., 2009; Li et al., 2009). Hence, they may also be expected to benefit disproportionately from the financing provided within the BRI programme. In addition, SOEs’ production share is especially high in infrastructure related industries, such as Metallurgical

industry and railway transportation equipment⁸, which are industries that may particularly benefit from BRI. Hence, notwithstanding the fact that private firms have also become an important part of China's economy, we may expect that exports by SOEs respond more strongly to the government-led BRI programme than exports by private owned firms, be they domestic or foreign owned.

Secondly, BRI may induce exports of capital goods more strongly than other products. Infrastructure-led economic integration has been one of BRI's priority from the very beginning. Such infrastructure includes transportation, energy and communication network⁹, and construction, all of which necessitate machinery and equipment, i. e. capital goods. This suggests that trade costs should be reduced more on these products, or BRI policy could be more favourable for these products to encourage exports. Hence, we classify exporting products into capital and non-capital goods, based on the BEC products category¹⁰. Before classifying, we link HS code to BEC product category¹¹.

Thirdly, BRI is also used as an instrument to tackle the imbalances in economic development between the Eastern coastal regions and the more backward Western and Central regions (Du and Zhang, 2018). Hence, we will investigate whether there is indeed a different trade enhancing effect observable across regions.

We use three alternative definitions of the dependent variable in equation (1). The first is aggregate exports from China to partner country i . We also decompose this aggregate into the extensive and intensive margin. The former is defined as the number of firms exporting to i . The intensive margin is the average export value per exporting firm to country i ¹². Changes in the extensive margin due to BRI may

⁸ SOEs account for 25 and 38 percent of production in these sectors (calculations based on data from <Chinese Industry Economy Statistical Yearbook 2013>).

⁹ The covering fields of infrastructure are from <Vision and Proposed Actions Outlined on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road> released by China's National Development and Reform Commission, Ministry of Foreign Affairs, Ministry of Commerce jointly.

¹⁰ <https://unstats.un.org/unsd/tradekb/Knowledgebase/50089/Classification-by-Broad-Economic-Categories-Rev4>

¹¹ The concordances of HS code to BEC category and HS code to SITC category are from UN TRADE STATISTICS. The link is <https://unstats.un.org/unsd/trade/classifications/correspondence-tables.asp>.

¹² We only consider direct exporters, i.e. manufacturing firms, in this paper. We treat firms with keywords such as "trading", "importing and exporting", "business and trading", "foreign trade", "industrial trade", "business", "logistic", "economic cooperation", "technology cooperation", in their names as intermediaries and exclude them from regression.

indicate changes in fixed costs of exporting, allowing more firms to enter the partner country. Changes in the intensive margin may be more related to changes in variable costs of exporting which may increase the value of exports per firm.

We estimate the model using the now standard Poisson Pseudo Maximum Likelihood (PPML) estimator proposed by Silva and Tenreyo (2006), which enables the estimation of unbiased parameters in a log-linearised model with heteroscedasticity. Moreover, it provides a convenient way of dealing with zero values of the dependent variable.

Our analysis is based on firm level trade data by HS product category and destination country from China customs. This data is available to us from 2011 to 2015, which covers two years before and after the unveiling of Belt and Road Initiative. For each record, trading information including total value, price and amount, firm information including ID number, name, ownership type and location are reported.¹³

These data allow us to calculate aggregate exports to partner country i , as well as the number of exporters (extensive margin) and average exports per firm (intensive margin). We are also able to calculate these variables by ownership type, product category (capital goods vs. other products) and by region of exporters.

Table 1 Descriptive statistics on exports

| | Total exports (in billion dollars) | | Number of exporters (in ten thousand) | | Average exports per firm (in million dollars) | |
|------|------------------------------------|------------|---------------------------------------|------------|---|------------|
| | To BRI | To Non-BRI | To BRI | To Non-BRI | To BRI | To Non-BRI |
| 2011 | 451.31 | 1447.19 | 16.36 | 22.98 | 27.58 | 62.98 |
| 2012 | 540.85 | 1870.44 | 17.30 | 24.19 | 31.25 | 77.33 |
| 2013 | 620.76 | 1983.58 | 17.40 | 24.19 | 35.68 | 82.00 |
| 2014 | 721.47 | 2174.31 | 19.16 | 26.36 | 37.66 | 82.49 |
| 2015 | 567.92 | 1668.54 | 19.41 | 26.53 | 29.26 | 62.89 |

¹³ We delete firms with missing values either in their names, ID number or trade type.

