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Quantifying Financing Needs in the Belt and Road Countries and Industries

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Abstract

This paper tries to quantify the financing needs in the Belt and Road countries and industries by using firm-level data from 2009 to 2014. By examining financial constraints of firms in the Belt and Road countries, this study constructs a Financing Needs Index for Belt and Road countries and highlights the characteristics of financing needs across 36 countries, 80 industries and 6 years. By further incorporating information from World Bank Enterprise Surveys, this paper builds an Augmented Financing Needs Index for 56 Belt and Road countries. The findings of this paper show that countries can achieve higher economic growth by further financial liberalization, improving business climate and institutional quality to address the financing needs of their indigenous firms.

Keywords: China, Belt and Road Initiative, Financing Needs

JEL classification: F34, H63, H83

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1. Introduction

The Belt and Road Initiative, a shorthand for the Silk Road Economic Belt and 21st Century Maritime Silk Road, is a broad and far-reaching collaborative development strategy envisaged by China to bolster international trade and co-operation with 65 countries in Asia, Europe, the Middle East and Africa, which stretches across more than 40% of the global land area and more than 60% of the total population in the world. The Belt and Road countries as a whole contribute to nearly 40% of global Gross Domestic Product, but economic performance across constituent countries varies. In terms of economic development, Belt and Road countries in the Near East and the Far East are much more developed on average, while those in the Asia Minor, the Middle East and Africa lag behind on a relative basis. While there are differences across the Belt and Road countries as shown in Figure 1, as a whole, real GDP growth and the investment rate have a significant positive correlation across these countries, implying that investment plays a crucial role in promoting economic development. The majority of countries in the Belt and Road group are still developing so there is huge potential to promote economic development through integration that builds upon multilateral economic complementarities.

[Insert Figure 1 Here]

In order to make a thorough study of the potential for cooperation within the Belt and Road group of countries, this paper aims to quantify the financing needs of these countries. Such financing could stimulate firms' investment and growth, and also bring investment profits for international investors. Therefore, this paper aims to provide a quantitative picture of the potential financing needs in the Belt and Road countries and industries.

The Belt and Road Initiative aims to spearhead international cooperation with countries situated on and beyond the ancient Silk Road in five key areas: (1) policy co-ordination; (2) facilities connectivity; (3) unimpeded trade; (4) financial integration; and (5) people-to-people bonds (HKTDC, 2016). This national and transnational strategy enables China to utilize its production capacity and huge foreign reserves in a multilaterally beneficial way. Domestically, the Initiative harmonises differences in levels of economic development across China by tapping the economic potential of the Chinese hinterland while optimising resources along coastal cities. Internationally, the Initiative can help to promote eco-

nomic development in the Belt and Road countries collaboratively and inclusively. In short, the Initiative will contribute to capitalizing on the strengths of each Belt and Road country, integrating economies across continents, fostering economic prosperity and instilling a collaborative and peaceful economic, political and social climate.

As an integral part of the People's Republic of China, Hong Kong can play an important role in providing services, and financing and promoting cultural exchange in the Belt and Road Initiative. Dejiang Zhang, Chairman of the Standing Committee of the National People's Congress, highlighted Hong Kong's significance, as summarized by Chun-ying Leung, the Chief Executive of Hong Kong during the Belt and Road Summit in May 2016:

> *"[…] Chairman [Dejiang] Zhang specifically pointed […] that 'Hong Kong is a key link for the Belt and Road' […] The Central Government supports Hong Kong 'in playing an active role' in 'building a platform of comprehensive services', 'facilitating capital flows and promoting Renminbi internationalisation and the development of the Belt and Road investment and financing platform', and 'promoting cultural exchanges for greater mutual understanding among the people along the Belt and Road'."* (HKISD, 2016)

This points out how cross border investment and financing - a major segment in the Belt and Road Initiative – align perfectly with the strengths and expertise of the Hong Kong economy. While there exist international entities that co-ordinate investment and financing, such as the China-Africa Development Fund, the Asian Infrastructure Investment Bank and the newly established US$ 40 billion Silk Road Fund, these are mainly positioned to finance and invest in infrastructure projects. Private collaboration is much more flexible in economic, investment and financing activities across the Belt and Road countries. This underscores the need to understand the economic structure and financial needs of the Belt and Road countries and see what, where and how governments and firms can work hand-in-hand.

While macroeconomic analyses on different Belt and Road countries are largely available (see for example, Fallon, 2015; the Economist Corporate Network, 2016), it is the less-available quantitative analyses on the highly heterogeneous firm level characteristics that will be able to provide richer and deeper insights to policymakers and the market alike. Given that private firms constitute a large part of these economies, facilitating growth for indigenous firms is a sustainable, inclusive and effective

economic strategy. This, however, is difficult, as binding financial constraints strain private and indigenous firms' ability to fund value-enhancing investment projects.

Financial constraints that bind indigenous firms are shaped by economic conditions and institutional settings. Campello, Graham and Harvey (2010) show that credit constrained firms cut their spending on investment and corporate innovation in the face of financial crises. The detrimental effects of binding financial constraints are amplified in developing countries where activities such as tunnelling are rampant and corporate governance is poor (for example, Lin et al. 2011 and 2012, Francis et al. 2013). Hence, from a top-down perspective, it is imperative for governments to pinpoint and improve on specific institutional attributes in order to soften financial constraints. Capitalising the transnational nature of the Belt and Road Initiative, indigenous firms will likely be less financially constrained through orderly economic harmonisation and integration. In addition, a more integrated institutional framework encourages merger and acquisition activities, which would relieve target firms from financial constraints post-acquisition (Erel, Yang and Weisbach, 2015). Recently, the Chinese cross-border, outbound merger and acquisition market has expanded rapidly, with the total volume of disclosed deals growing from US$ 220 billion in 2011 to US$ 733.7 billion in 2015. Provided this trend continues, this will likely mitigate the magnitude of financial constraints and fulfil the financing needs of indigenous firms in other Belt and Road countries. The role of the Belt and Road Initiative in softening firm financial constraints is two-fold: (1) mitigating the overall level of financial constraints in an economy top-down, and (2) encouraging market activities that channel financial capacity from less-constrained firms to more constrained firms.

This research paper investigates financial constraints on indigenous firms particularly in the private sector in the Belt and Road countries, and how their financing needs may evolve through time. It analyses the interplay between financial constraints and different economic indicators and indices for institutional quality. To quantify the magnitude of the financing needs of firms in the Belt and Road countries, we follow Fazzari, Hubbard and Peterson (1988) to estimate a model for investment-cash flow sensitivity and follow Almeida, Campbello and Weisbach (2004) to estimate a model for the cash flow sensitivity of cash. By standardising and normalizing the investment-cash flow sensitivity and cash flow sensitivity of cash coefficients, we create a Financing Needs Index to gauge how financial constraints, as revealed by reliance on internal funds, shape the financing needs of indigenous firms.

By incorporating survey data from the World Bank Enterprise Survey, we construct an Augmented Financing Needs Index that encapsulates four additional dimensions: (1) perception of financial obstacles; (2) availability of credit facility; (3) difficulty in loan application and (4) requirements for collaterals. The resulting index gauges the magnitude of revealed and perceived financing needs in 52 Belt and Road countries.

Our findings yield three key insights. First, in the regions examined, firms in the Middle East are the most financially constrained. Investment expenditure and cash holdings of firms in the region are systematically more sensitive to internal cash flows relative to other regions, signalling a more impeded access to external financing. Second, an industry may be financially constrained to a different degree in different countries. A particular industry may be highly financially constrained in one country but virtually unconstrained in another. This complementarity signals the potential for cross-border collaboration targeted on industry-specific financing needs. Third, the magnitude of financing needs as measured by our Financing Needs Index varies across countries through time. The differences across countries can be explained by a country's level of financial liberalisation, business climate, regulatory constraints, and institutional quality. The changes over time correspond more strongly to domestic macroeconomic shocks than to global shocks. These insights yield policy implications for governments trying to mitigate the presence of financial constraints faced by indigenous firms and satisfy their financing needs.

This paper has four significant contributions. First, to the best of our knowledge, it is the first systematic analysis that reveals the whole picture of financial constraints and external financial demand in Belt and Road countries and draws guidance for policy makers and practitioners. This is made possible by the use of data provided by the Orbis database, which covers more than 200 million private firms worldwide. According to the World Bank and the World Federation of Exchanges, as of the end of 2015, there are altogether 43,539 listed companies worldwide, roughly 0.02% of the number of firms in Orbis, where more than 99% of firms are private. Results are hence more representative than those obtained by analysing public firms only.