Table 1 shows values for total exports, as well as the extensive and intensive margins to countries that do participate in BRI and to those that do not. This shows that there exist obvious differences between exports to BRI countries and non-BRI countries. Total exports from China to non-BRI countries are much larger than to BRI countries, as is the number of exporters and the average exports per firm. In addition, we observe a growth in total exports and number of exporters after 2013 for both BRI countries and non-BRI countries. Compared with 2012, the growth rate of total exports for BRI countries in 2014 is about 33% and is 16% for non-BRI countries. At the same time, the table shows that the number of exporters to BRI countries also has higher growth rates than to non-BRI countries after 2013. Hence, this is some preliminary evidence of a positive growth rate difference, in line with the idea that BRI stimulated exports more to BRI participants compared to non-participants. However, we now turn to a more formal econometric difference-in-differences analysis which also allows us to control for other confounders which may play a role.

3. Empirical results

3.1 Baseline results

The baseline estimation of the difference-in-differences model in equation (1) is presented in Table 2 for total exports, the extensive and intensive margin. This shows that, in the aggregate, the start of the BRI programme has had no differential effect on BRI partner countries compared to non-BRI partners (the control group)¹⁴.

Table 2

Firms response on BRI

| | (1) <i>exp</i> | (2) <i>exp_ex</i> | (3) <i>exp_in</i> |
|--------------------|---------------------|----------------------|----------------------|
| $BRI_i \times T_t$ | 0.0362 (1.02) | 0.0108 (1.18) | 0.0433 (0.83) |
| $\ln GDP_{it}$ | 1.1307*** (3.99) | 0.8112*** (9.17) | 0.0784 (0.33) |

¹⁴ We tested whether firms already exported more to the node countries before BRI, by considering the interaction terms of BRI dummy with year dummy of 2011, 2012, 2013. The results in Table A2 show that there is no evidence that firms exported more to the node countries before 2013.

| | | | |
|----------------------|---------------------|--------------------|------------------|
| $\ln POP_{it}$ | 11.3887** (2.32) | 2.3257** (2.21) | 5.0824 (0.76) |
| Country fixed effect | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes |
| N | 900 | 900 | 900 |

However, as pointed out above, this aggregate result may hide differential responses by firms of different ownership types. We investigate this in Table 3, distinguishing exports by SOEs, private domestic and foreign owned firms. We calculate the export variables separately for these three ownership groups and run the regressions separately¹⁵.

The results suggest that there is heterogeneity in response, in that the start of the BRI programme has an overall export-enhancing effect (relative to the control group) predominantly for SOEs. This is primarily driven by increases in the intensive margin, i.e., the average value of exports per firm. We also estimate an increase in the number of foreign firms exporting to BRI countries, but this is accompanied by a reduction in the average exports per firm, leading to a zero effect on overall exports to BRI countries by foreign-owned firms.

Table 3

Exporting response by ownership

| | (1) <i>exp</i> | (2) <i>exp_ex</i> | (3) <i>exp_in</i> |
|----------------------|---------------------|----------------------|----------------------|
| SOEs | 0.1453*** (2.82) | 0.0054 (0.53) | 0.1953*** (2.74) |
| Private firms | -0.0354 (-0.57) | 0.0101 (0.95) | 0.0062 (0.13) |
| Foreign firms | -0.0397 (-0.75) | 0.0261*** (3.05) | -0.0480 (-0.81) |
| Other variables | Controlled | Controlled | Controlled |
| Country fixed effect | Yes | Yes | Yes |

¹⁵ We carried out a similar test of years before BRI for firms with different ownership types as well. The negative effects (for SOEs and foreign firms) indicate that these firms exported less to BRI node than to other countries before BRI. This suggests that our estimates below may be considered lower bounds.

| | | | |
|-------------------|-----|-----|-----|
| Year fixed effect | Yes | Yes | Yes |
| N | 900 | 900 | 900 |

Notes: Coefficients of $BRI_i \times T_t$ are reported.