Second, by incorporating survey data in the Enterprise Survey, our Augmented Financing Needs Index aggregates revealed and perceived financial constraints at the firm level. This provides a comprehensive measure of financial constraints binding indigenous firms in 52 Belt and Road countries.

Third, it points to the countries and industries where financing is more difficult to obtain, allowing firms and investors to capitalise on international investment and financing opportunities. Finally, it provides policy directions for governments in the Belt and Road countries to fully reap the benefits of the Initiative through improvements in specific institutional arrangements.

The remainder of the paper is as follows. Section 2 describes our data and identification strategy. Section 3 presents our empirical results. Section 4 introduces our Financing Needs Index and analyses the financial needs across Belt and Road countries and across industries. Section 5 compares our Financing Needs Index with the World Bank Enterprise Survey as a validity test, and then constructs an Augmented Financing Needs Index that encapsulates four additional dimensions of financial constraints. Section 6 links financing needs to various country-level financial indicators and explores the mechanisms that could mitigate financial constraints. Section 7 concludes.

2. Identification and Data

2.1 Empirical Model

Without capital market imperfections, internal and external finance are perfect substitutes. Firms will then invest in response to investment opportunities without having to take financial constraints into account. With financial frictions, however, financial constraints will heavily influence a firm's investment decisions. Financially constrained firms will invest according to a financing hierarchy (Fazzari, Hubbard & Peterson, 1988). Costs of funds differ, with internal funds being the cheapest, followed by external debt and equity issuance. A financially constrained firm's investment decision will therefore depend on fluctuations in the least-costly availability of internal funds, i.e. *Cash Flows*. Following Fazzari et al. (1988) and Mclean et al. (2012), we employ the empirical model below to estimate the investment-cash flow sensitivity of firms in Belt and Road countries:

$$I_{i,t} = \beta_0 + \beta_1 * L.CF_{i,t} + \beta_2 * Growth_{i,t} + Fixed\ Effects + \varepsilon_{i,t}$$

where $I_{i,t}$ is the ratio of firm *i*'s *Capital Expenditure* to beginning-of-period *Total Asset*. $L.CF_{i,t}$ is the ratio of firm *i*'s prior period *Cash Flow* to beginning-of-period *Total Asset*. Due to a lack of *Cash Flow*

data, $L.CF_{i,t}$ is replaced with the ratio of firm *i*'s *Earnings Before Extraordinary Items* to *Total Asset* for Kazakhstan, Lithuania, Moldova, Turkey and Russia. $Growth_{i,t}$ is proxied by firm *i*'s three-year average growth rate in *Operating Revenue*, net of value-added tax (VAT) when a country imposes VAT on transactions. Firm and year fixed effects are controlled for in the country and industry level models; industry fixed effects are controlled for in our country year model; country fixed effects are controlled for in our industry year model; firm and year fixed effects are controlled for in our country industry model. Finally, β_0 is the constant term and $\varepsilon_{i,t}$ is the error term for firm *i* at time *t*.

Financially unconstrained firms invest according to their investment opportunities or growth potential, usually proxied by *Tobin's Q* in the literature. In this case, β_1 is expected to be zero while β_2 is expected to be positive and statistically significant. However, firms that are more financially constrained are less able to raise external capital. The level of investment they make each year depends heavily on fluctuations in internal funds. The parameter of interest, β_1, estimates the economic magnitude of financial constraints by measuring how much of *Cash Flow* is translated into *Investment*. β_2, on the other hand, estimates how *Growth*, the proxy for growth potential, impacts on $I_{i,t}$. Thus, financially constrained firms are expected to positive and statistically significant estimates for β_1 and β_2.

Some studies challenge the validity of the investment-cash flow sensitivity method in addressing firms' financial constraints (Chen & Chen, 2012; Wan & Zhu, 2011), but their arguments are mainly from the perspective of the financial crisis period (year 2007-2009 in Chen & Chen, 2012) or specific event studies (China's tax reform in Wan & Zhu, 2011). Our study does not rely on these episodes for the following reasons. First, our sample period stretches from 2009 to 2015, almost ten years after the recession period. Second, the majority of our sample countries have a relative low level of financial openness, therefore would have experienced less economic contagion from the US financial crisis.

Financial constraints impact beyond investment. Firms anticipating financial constraints in the future will hoard more cash today, building precautionary cash reserves for future liquidity management and investment decisions. According to Almeida, Campello & Weisbach (2004), holding excess cash is costly since excess cash can otherwise be invested in current value enhancing investment projects. Following the same logic in the investment-cash flow sensitivity model, while financially unconstrained firms have no incentives to maintain excess cash holdings, their financially constrained counterparts will need to do so and the size of these will depend systematically on their internal *Cash Flow*. There-

fore, financial constraints will be related to a firms' propensity to save cash out of cash flow, which is referred to as the cash flow sensitivity of cash by Almeida, Campello and Weisbach (2004). The model is as follows:

$$ChgCash_{i,t} = \gamma_0 + \gamma_1 * CF_{i,t} + \gamma_2 * Growth_{i,t} + \gamma_3 * Size_{i,t} + Fixed\ Effects + u_{i,t}$$

where $ChgCash_{i,t}$ is the ratio of firm *i*'s changes in *Cash and Cash Equivalents* to *Total Asset*. $CF_{i,t}$ is the ratio of firm *i*'s current period *Cash Flow* to *Total Asset.* Due to a lack of *Cash Flow* data, $CF_{i,t}$ is replaced with the ratio of firm *i*'s *Earnings Before Extraordinary Items* to *Total Asset* for Kazakhstan, Lithuania, Turkey and Russia. and $Size_{i,t}$ is the log of *Total Asset.* γ_0 is the constant term and $u_{i,t}$ is the residual for firm *i* at time *t*. *Fixed Effects* are the identical to that in the investment-cash flow sensitivity model.

A financially unconstrained firm may have its *ChgCash* related to its size due to standard economies of scale arguments in cash management (i.e. a positive and statistically significant γ_3), but there should not be any systematic relationship between its *ChgCash* and *Cash Flow* or *ChgCash* and *Growth Potential*. *Cash Holding* of a financially constrained firm, however, is expected to have systematic relationship not only to *Size*, but also to *Cash Flow* and *Growth Potential*. The cash policy of a financially constrained firm should be affected by both its current cash flow shocks as well as the attractiveness of future investment opportunities. The first parameter of interest in this model, γ_1, estimates the economic magnitude of financial constraints by measuring how much *ChgCash* will be determined by *Cash Flow*. The second parameter of interest, γ_2, estimates how much *ChgCash* will be determined by *Growth*, the growth potentials. Hence, a financially constrained firm is expected to have positive and statistically significant γ_1 and γ_2. According to Almeida et al. (2004), the estimate of γ_2 may give less useful information about the effect of financial constraints than the estimate of γ_1. Therefore, we mainly focus on the estimate of γ_1.

2.2 Data and Sample

We construct our dataset by retrieving firm level financial data from the Orbis database. The Orbis database is considered to be the most comprehensive data source for international firm level analysis. Data is gathered and combined across different sources including regulatory filings, databases and news archive, with automated and manual tests to ensure data quality. Orbis contains information on

more than 200 million companies worldwide, more than 99% of which are private. The geographical profile of Orbis spans the Belt and Road countries, with data on more than 33 million, 89 million and 4 million companies in Asia, Europe, and the Middle East and Africa respectively. As private firms constitute the majority of firms globally, the Orbis database provides useful and relevant data for analysing the financial needs of firms in the Belt and Road countries. Orbis provides variables in the global standard format that standardizes variables across countries by adjusting for differences in accounting standards, tax regimes and fiscal calendars to facilitate cross country analyses.

We obtain a list of 65 Belt and Road countries from the Hong Kong Trade and Development Council, and retrieve all available and relevant financial data pertaining to firms belonging to Belt and Road countries from Orbis. Subject to data availability, the sample period spans from 2006 to 2015. To compensate for the lack of market value data for private firms, and for consistency purposes, we use a three-year arithmetic growth rate in *Operating Revenue* in place of *Tobin's Q*, which is constructed using the ratio of a firm's market-to-book value, to proxy for a firm's growth opportunities in our regression. This shortens the sample period for the regressions results to 7 years, from 2009 to 2015.

For robustness purposes, countries with fewer than 200 valid firm year observations are excluded in our regression samples. Our final regression sample consists of 2,632,220 firms in 36 Belt and Road countries including 16 European countries, 12 Asian countries and 8 Middle East countries. Our sample covers 10 industry divisions according to the Standard Industrial Classification and the majority of the sub-classification industry groups, with a total of 78 industry groups.

To enrich our analysis, we supplement and augment our empirical results by incorporating data from the World Bank Enterprise Surveys. The Enterprise Surveys are firm level surveys of a representative sample of a country's private sector, covering topics such as access to finance, corruption, infrastructure, crime, competition and performance measures (World Bank, 2016). Private contractors are hired to conduct the survey interviews due to the sensitive nature of survey questions relating to business government relations and bribery. Due to the scope of the survey interviews, only a subset of countries is investigated each year, with survey data from different countries collected at different points in time so it does not constitute a panel dataset. To ensure data comparability, the Enterprise Surveys Global sampling methodology is used, which therefore enables cross country analyses. The up to date dataset contains over 125,000 companies in 139 economies.

We primarily use data relating to finance, which includes qualitative and quantitative questions on a firm's reliance on internal funds for working capital and capital expenditure, availability of credit facility, its difficulties in loan applications and level of perceived financial constraints. The World Bank Enterprise Surveys cover 52 Belt and Road countries.

Table 1 provides descriptive statistics for the 56 Belt and Road countries in our sample: including (1) country name, (2) respective geographic region, (3) average annual real GDP growth rates during 2009 and 2014, (4) average annual investment (gross capital formation)-to-GDP rate during 2009 and 2014, (5) and (6) total number of firms in the sample in Orbis and World Bank Enterprise Survey database, respectively.

[Insert Table 1 Here]

Throughout the sample period, Belt and Road countries grew at a different pace. Mongolia and China had the highest average annual real GDP growth rate at 9.01% and 8.68% respectively, while Croatia came last, with its economy shrinking by 2.16% every year. Classifying countries into larger geographical regions in our sample, Asian countries fared better on average while Eastern European, Ukraine and Croatia in particular, experienced a period of economic setbacks. Investment driven economies such as China, Mongolia and Timor-Leste tend to have higher economic growth over the period. Consistent with the variation in real GDP growth rates, there are significant variations in the level of investment rates as well as growth rates among the Belt and Road countries.

Table 2a reports the summary statistics for variables in our investment-cash flow sensitivity regression for the 36 Belt and Road countries in the sample. Due to the data sufficiency of Orbis database, the summary statistics summarize the variables in 36 Belt and Road countries. There are noticeable cross country differences in *Investment* and *L.CF*. Countries such as China, Singapore, and Thailand have a higher average ratio of *Investment* at around 10%. Cross country differences in *Growth* are less dramatic than for other variables, but as revealed by the skewness and kurtosis statistics, within country differences are high. After winsorizing the data at 3%- and 97%- levels, the variables still exhibit high skewness and kurtosis, signalling an inherent variability between private firms.

[Insert Table 2a Here]

Table 2b tabulates the summary statistics of variables in our cash flow sensitivity of cash regression for the 36 Belt and Road countries in the sample. The average *ChgCash* for most countries, in contrast to *I*, is negative, implying that firms are holding less *Cash and Cash Equivalent* incrementally relative to *Total Assets* throughout the sample period. Similar to the investment-cash flow sensitivity model, except for *Size*, the variables are highly skewed and leptokurtic.

[Insert Table 2b Here]

The large differences in the number of firms in our sample can be attributed to data availability in Orbis. This distribution is not reflective of the size of the private sector in the Belt and Road countries.

3. Empirical Results

3.1 Financial Constraints Across Countries

Table 3a tabulates the regression results for investment-cash flow sensitivity by countries. The coefficients on *Growth* show the sensitivity of *I* to our proxy for growth potential, while those on *L.CF* represent the investment-cash flow sensitivity for the corresponding country. A great majority of countries across different regions in our sample have positive and statistically significant coefficients on *Growth* and *L.CF*. Together, this means that even after controlling for growth potential, cash flows are a statistically significant determinant of investment decisions. This implies that most Belt and Road countries face binding financial constraints.

[Insert Table 3a]

In particular, a positive and statistically significant coefficient on *Growth* indicates that firms in that country base investment decisions on growth potential. This is a standard scenario in the neoclassical setting. Furthermore, a positive and statistically significant coefficient on *L.CF* indicates that firms in that country base investment decisions on *L.CF* in addition to growth potentials. As an example, the coefficient on *L.CF* for China, which is statistically significant at the 1% level, is 0.191, which means that on average for each one-dollar increment in a firm's cash flow 0.191 of each dollar will be directed to capital expenditure, other things equal, after controlling for investment opportunities. Hence,

these firms are faced with binding financial constraints, with a larger coefficient suggesting higher constraints as a larger portion of investment is affected by cash flow.

While there are negative coefficients on *L.CF* for Croatia and Israel and negative coefficients on *Growth* for Iraq, Jordan and Kuwait, none of these are statistically significant. This could be attributed to inherently noisier data due to the nature of private firms, or a relatively smaller sample size, or that there exist country level shocks, such as civil war or conflict, which have induced greater variability and heterogeneity in firms' behaviour.

Table 3b tabulates the regression results for cash flow sensitivity of cash. The coefficient on *Growth* indicates how sensitive the change in cash holding is to our proxy for growth potential, while that on *CF* represents the cash flow sensitivity of cash for each corresponding country. A great majority of countries across different regions in our sample have a positive and statistically significant coefficient on *Size* and *CF*, but a statistically insignificant coefficient on *Growth.* By this measure, most firms in the Belt and Road countries are financially constrained as well.

[Insert Table 3b Here]

Again, a positive and statistically significant coefficient on *Size* is consistent with the economies of scale argument in cash holdings, meaning that a larger (smaller) firm is reward by holding more (less) *Cash and Cash Equivalent* incrementally. A positive and statistically significant coefficient on *CF*, however, indicates that firms systematically retain a portion of cash flows, which suggests that firms might be reserving cash as internal funds because of future uncertainties. Results from this model indicate that in addition to raising investment financing, most countries are financially constrained with regard to raising liquidity too. Interestingly, 24 out of the 36 countries examined show no statistically significant coefficient on *Growth*, implying that growth opportunities and cash retention policies are not systematically related in most countries.

For example, China has positive and statistically significant coefficients on cash flow (*CF)*, growth *(Growth)* and size (*Size)*. The 0.179 coefficient on *Cash Flow*, suggests that firms in China retain 0.179 dollar for each 1 dollar increment in *CF* on average,other things equal. Firms in China will re-serve cash in face of higher growth, increasing *ChgCash* by a statistically significant 0.018 percent-

age points for each percentage point increment in *Growth*. In addition, larger firms hold more cash on average, as indicated by a positive and statistically significant coefficient on *Size*.

While results from the investment-cash flow sensitivity model and the cash flow sensitivity of cash model are consistent across broader geographical regions, there are noticeable cross-country variations, with firms in the Middle East being more constrained and those in Eastern Europe less so. This indicates that while firms in the Belt and Road countries are financially constrained, the financial constraints vary in magnitude and operate through different channels.

In country level regressions in both models, we further control for macroeconomic indicators, namely the natural logarithm of GDP, real GDP growth rate, CPI inflation, and the ratio of broad money supply to GDP. The results are quite similar with those in Table 3a & 3b, therefore we only report them in Appendix 4.

3.2 Financial Constraints Across Industries

In this section, we further examine the industry-level financial constraints using the investment-cash flow sensitivity model and the cash flow sensitivity of cash models to better understand the financial needs of different industries. Table 3 tabulates the regression results by industrial divisions according to the Standard Industrial Classification (SIC) code. The SIC code is a hierarchical coding structure that narrows industrial classification down from general characteristics to specifics. This set of results makes use of the most general industrial division, covering ten broad business sectors. Appendix 2 summarizes the SIC industrial divisions and major groups. Firms in our sample operate across all major divisions and 78 of the major groups. Each industrial division, however, contains both heavy and light industries and industries that fall in between. For example, the *Mining* division contains firms operating in heavy industries such as *Metal Mining* and *Drilling Oil and Gas Wells*, and less well defined industries such as *Oil and Gas Field Exploration Services* and *Oil and Gas Field Services*. This section presents findings using results from the industry division classification. Due to the much smaller sample sizes, the more specific results for major groups are provided in the Appendix 2 as a raw reference only.