Another aspect of heterogeneity that may be illuminating to explore is the product category. Since infrastructure development is one of the crucial issues of BRI according to the Chinese government, we examine whether exports of products that are closely related with infrastructure development, i.e. capital goods, benefit more strongly from the BRI programme.¹⁶ The results, shown in Table 4, do not provide evidence for such a product bias, however. We find broadly the same pattern as observed for total exports when distinguishing products into capital and non-capital goods exports. This suggests that BRI does not only lead to increased trade for building infrastructure but also facilitates exports of other products to the BRI partner countries.

Table 4

Capital products and non-capital products

| Capital Products | | | |
|----------------------|--------------------|----------------------|----------------------|
| | (1) <i>exp</i> | (2) <i>exp_ex</i> | (3) <i>exp_in</i> |
| SOEs | 0.1226* (1.89) | 0.0101 (0.74) | 0.4239** (2.06) |
| Private firms | -0.1168 (-1.24) | 0.0078 (0.58) | -0.0840 (-0.67) |
| Foreign firms | -0.0583 (-0.85) | 0.0197** (2.11) | -0.0749 (-0.87) |
| Non-Capital Products | | | |
| | (4) | (5) | (6) |
| SOEs | 0.1550** (2.51) | 0.0044 (0.43) | 0.1699** (2.36) |
| Private firms | -0.0170 (-0.29) | 0.0106 (1.02) | 0.0205 (0.42) |
| Foreign firms | -0.0305 (-0.63) | 0.0267*** (3.02) | 0.0016 (0.04) |
| Other variables | Controlled | Controlled | Controlled |
| Country fixed effect | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes |

¹⁶ BEC products category classifies products into three groups, capital goods, intermediates and consumption goods. Capital goods are more related with infrastructure construction compared with other products.

| | | | |
|---|-----|-----|-----|
| N | 900 | 900 | 900 |
|---|-----|-----|-----|

Chinese policy makers also claim that one of the aims of the BRI programme is to alleviate regional inequality in industrial development. Given that the Eastern regions are the most developed and export intensive, such a policy bias should imply that Western and Central regions should be able to boost their exports relatively more as a result of the start of the BRI programme. We investigate this issue in Table 5, where we aggregate export variables according to the location of the exporter into regional exports, and then run regressions separately.

The results show that, in terms of overall exports, the Eastern provinces clearly benefit more from BRI. This is particularly true for SOEs located in the Eastern provinces. While there are also positive effects on the intensive margin of exports from Central regions, these are not strong enough to translate into significant increases in total exports. In fact, for non-SOEs located in Central and Western regions we estimate significant negative effects of the start of the BRI programme on total exports. Hence, the aim to boost particularly Central and Western regions does not seem to be met, certainly for the period of analysis in this paper.

3.2 Extensions

In what follows we add a robustness check related to export processing. As early as the mid-1980s China introduced special “processing trade” schemes in an attempt to boost exports. The hallmark of this scheme is that there are tariff-exemptions on imported inputs as long as these are only processed in the country and then re-exported. Domestic sales of these processed goods are, in general, not permitted. Firms that export under such processing schemes behave very differently than “ordinary exporters” (e.g., Dai et al., 2017). Based on our customs data, we can distinguish export processors and ordinary exporters similar to Dai et al. (2017). Distinguishing exports into “ordinary” and “processing” yields the results in Table 6. We can see that, in aggregate, only “ordinary” exports benefit from the BRI programme, and only those that are done by SOEs. While we also find some positive

effects on the intensive margin for export processors, this is not large enough to make a difference at the aggregate.

Table 5

Firms exporting according to provinces

| All firms | | | |
|----------------------|-----------------------|--------------------|---------------------|
| | <i>exp</i> | <i>exp_ex</i> | <i>exp_in</i> |
| East provinces | 0.0385 (1.19) | -0.0031 (-0.30) | 0.1155** (2.51) |
| North-east provinces | 0.1045 (1.19) | 0.0112 (0.99) | 0.1453 (1.51) |
| Central provinces | -0.1128 (-1.55) | 0.0131 (1.13) | 0.2662** (2.26) |
| West provinces | -0.2545*** (-2.66) | -0.0055 (-0.37) | -0.0433 (-0.46) |
| SOEs | | | |
| East provinces | 0.1038** (2.29) | 0.0092 (1.15) | 0.1873*** (2.75) |
| North-east provinces | 0.0138 (0.13) | 0.0009 (0.06) | 0.0885 (0.65) |
| Central provinces | 0.0708 (0.99) | 0.0085 (0.75) | 0.4725*** (2.65) |
| West provinces | 0.0023 (0.03) | 0.0042 (0.28) | 0.3109* (1.77) |
| Non-SOEs | | | |
| East provinces | 0.0315 (0.97) | -0.0040 (-0.38) | 0.0723* (1.77) |
| North-east provinces | 0.1307 (1.34) | 0.0127 (1.03) | 0.1917 (1.53) |
| Central provinces | -0.1331* (-1.76) | 0.0138 (1.13) | 0.2234 (1.56) |
| West provinces | -0.2742** (-2.55) | -0.0062 (-0.37) | -0.1063 (-1.14) |
| Other variables | Controlled | Controlled | Controlled |
| Country fixed effect | Yes | Yes | Yes |

| | | | |
|-------------------|-----|-----|-----|
| Year fixed effect | Yes | Yes | Yes |
|-------------------|-----|-----|-----|

Note: We divide the firms existing in China custom trade data into four groups by their location, including east province, northeast province, central province, west province. East provinces: Beijing, Guangdong, Fujian, Shandong, Tianjin, Zhejiang, Shanghai, Hunan, Hebei, Jiangsu (10). Northeast: Heilongjiang, Jilin, Liaoning (3). Middle Provinces: Anhui, Henan, Hunan, Shanxi(山西), Jiangxi, Hubei (6). West provinces: Chongqing, Gansu, Guangxi, Ningxia, Qinghai, Shanxi(陕西), Xinjiang, Yunnan, Xizang, Sichuan, Guizhou, Neimenggu (12).

Table 6

Ordinary exporting and processing exporting

| | (1) <i>exp</i> | (2) <i>exp_ex</i> | (3) <i>exp_in</i> |
|----------------------|--------------------|----------------------|----------------------|
| SOEs | | | |
| Ordinary exporting | 0.0971** (2.13) | 0.0096 (1.19) | 0.1106* (1.96) |
| Processing exporting | -0.0381 (-0.64) | -0.0065 (-0.74) | 0.2225** (2.16) |
| Non-SOEs | | | |
| Ordinary exporting | 0.0163 (0.44) | 0.0012 (0.13) | -0.0211 (-0.39) |
| Processing exporting | 0.0157 (0.48) | -0.0136 (-1.31) | 0.0522 (0.91) |
| Other variables | Controlled | Controlled | Controlled |
| Country fixed effect | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes |
| N | 900 | 900 | 900 |

5. Conclusions

To understand the effect of BRI in real term, it is necessary to investigate firms' behavioral responses towards BRI. After all, it is firms who engage in trade rather than countries. We use firm-product-destination level customs data from 2011 to 2015, evaluating firms' exporting responses towards BRI and considering their heterogeneous responses, in total export, extensive margin and intensive margin.

Specifically, firms' heterogeneity refers to ownership types, product types, regional origin and trade mode.

Our empirical results show that Chinese exporting firms' response to BRI is rather weak, i.e. there is no significant change in aggregate exporting behavior after BRI. However, ownership matters when evaluating firms' reactions. We find that SOE firms increase their exporting to BRI countries significantly after the BRI program is announced, both in terms of total exports and the intensive margin. The total number of foreign firms engaging in exporting to BRI countries is increased as well. However, exports by private firms in China are not changed significantly, irrespective of the two margins.

Further, we test the heterogeneity on product types. The results show that firms with different ownership behave similar on capital goods and non-capital goods exporting, i.e. there is no significant difference between infrastructure-related and non-infrastructure-related products. We also investigate the heterogeneous response by region of the exporter to test whether "open through the west" worked out. It turns out that firms located in western provinces actually export less to BRI countries after 2013. While firms located in eastern and central provinces export more to BRI countries.