From the investment-cash flow sensitivity model, all industrial divisions exhibit positive and statistically significant coefficients on both *Cash Flow* and *Growth*. This indicates that firms across industries sys-

tematically factor both growth potential and financial constraints into their investment decision making process. Consistent with economic intuition, the capital intensive *Agriculture, Forestry and Fishing* division exhibits the highest level of financial constraints, with a 0.053 coefficient on *Cash Flow*, whereas the *Retail Trade* division, which has relatively lower capital expenditure requirements by nature, is least financially constrained compared to the other divisions.

[Insert Table 4a Here]

From the cash flow sensitivity of cash model, all industrial divisions exhibit positive and statistically significant coefficients on *Cash Flow* and *Size*, indicating the existence of binding financial constraints and economies of scale in liquidity management across industries. Consistent with economic intuition, industrial divisions with higher liquidity needs exhibit the highest level of cash flow sensitivity of cash, with the *Public Administration* division and the *Services* division having the highest sensitivity. Most industrial divisions contain a positive and statistically significant coefficient on *Growth*, in contrast to the country level results, possibly due to disproportionate relative sample sizes. Out of the six countries with more than 300,000 observations, four (Bulgaria, Hungary, Romania and Russia) contain positive and statistically significant coefficients on *Growth*.

[Insert Table 4b Here]

Similar to the country level results, where both the investment-cash flow sensitivity model and the cash flow sensitivity of cash model indicate the presence of financial constraints across industrial division, these financial constraints vary in magnitude and operate through different channels.

4. Financing Needs Index

4.1 Construction of the Financing Needs Index

In order to better capture the magnitude of suppressed financing needs, we aggregate the information from the investment-cash flow sensitivity and the cash flow sensitivity of cash models to construct a

Financing Needs Index[1]. The first step is to normalise the statistically significant coefficients on investment-cash flow sensitivity as well as cash flow sensitivity of cash in each country/industry using the following formula:

$$Score_{s,j} = \frac{Sensitivity_{s,j} - Sensitivity_{s,min}}{Sensitivity_{s,max} - Sensitivity_{s,min}}$$

where $Score_{s,j}$ is the normalised score, which is between 0 and 1, for the sensitivity measure *s* for country/industry *j*, with *s* being investment-cash flow sensitivity or cash flow sensitivity of cash. $Sensitivity_{s,max}$ and $Sensitivity_{s,min}$ is the highest and lowest coefficient in the regression for the respective sensitivity measure.

The normalised score is then averaged to give the index reading. For countries/industries with only one statistically significant coefficient, the normalized score for that statistically significant coefficient is taken directly as the index reading.

$$Financing\ Needs\ Index_j = \begin{cases} \frac{\sum Score_{s,j}}{2} & \text{if both Score}_{\text{s,j}} \text{ are statistically significant} \\ Score_{s,j} & \text{if only Score s is statistically significant} \end{cases}$$

The magnitude of statistically insignificant coefficients is ignored as they do not constitute suppressed financing needs stemming from binding financial constraints. For region level, country-year, industry-year level analysis, the normalization method is the same as for the country/industry level analysis. The higher the Financing Needs Index, the higher the financial constraints and financing needs.

4.2 The Financing Needs Index

4.2.1 Financing Needs Index across Belt and Road Countries

Table 5 tabulates the resulting Financing Needs Index and rankings for the 36 Belt and Road countries, with Indonesia using the normalised score for investment-cash flow sensitivity only as the index

[1] Regressing the investment-cash flow sensitivity coefficient on that of the cash flow sensitivity of cash in a no-constant regression, we obtain a significant coefficient of 0.48, which indicates although the two sensitivities are highly correlated, they still offer different dimensions of constraint information.

score and Bangladesh, Croatia, Egypt, Iraq, Israel, Jordan, Kazakhstan, Kuwait, Latvia and the Philippines using the normalised score for cash flow sensitivity of cash only. The resulting Financing Needs Index is highly and statistically significantly correlated with the investment-cash flow sensitivity and cash flow sensitivity of cash coefficients, at 0.5265 and 0.6747 respectively.

[Insert Table 5 Here]

In general, countries that are economically more developed in the sample and situated in Eastern Europe, such as Russia and Hungary are less financially constrained; whereas countries that have experienced political and social instability and are situated in the Middle East, namely Egypt and Iraq, are more financially constrained. Figure 2 visualizes the country level financing needs by charting the map of the Belt and Road countries in the sample according to the rankings in Table 5, and Figure 3 graphs the Financing Needs Index scores for geographical regions covered in the sample[2].

[Insert Figures 2 and 3 Here]

By examining the Financing Needs Index for each country and each year, we obtain the time evolution of the financing needs reported in Figure 4. The time evolution of the indices differs drastically across countries throughout the sample period. Even though the sample period coincides with the Global Financial Crisis and the Eurozone Crisis, fluctuations in the indices remain largely asynchronous. This may be due to differences in domestic stimulus policies adopted by Belt and Road countries in coping with the financial crisis or country specific economic and/or political shocks. The Financing Needs Index for the Philippines suggests that domestic shocks have a first order impact on the financing needs of indigenous private firms; the index dipped from 2013 to 2014 following a credit rating upgrade of the Philippines. As another example, the Financing Needs Index of Russia rose between 2013 and 2014, moving synchronously with nominal national GDP, which reached its peak in 2013 and turned down sharply afterwards. The fall and rise in the Financing Needs Index for India could be attributed to domestic stimulus policies, which the then-Governor of the Reserve Bank of India Raghuram Rajan highlighted in his statement of the "withdrawal of large monetary and fiscal stimulus by Indian government that was administered immediately after the crisis" in 2013. Last but

[2] The region level Financing Needs Index is constructed using the same method as in section 4.1. For brevity reasons, we do not report the regression results of both Investment-cash flow sensitivity and cash flow sensitivity of cash for region level in the main text.

not least, the evolution of the country level Financing Needs Index may reflect how political uncertainty affects firms' behaviour, as the index readings heightened from 2010 onwards, when the Pro-Russian Viktor Yanukovych became President in Ukraine, reducing the likelihood of that country becoming a member of the European Union.

[Insert Figure 4 Here]

4.2.2 Financing Needs Index Across Industries

In this section, we examine the industry level Financing Needs Index in order to shed light on how binding financial constraints impact on each industry's financing needs. The results are reported in Table 6. Consistent with the results from Tables 4a and 4b, the *Retail Trade* division is the least financially constrained, with an index score of 0.0100, which is significantly lower than the most constrained division, *Agriculture, Forestry and Fishing*, which has a score of 0.7014. With the standardised constraint index, the differences in suppressed financing needs are easily visualised. The stark differences in the least and most constrained industries may stem from that the *Retail Trade* division is more resilient to changes due to its high turnover nature, better operational control, and low capital requirements, while the *Agricultural, Forestry and Fishing* division requires substantial capital investment and operational outlays and is subject to seasonal and natural shocks. *Construction, Transportation and Public Utilities Industries* are also ranked high in the Financing Needs Index ranking.

[Insert Table 6 Here]

By examining the Financing Needs Index for each industry and each year, we obtain the time evolution of the financing needs for each industry shown in Figure 5, which is noteworthy. Despite the heterogeneous characteristics across industries, controlling for country fixed effects, most industries follow a rise-then-fall pattern during the sample period, mostly peaking in 2012. There is an inverse relation with the average GDP growth rate of the countries in the sample, which bottomed at 2.85% in 2012.

[Insert Figure 5 Here]

The industry level results point in a clear direction. First, while infrastructure development is prioritized in the Belt and Road Initiative, the industrial division *Infrastructure* is highly financially constrained. Second, governments may have to be more active in directing and co-ordinating financial capital to the prioritized industries in order to fund projects in the pipeline. However, with the time-varying nature of financial constraints and financing needs across industry, policies aimed at mitigating financial constraints ought to be narrower and more specific. The following subsection examines the financial needs of each industry in the Belt and Road countries and whether there are cross-country complementarities that present business opportunities to the private sector.

4.2.3 Financing Needs Index across Industries in Belt and Road Countries

In order to provide a thorough picture of the financing needs across industries and across countries, two sets of analysis are conducted in this subsection. First, the Financing Needs Indices of each industry are quantified and compared within each country. This set of analysis shows us the relative level of industrial financing needs within each home country. Second, the Financing Needs Indices of each industry are quantified and compared across the Belt and Road countries. This set of analysis shows us the relative level of the financing needs of the same industry across Belt and Road countries.