Our findings show who is positively affected by BRI and who is not, in the short term. First and foremost, it is SOEs. Even though non-SOEs account for more than 80% of Chinese exports between 2011-2015, they did not react positively to BRI. However, for the success of BRI and the wider economic cooperation with BRI countries, it can be seen as crucial that non-SOEs also join in and benefit from the scheme. Hence, a non-discriminating collaborative framework that reduces trade costs for all participants should be offered by BRI, to have prolonged and widely impacts.

Additionally, the aim of boosting development in Western regions, "open through the west", has thus far not appeared to work well. Infrastructure connectivity of China and its BRI partners through western provinces in China still has a long way to go, as

well as the economic development in the west provinces. Even SOEs in western provinces do not appear to make a difference.

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Appendix

Table A1

The list of BRI node country

| Region | Country | total amount |
|------------------------------------|---|--------------|
| Commonwealth of Independent States | Russia, Ukraine, Belarus, Georgia, Azerbaijan, Armenia, Moldova | 7 |
| Central Asia | Mongolia, Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, Tajikistan | 6 |
| South Asia | India, Pakistan, Bangladesh, Sri Lanka, Afghanistan, Nepal, Maldives, Bhutan | 8 |
| South-east Asia | Indonesia, Thailand, Malaysia, Vietnam, Singapore, Philippines, Myanmar, Cambodia, Laos, Brunei, Timor-Leste | 11 |
| West Asia and North Africa | Saudi Arabia, The United Arab Emirates, Oman, Iran, Turkey, Israel, Egypt, Kuwait, Iraq, Qatar, Jordan, Lebanon, Bahrain, Yemen, Syria, Palestine | 16 |
| Central East Europe | Poland, Romania, Czech Republic, Slovakia, Bulgaria, Hungary, Latvia, Lithuania, Slovenia, Estonia, Croatia, Albania, Serbia, Macedonia, Bosnia, Montenegro | 16 |

Notes: The country-group division is according to the publication <"The Belt and Road" National Industrialization Process Report> of Institute of Industrial Economics in Chinese Academy of Social Science. However, we exclude some countries from our regression for data missing problem, including Syria, Palestine, Serbia, Macedonia, Montenegro.

Table A2

Firms' export to BRI countries in leading years

| All Firms | | | |
|----------------------|-----------------------|----------------------|----------------------|
| | <i>exp</i> | <i>exp_ex</i> | <i>exp_in</i> |
| $BRI_i \times T2011$ | 0.0131 (0.18) | -0.0195 (-1.23) | -0.0405 (-0.44) |
| $BRI_i \times T2012$ | -0.0968*** (-2.65) | -0.0061 (-0.60) | -0.0469 (-0.83) |
| $BRI_i \times T2013$ | -0.0499 (-1.61) | -0.0028 (-0.31) | -0.0018 (-0.04) |
| SOEs | | | |
| $BRI_i \times T2011$ | -0.2106*** (-2.68) | -0.0085 (-0.51) | -0.2521** (-2.46) |
| $BRI_i \times T2012$ | -0.1734*** (-2.64) | -0.0007 (-0.06) | -0.1574 (-1.80) |
| $BRI_i \times T2013$ | -0.0989* (-1.69) | 0.0033 (0.33) | -0.0318 (-0.39) |
| Private Firms | | | |
| $BRI_i \times T2011$ | 0.1535 (1.91) | -0.0300 (-1.63) | -0.0583 (-0.84) |
| $BRI_i \times T2012$ | 0.0223 (0.28) | 0.0088 (0.65) | 0.0349 (0.52) |
| $BRI_i \times T2013$ | 0.0510 (1.16) | 0.0142 (1.38) | -0.0101 (-0.24) |
| Foreign Firms | | | |
| $BRI_i \times T2011$ | 0.1279 (1.16) | -0.0343** (-2.31) | 0.0944 (0.87) |
| $BRI_i \times T2012$ | -0.0039 (-0.06) | -0.0246** (-2.51) | 0.0490 (0.64) |
| $BRI_i \times T2013$ | -0.0044 (-0.09) | -0.0061 (-0.73) | 0.0542 (0.73) |
| Other variables | Controlled | Controlled | Controlled |
| Country fixed effect | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes |
| N | 900 | 900 | 900 |