[Insert Figure 6a Here]

Figure 6a graphs the Financing Needs Index for each industry in the Belt and Road countries. The index scores for each industry are normalised within each country, which indicate how binding financial constraints impact on firms' financing needs within one country. The results are not comparable across countries. As shown in Figure 6a, there is significant variability in the magnitude of financial constraints straining the financing needs of firms in different industries in different countries. For example, while all the graphed industries are financially constrained in Bosnia and Herzegovina with the *Finance, Insurance and Real Estate*, the *Mining*, and the *Services* industries significantly more constrained than the other divisions, the most financially constrained industry in Poland and Sri Lanka is the *Agriculture, Forestry and Fishing* division. Therefore, domestically, governments may dedicate resources to the most financially constrained industries in an attempt to harmonise the differences

across industries, lower the overall magnitude of financial constraints and hence fulfil firms' financing needs.

By normalising index scores across industries, Figures 6b.1 and 6b.2 graph the three most and least financially constrained countries for each industry division. As shown in Figure 6b.1 and 6b.2, for example, the *Agriculture, Forestry and Fishing Industry* is most constrained in Kazakhstan, Vietnam and the Philippines, and least constrained in Serbia, Russia and Ukraine. The differences in financial constraints faced by the same industry across different countries indicate the presence of inter-country complementarities where a less financially constrained firm may channel its financial capacity to a financially constrained firm in the same industry in another country and meet its financing needs. However, differences in business, institutional and regulatory environment may hinder these cross border collaborations or activities, especially when a country exercises capital control. The Belt and Road Initiative with its institutional architecture presents the opportunity to harmonise these differences with efficacy.

[Insert Figures 6b.1 and 6b.2 Here]

As shown in Figures 2, 4, 5 and 6, the Financing Needs Index varies across countries and industries and through time. This implies that both top down macroeconomic analyses and bottom up industry analyses are crucial in coordinating resources to meet the financing needs for firms in the most financially constrained group in a timely fashion. While governments may have timely access to macroeconomic information, professionals and experts are more likely to be informed on industry developments. This signals the importance of public private cooperation, and the possibility of alleviating financial constraints and satisfying financing needs at both a macro and micro level.

5. Validity Test and Augmented Financing Needs Index

5.1 Revealed versus Surveyed Financing Needs: A Validity Test

While the Financing Needs Index gauges how financial constraints shape financing needs, firms in these economies may have a different perception. By comparing the Financing Needs Index with the

publicly available, aggregated survey results on Access to Finance in the Enterprise Surveys published by the World Bank, this section explores whether and to what extent revealed financing needs align with perceived and self-reported indicators of access to external finance.

The Enterprise Surveys is a series of firm level surveys on a representative sample of a country's private sector, covering topics such as access to finance, corruption, infrastructure, crime, competition and performance measures (World Bank, 2016). The standardized and aggregated country level data used in this section is publicly available on the Enterprise Surveys website, covering 15 aggregated indicators assessing whether firms need loans and evaluating firms access to external finance in 139 countries.

The Financing Needs Index is consistent with various indicators in the Finance subsection in the Enterprise Surveys. Firms in a country that has a higher Financial Needs Index score has a higher likelihood of (1) needing a loan as shown in Figure 7a, (2) identifying access to finance as a major obstacle as shown in Figure 7b, (3) having a higher percent of firms with banking services as shown in Figure 7c, (4) requiring more valuable collateral proportional to bank loans as shown in Figure 7d.

[Insert Figures 7 Here]

The close correspondence between the Financing Needs Index and the Enterprise Surveys indicators shows that the Financing Needs Index, which measures firms' reliance on internal funds for investment decisions and future liquidity management, is a valid measure for gauging firms' financing needs.

5.2 Augmented Financing Needs Index

As the Enterprise Surveys report perceived and self-reported information on financing needs and financing situation, which has been shown to be consistent with the Financing Needs Index in Section 5.1, it is possible to enrich the Index by aggregating measures for financial constraints constructed using data from the Enterprise Surveys. The World Bank provides a full set of survey data – in contrast to country level indicators used in Section 5 – with restricted access. This set of firm level data contains an expansive array of self-reported economic information on over 125,000 firms in 139 countries. We construct a Financing Obstacles Index by sorting and aggregating Enterprise Surveys

data, which has a statistically significant 0.41 correlation with our Financing Needs Index. This underscores both consistency and complementarity between the two sets of information.

5.2.1 Financing Obstacles Index

By referring to the World Bank Enterprise Surveys Core Module (2007), we sort and group the Enterprise Survey data into four dimensions: (1) availability of credit facility; (2) requirement for collaterals; (3) difficulty in loan application; and (4) perception of financing obstacles. Detailed construction methods of the four scores are provided in the appendix.

Firm level responses are averaged within country to obtain the country level scores, which are normalized into the country level sub-index scores. The sub-indices for each country are aggregated to obtain the Financing Obstacles Index. A higher index (sub-index) score indicates that the country has greater financing obstacles (in the respective dimension). The resulting Financing Obstacles Index contains 56 Belt and Road countries, covering an additional 20 countries compared to the Financing Needs Index. The Financing Obstacles Index and subindex scores are tabulated in Table 7a.

[Insert Table 7a Here]

5.2.2 Augmented Financing Needs Index

Results from Section 5.1 indicate consistency between our Financing Needs Index and the Enterprise Surveys data. The statistically significant 0.41 correlation between the Financing Needs Index and the Financing Obstacles Index points further to a level of complementarity. This suggests that we might be able to construct a more comprehensive Augmented Financing Needs Index using balance sheet data in the Financing Needs Index and survey data in the Enterprise Surveys. The Augmented Financing Needs Index measures the relative magnitude of financing needs for 56 Belt and Road countries up to six dimensions: (1) reliance on internal funds for investment decisions after controlling for growth potentials; (2) reliance on internal funds for future liquidity management after controlling for growth potentials and size; (3) availability of credit facility; (4) requirement for collaterals; (5) difficulty

in loan application; and (6) perception of financing obstacles. Each sub-index score is normalized in between 0 and 1, then averaged across and normalized again to obtain the Augmented Financing Needs Index score. Table 7b tabulates the Augmented Financing Needs Index and the rank for each of the 56 Belt and Road countries.

[Insert Table 7b Here]

In general, firms in countries in the Middle East and South Asia have greater financing needs, whereas those in Central and Eastern Europe are less financially constrained. Iraq is the country with the greatest financing needs, with the Augmented Financing Needs Index score much higher than for Afghanistan and United Arab Emirates. The differences in the least constrained countries are less distinct. This highlights the asymmetry in financing needs, and hints that there may be a number of underlying factors shaping the magnitude of financial constraints in each country.

5.2.3 Macroeconomic Impact of Financing Constraints

The Augmented Financing Needs Index reveals the average magnitude of financing needs of private indigenous firms in a country. To evaluate the macroeconomic impact of the Augmented Financing Needs Index, we examine the extent to which Augmented Financing Needs Index hinders investment due to the unsatisfied financing needs for indigenous firms. Specifically, we regress the cumulative investment growth from 2009 to 2014 on both the Augmented Financing Needs Index and the average GDP per capita during the corresponding period and report the results in Table 7c.

We define the cumulative investment growth as the growth of investment from the year of 2009 to the year of 2014. We use the cumulative growth over five years to smooth yearly fluctuations. We control Ln(GDP per capita) in the regression, and construct it as the natural logarithm of the average GDP per capita during 2009 and 2014.

[Insert Table 7c Here]

As shown in Table 7c, the -0.346 coefficient on the Augmented Financing Needs Index is statistically significant, indicating that while growth opportunities drive investment, financial constraints deter the process. Impeded access to external finance, as gauged by Augmented Financing Needs Index,

strain investment and this in return dampens economic growth. Given the standard deviation of Augmented Financing Needs Index as 0.187, a one standard deviation increase in the Augmented Financing Needs Index will decrease the cumulative investment growth by 6.5% (0.187*0.346). Therefore, it is economically significant also.

There are noticeable differences in the Index scores for each country in the sample, particularly for countries that have the greatest financing needs. In addition to market driven remedies that reduce differences, as outlined in Section 4, governments in the Belt and Road countries may introduce policies to mitigate the overall magnitude of financial constraints domestically. In the next section, we investigate institutional characteristics associated with financial constraints and draw out some policy implications.

6. Financing Needs and Financial Development of Belt and Road Countries

This section examines the institutional attributes of the Belt and Road countries to pinpoint areas where governments could mitigate some of the differences in measures of financial constraints and thereby help to satisfy the financing needs of private firms within their economies. A large strand of literature has documented the role of financial development in promoting long term economic growth (e.g. King and Levine, 1993a, 1993b, 1993c). Governments could improve institutional quality in their economies through governmental governance and financial liberalisation to propagate a business friendly climate, which could help to reduce financial constraints overall. By comparing the Augmented Financing Needs Index for the Belt and Road countries with the Financial Reform Index by Abiad, Detragiache and Tressel (2008), the Ease of Doing Business rankings by the World Bank (2016) and the World Governance Index by Kaufmann, Kraay and Mastruzzi (2009), we attempt to provide policy directions that may compress the differences in financial constraints across the Belt and Road countries and meet the financing needs of indigenous firms.

6.1 Financial Liberalisation

Multiple studies have shown that financial liberalization and the entry of foreign investors promotes good corporate governance, productivity and economic growth (Javorcik, 2004; Bekaert, Harvey and Lundblad, 2005; Aggarwal et al., 2011). Hence, this section examines whether this is applicable to the Belt and Road countries. It contextualizes both investment-cash flow sensitivity and cash flow sensitivity of cash by comparing the results with the Financial Reform Index designed by Abiad, Detragiache and Tressel.

The Financial Reform Index introduced by Abiad, Detragiache and Tressel measures the level of financial liberalisation in 91 economies over the period 1973–2005. It covers eight dimensions that are first coded into a raw liberalization score normalized between zero and three, and then combined into a graded index that is normalized between zero and one. These eight dimensions include: (1) credit controls and reserve requirements; (2) aggregate credit ceilings; (3) interest rate controls; (4) banking sector entry; (5) capital account transactions; (6) privatization; (7) securities markets; and (8) banking sector supervision. In contrast to other indices with a similar nature (e.g. Edison and Warnock's (2003) measure on capital control, Bandiera, Honohan and Schianatrelli (2000)'s and Laeven's (2003) measures on financial liberalization) this Index prepared by Abiad, Detragiache and Tressel has a broader coverage both in terms of dimensions and countries. For the normalized Financial Reform Index, 0 represents a fully financially repressed economy, whereas 1 represents a fully financially liberalized economy.

[Insert Figure 8 here]

A less financially liberalized economy tends to have a less competitive financial market. Firms in such an economy are therefore expected to have limited access to external financing and are more financially constrained. Hence, there should be an inverse relationship between the Augmented Financing Needs Index and the Financial Liberalization Index. Figure 8 graphs the linear relationship between the Augmented Financing Needs Index and the Financial Reform Index. Consistent with the theory, there exists a clear negative relationship between the two. With more government intervention and therefore less competition in financial markets, firms' access to external financing is impeded, resulting in more binding financial constraints and greater financing needs.

However, while financial liberalization may mitigate the level of financial constraints in a country, the process is intricate and consequential. Demirgüç-Kunt and Detragiache (1998) show that while financial liberalisation enhances financial development in financially repressed countries, there is an increased probability of a banking crisis. This probability is lower if a country has a strong rule of law and contract enforcement, and strong institutions with a low level of corruption. This implies that in addition to a stable and robust macroeconomic performance, a country requires strong institutions in order to reap the fruits of financial liberalisation. This also points to the possibility that financial constraints are related to regulatory and institutional attributes, which are explored in the following subsections.

6.2 Regulatory Constraints and Business Climate

The regulatory constraints and business climate in a country heavily influences the operations of both indigenous and foreign firms. By comparing the Augmented Financing Needs Index with Doing Business 2016 prepared by the World Bank, this subsection explores how select business regulations strain firms' financing needs in the Belt and Road countries.

In the Doing Business report, the World Bank researches into 189 economies' regulatory constraints and gauges the business climate through examining ten areas of business regulations. Data is gathered through expert surveys, with most indicators benchmarked to a small, hypothetical company. This is not a statistical sample, nevertheless, the results from Doing Business provide a reference that is standardised across the surveyed economies. Each economy receives a distant-to-frontier score through a comparison with regulatory best practice, which is then rounded to two decimal places to attain the Ease of Doing Business Rank. The higher (lower) the distance-to-frontier score (Ease of Doing Business Rank), the less regulatory constraints an economy has, which can be interpreted as having a better business climate.

[Insert Figure 9 Here]

Figure 9 graphs the linear relationship between the Augmented Financing Needs Index and the overall Doing Business rank for the Belt and Road countries in the sample. A lower rank implies a more business friendly economy, therefore the two indices are expected to exhibit a positive relationship.

Every subcomponent numerical rank is positively related to the Augmented Financing Needs Index, and is indicative of how the general business climate affects the financing needs of indigenous firms. In particular, the relationship between a lower Augmented Financing Needs Index score and the *Getting Credit* rank, the *Protecting Minority Investors* rank, the *Enforcing Contracts* rank, the *Resolving Insolvency* rank, the *Trading across Borders* rank, and the *Registering Property* rank is strong and unequivocally clear. *Getting Credit* gauges the strength of legal rights of borrowers and lenders with respect to secured transactions. *Protecting Minority Investors* gauges the protection of minority investors and shareholders' right in corporate governance. *Enforcing Contracts* gauges judicial quality by measuring time and cost for resolving a commercial dispute through a local first-instance court. *Resolving Insolvency* gauges strength of the legal framework governing the liquidation and reorganisation process. *Trading across Borders* gauges the ease of cross-border trading and business. *Registering Property* gauges the ease of register a property. These results suggest four ways in which institutional and regulatory arrangements can influence the overall magnitude of financial constraints experienced by indigenous firms in a country.

6.3 Institutional Quality

In addition to regulatory constraints and business environment, the institutional quality of governments also shapes socio-economic interactions, and hence, financial constraints and financing needs. By comparing the Augmented Financing Needs Index with the World Governance Indicators constructed by Kaufmann and Kraay and Mastruzzi, this subsection examines how institutional governance impacts on financing needs.

The World Governance Project sources data from over 30 entities and creates indicators by aggregating views on institutional governance from enterprises, citizens and expert survey respondents (World Bank, 2016). The resulting World Governance Indicators examine how authority in a country is exercised in 215 economies from 1996-2014 in six dimensions. The score follows a standard normal distribution with mean zero and a unit standard deviation, with virtually all scores lying in the range from -2.5 to 2.5. A high score translates into better performance in the respective dimension. Figure 9 graphs the linear relationship between the Augmented Financing Needs Index and four relevant dimensions of the World Governance Index. These dimensions include: (1) *Voice and Accountability*,

which gauges the extent that citizens can participate in selecting their government and the accountability of a government to its citizens; (2) *Political Stability and Absence of Violence*, which gauges whether the political authority is stable and unthreatened by politically motivated violence and terrorism; (3) *Government Effectiveness*, which gauges the quality of public and civil service, policy formulation and implementation and governmental credibility; (4) *Regulatory Quality*, which gauges the quality of regulations in promoting and permitting development in the private sector; (5) *Rule of Law*, which gauges the perception of the extent to which agents abide by the rules of the society; and (6) *Control of Corruption*, which gauges the extent to which public power is exercised for private gains.

A country with better institutional quality is expected to have spillover effects on corporate governance, as institutional quality heavily influences the business climate in a country, as well as its business culture and ethics, and its attitude towards and the level of competition. Firms in such a country are expected to be less financially constrained and have lower financing needs. We construct the World Governance Index by first averaging each Indicator in a country from 2009 to 2014, then averaging across all Indicators. Figure 10 shows the strongly negative relation between the Augmented Financing Needs Index and the World Governance Index, indicating that better institutional quality is positively correlated with lower financing needs of firms in that country.

[Insert Figure 10 Here]

The relation between the Augmented Financing Needs Index and the Financial Reform Index, the Doing Business rankings, and the World Governance Index indicate how financial development, business climate and institutional arrangements are closely knitted. Liberalising the financial sector and improving the business climate and institutional quality are long term aims by nature. But these general aims provide scope for the Belt and Road countries to strengthen governmental collaboration and harmonize differences across countries, and to pool and co-ordinate capital and expertise across regions. This requires commitment and caution, but over the long run, if financial constraints can be alleviated and the financing needs of indigenous firms satisfied, the Belt and Road countries will be able to accelerate economic development sharply, inclusively and cohesively.

7. Conclusions

The Belt and Road Initiative is a key national and international development strategy that will bring about economic, social and cultural prosperity across countries. Hong Kong, as an integral part of China and as one of the most prominent international financial centres in the world, is well positioned to capitalise on its strength and expertise in facilitating cross-border financing.

By examining a large dataset containing predominantly private firm data in 36 Belt and Road countries, we construct a Financing Needs Index and highlight the major characteristics of the financial constraints binding firms in the Belt and Road countries. By augmenting the Financing Needs Index with survey data in the World Bank Enterprise Surveys, we build a comprehensive measure that gauges the financing needs of firms in 56 Belt and Road countries across six dimensions that include both revealed and perceived constraints. The indices introduced in this paper highlight the countries which have higher financing needs as well as the magnitude of these needs relative to other countries in the sample. We suggest several ways in which governments in the Belt and Road countries can work together to meet the financing needs of indigenous firms. Our key results can be summarised as follows.

First, at country level, Belt and Road countries differ significantly in the financing needs of their indigenous firms. Our results show that Iraq is the country in which indigenous firms have the highest financing needs, followed by Afghanistan and United Arab Emirates.

Second, at an industry level, the *Retail Trade* division is the least financially constrained, while *Agriculture, Forestry and Fishing* is the most constrained division.

Third, within each Belt and Road country, the level of financing needs across different industries differs. For example, in Bosnia and Herzegovina, the Finance, Insurance and Real Estate, the Mining, and the Services industries are significantly more constrained than the other divisions. While for the same industry, the level of financing needs differs across countries. For example, the Agriculture, Forestry and Fishing Industry is the most constrained in Kazakhstan, Vietnam and the Philippines, and the least constrained in Serbia, Russia and Ukraine.

Last but not least, the differences in financing needs can be eased through improving institutional structures and the business environment in which firms operate, targeting the most financially constrained industries through international cooperation.

Our paper has a few limitations. The data availability for a longer time period will be helpful for our analysis of the time trends of financing needs across countries and industries. Furthermore, since our sample mainly consists of large private corporations, the results would be more comprehensive if we could obtain data for small corporations. In terms of future research, methods of constructing the index could be further improved, and more detailed industrial knowledge can also be combined with the sector level results to yield possibly richer insights into the nature of financial constraints facing firms in our sample.

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Table 1. Descriptive Statistics

Table 1 lists the Belt and Road countries, the respective regions, average annual real GDP growth rates from 2009 to 2014, average investment-to-GDP rate from 2009 to 2014, average change in investment rate from 2009 to 2014, correlation between investment rate and real GDP growth, and the total number of firms in the sample in each database. Investment is proxied by gross capital formation. The list of the Belt and Road countries and their geographical classification are obtained from the Hong Kong Trade Development Council. The macroeconomic statistics are obtained from the World Bank's World Development Indicators.

(1)	(2)	(3)	(4)	(5)	(6)
Country	**Region**	**Average Real GDP Growth (%)**	**Average Investment-to-GDP Rate (%)**	**Number of Firms (Orbis)**	**Number of Firms (Enterprise Surveys)**
Afghanistan	South Asia	8.88	17.43	N.A.	945
Albania	Central Europe	2.39	29.58	N.A.	664
Armenia	Western Asia	1.13	27.25	N.A.	734
Azerbaijan	Western Asia	4.05	21.62	N.A.	770
Bangladesh	South Asia	5.95	27.52	169	2946
Belarus	Eastern Europe	2.98	37.73	N.A.	633
Bhutan	South Asia	6.49	57.78	N.A.	503
Bosnia and Herzegovina	Central Europe	0.22	18.11	27073	721
Bulgaria	Eastern Europe	0.08	23.01	224165	1596
Cambodia	Southeast Asia	5.82	19.35	N.A.	845
China	East Asia	8.68	47.22	32908	2700
Croatia	Central Europe	-2.16	20.6	80	993
Czech Republic	Central Europe	-0.01	26.17	150733	504
Egypt	Middle East	3.03	16.69	210	2897
Estonia	Eastern Europe	0.83	25.12	73827	546
Georgia	Western Asia	3.99	24.05	N.A.	733
Hungary	Central Europe	-0.03	20.66	277255	601
India	South Asia	7.44	36.57	7868	9281
Indonesia	Southeast Asia	5.61	33.39	425	2764
Iraq	Middle East	5.95	16.89	69	756
Israel	Middle East	3.42	19.58	918	483
Jordan	Middle East	3.16	26.45	188	573

Kazakhstan	Central Asia	5.23	24.34	2324	1144
Kuwait	Middle East	1.06	15.36	163	N.A.
Kyrgyz Republic	Central Asia	3.8	30.96	N.A.	505
Lao PDR	Southeast Asia	8.01	28.66	N.A.	998
Latvia	Eastern Europe	-0.42	23.4	79585	607
Lebanon	Middle East	4.23	28.14	N.A.	561
Lithuania	Eastern Europe	0.55	18.24	3012	546
Macedonia	Central Europe	1.89	27.55	N.A.	726
Malaysia	Southeast Asia	4.56	23.52	8155	999
Moldova	Eastern Europe	3.47	24.2	571	723
Mongolia	East Asia	9.03	46.49	N.A.	722
Montenegro	Central Europe	0.44	21.44	N.A.	266
Myanmar	Southeast Asia	8.37	N.A.	N.A.	632
Nepal	South Asia	4.51	36.02	N.A.	850
Pakistan	South Asia	3.3	15.42	487	2182
Philippines	Southeast Asia	5.39	19.46	19562	2661
Poland	Central Europe	2.92	20.72	74937	997
Romania	Eastern Europe	0.02	26.58	426178	1081
Russia	Eastern Europe	1.06	21.63	624685	5224
Saudi Arabia	Middle East	4.71	28.39	118	N.A.
Serbia	Eastern Europe	-0.23	19.02	54870	748
Singapore	Southeast Asia	5.27	28.6	1923	N.A.
Slovakia	Central Europe	1.32	22.2	125476	543
Slovenia	Central Europe	-1.11	20.87	82034	546
Sri Lanka	South Asia	6.16	32.07	248	610
Tajikistan	Central Asia	6.55	19.18	N.A.	719
Thailand	Southeast Asia	3.1	25.45	28864	1000
Timor-Leste	Southeast Asia	8	48.75	N.A.	150
Turkey	Middle East	3.72	19.8	17580	2496
Ukraine	Eastern Europe	-2	18.82	279280	1853
United Arab Emirates	Middle East	2.9	24.79	66	N.A.
Uzbekistan	Central Asia	8.2	23.59	N.A.	756
Vietnam	Southeast Asia	5.79	30.56	6214	2049
Yemen	Middle East	-0.2	N.A.	N.A.	830

Table 2a. Summary Statistics of the Investment-cash Flow Sensitivity Model

Table 2a reports the summary statistics for the variables *I*, *L.CF* and *Growth* and the total number of observations by country in the investment-cash flow sensitivity model for the period 2009-2014. The variable *Investment* is measured by the annual growth of firms' *Fixed Assets* to *Total Assets ratio*. *L.CF* is measured by firms' prior period's *Cash Flow* deflated by beginning-of-period *Total Assets*. *Growth* is proxied by firms' three-year average growth rate in *Operating Revenue*. For Kazakhstan, Lithuania, Moldova, Turkey and Russia, the ratio of *Earnings Before Extraordinary Items* to beginning-of-period *Total Asset* is substituted for *L.CF* due to lack of *Cash Flow* data. Each variable is winsorized at the 3%- and 97%- levels due to excess skewness and kurtosis.

Country	*Investment*				*L.CF*				*Growth*				Observations
	Mean (%)	**Std.(%)**	**Skewness**	**Kurtosis**	**Mean (%)**	**Std.(%)**	**Skewness**	**Kurtosis**	**Mean**	**Std.**	**Skewness**	**Kurtosis**	
Bangladesh	2.179	28.27	1.641	7.373	9.18	6.98	0.99	3.21	1.15	0.21	1.7	6.66	375
Bosnia and Herzegovina	0.932	51.04	1.79	8.137	8.55	14.01	0.81	4.57	1.11	0.46	2.54	10.57	89136
Bulgaria	0.8716	68.94	2.152	9.183	12.4	18.91	0.51	4.22	1.34	0.92	3.11	12.92	367261
China	7.821	57.22	2.344	9.43	7.37	5.94	0.72	4.05	1.26	0.41	3.4	17.08	18161
Croatia	2.527	67.28	1.998	8.554	9.45	21.25	-0.5	3.8	1.05	0.4	2.75	11.61	270
Czech Republic	5.33	65.76	2.202	9.421	8.06	16.51	-0.23	4.81	1.18	0.63	3.65	17.18	334687
Egypt	3.921	28.29	2.225	9.44	8.35	9.27	0.66	3.55	1.21	0.55	2.99	11.85	1005
Estonia	3.243	68.17	2.072	8.809	12.02	23.49	-0.1	3.9	1.26	0.71	2.99	12.73	168418
Hungary	2.45	66.33	1.882	8.029	10.49	29.73	-0.64	6.11	1.2	0.63	2.8	11.14	696067
India	7.28	47.85	2.599	11.18	4.88	8.64	-0.45	4.65	1.51	1.62	4.16	20.06	22339
Indonesia	3.825	32.14	1.947	8.321	7.59	9.54	0.29	3.58	1.41	1.3	4.84	25.98	1956
Iraq	13.65	81.7	2.631	10.27	1.39	15.42	-0.69	3.93	1.37	0.68	1.97	7.1	258
Israel	5.162	47.32	2.068	9.516	-0.57	22.32	-2.69	11.19	1.35	1.08	3.86	17.96	1419
Jordan	3.466	21.29	1.724	7.522	3.04	9.03	-0.32	3.63	1.4	1.39	4	18.47	952
Kazakhstan	4.203	34.45	1.995	8.814	14.33	15.27	1.09	4.21	1.68	2.43	4.25	19.81	150
Kuwait	1.594	16.44	0.845	5.31	2.45	9.46	-0.42	3.07	1.6	2.02	4.53	23.46	816
Latvia	3.286	71.29	1.985	8.358	8.61	39.52	-1.41	6.81	1.21	0.69	3.16	14.82	7577
Lithuania	10.52	66.56	2.586	10.33	10.21	9.77	0.33	2.89	1.06	0.25	3.6	21.41	130
Malaysia	7.678	70.92	2.525	10.73	8.3	8.8	0.63	3.93	1.23	0.72	5.33	33.48	10193
Moldova	0.7042	14.18	0.8243	5.151	1.23	8.36	0.64	4.35	1.19	0.54	2.23	8.31	2436
Pakistan	-1.015	24.3	-0.4353	6.298	7.16	9.41	-0.1	3.26	1.21	0.72	4.42	23.57	1976
Philippines	5.803	59.29	2.463	10.15	6.33	12.29	-0.43	4.71	1.19	0.34	2.3	9.27	24569

Poland	6.922	62.29	2.363	10.02	10.37	16.5	0.27	4.49	1.1	0.32	2.45	9.96	224427
Romania	-2.937	57.57	1.504	6.901	5.42	33.34	-0.83	5.42	1.24	0.71	2.72	10.76	1206569
Russia	7.216	93.83	2.599	10.79	9	7.83	0.08	3.11	1.21	0.66	5	29.96	589
Saudi Arabia	2.018	12.29	1.014	4.943	10.77	9.19	0.57	3.08	1.19	0.42	3.7	17.42	593
Serbia	5.22	64.98	2.093	8.775	8.87	14.56	0.58	4.62	1.17	0.57	2.87	12.16	121475
Singapore	13.35	66.65	2.824	11.79	7.21	10.4	-0.13	4.2	1.16	0.3	1.91	7.2	4931
Slovakia	1.011	74.89	2.134	8.818	9.94	23.97	-0.54	5.1	1.24	0.77	3.36	14.94	237155
Slovenia	-0.05721	59.34	1.711	7.673	20.91	35.11	2.38	9.3	1.14	0.44	2.78	11.33	154460
Sri Lanka	3.854	24.29	1.93	8.157	6.91	6.94	0.15	3.08	1.24	0.56	3.82	17.9	1172
Thailand	6.11	63.2	2.554	11.14	9.6	10.51	0.39	3.74	1.17	0.36	2.64	10.55	14697
Turkey	15.3	76.24	2.513	9.76	-1.12	15.29	-0.81	4.36	1.4	0.73	1.29	3.25	296
Ukraine	0.6586	60.4	1.69	7.581	0.49	29.99	-1.17	6.46	1.36	1.06	3.1	12.89	901761
United Arab Emirates	2.846	20.57	1.553	7.688	6.43	6.72	-0.14	3.59	1.23	0.69	3.86	18.43	319
Vietnam	4.291	40.16	1.954	7.665	8.94	8.06	0.75	3.43	1.17	0.36	2.51	10.5	4732

Table 2b. Summary Statistics of the Cash Flow Sensitivity of Cash Model

Table 2b reports the summary statistics for the variables *ChgCash*, *CF*, *Growth* and *Size* and the total number of observations by country in the cash flow sensitivity of cash model for the period 2009-2014. The dependent variable *ChgCash* is measured by the ratio of firms' change in *Cash and Cash Equivalent* deflated by beginning-of-period *Total Assets*. *CF* is measured by firms' current period's *Cash Flow* deflated by beginning-of-period *Total Assets*. *Growth* is proxied by firms' three-year average growth rate in *Operating Revenue*. For Kazakhstan, Lithuania, Moldova, Turkey and Russia, the ratio of *Earnings Before Extraordinary Items* to beginning-of-period *Total Asset* is substituted for *CF* due to lack of *Cash Flow* data. *Size* is the log of *Total Asset*. *ChgCash, CF* and *Growth* are winsorized at the 3%- and 97%- levels due to excess skewness and kurtosis.

Country	*ChgCash*				*CF*				*Growth*				*Size*				Observations
	Mean (%)	**Std.(%)**	**Skewness**	**Kurtosis**	**Mean (%)**	**Std.(%)**	**Skewness**	**Kurtosis**	**Mean**	**Std.**	**Skewness**	**Kurtosis**	**Mean**	**Std.**	**Skewness**	**Kurtosis**	
Bangladesh	0.44	6.30	0.58	7.77	9.14	7.09	1.06	3.45	1.15	0.21	1.75	6.60	10.75	1.53	0.03	2.88	366
Bosnia and Herzegovina	-0.02	9.30	-0.29	6.35	8.49	13.93	0.82	4.65	1.13	0.45	2.54	10.33	5.97	1.79	0.39	3.49	82040
Bulgaria	0.99	17.43	-0.42	5.94	12.51	17.33	0.77	4.29	1.37	0.93	3.07	12.54	5.68	1.78	0.25	3.33	316525
China	2.34	10.27	0.79	3.90	6.66	5.39	0.63	4.57	1.26	0.39	3.21	15.63	12.85	1.65	-0.14	4.33	18171
Croatia	-1.00	11.93	-0.81	6.10	7.41	23.41	-0.51	3.65	1.03	0.38	2.80	12.26	5.00	1.87	0.41	3.17	235
Czech Republic	-0.74	15.77	-0.93	6.63	7.90	16.24	-0.25	5.01	1.18	0.63	3.61	16.71	6.37	1.92	0.32	3.25	327554
Egypt	-0.34	8.12	0.18	4.76	7.51	9.01	0.56	3.62	1.21	0.55	3.01	12.02	11.29	1.79	0.10	3.24	1019
Estonia	-0.63	20.41	-0.68	5.43	11.55	22.93	-0.11	4.04	1.27	0.72	2.94	12.31	4.78	1.90	0.47	3.17	165037
Hungary	-0.17	20.42	-0.65	5.71	10.19	29.11	-0.70	6.27	1.21	0.65	2.84	11.31	4.60	2.00	0.49	3.54	684334
India	0.26	5.66	0.28	6.03	4.62	8.36	-0.43	4.57	1.47	1.50	4.13	19.84	10.31	2.27	0.18	2.94	19273
Indonesia	0.66	6.62	0.32	4.98	7.58	9.20	0.37	3.75	1.42	1.31	4.80	25.54	11.87	1.79	-0.27	3.04	1951
Iraq	2.53	17.72	0.26	3.54	1.51	15.55	-0.77	4.08	1.36	0.66	1.96	7.22	8.31	1.41	0.52	4.36	257
Israel	-1.28	14.04	-1.32	7.91	-0.55	22.18	-2.72	11.44	1.34	1.00	3.90	18.39	11.74	2.11	-0.09	3.43	1392
Jordan	-0.75	6.65	-0.43	5.83	2.86	8.79	-0.27	3.48	1.39	1.38	4.08	19.09	10.40	1.32	0.35	3.69	942
Kazakhstan	-0.36	8.12	-0.79	6.83	14.49	15.47	0.96	4.19	1.68	2.51	4.48	21.85	12.06	1.70	0.07	4.85	159
Kuwait	-1.10	7.73	-1.28	7.19	3.03	9.02	-0.38	3.17	1.63	2.13	4.47	22.87	12.33	1.32	0.10	2.69	816
Latvia	-1.18	21.12	-1.33	8.56	8.82	36.90	-1.33	6.88	1.21	0.65	3.28	15.79	4.77	2.33	0.67	3.98	7144
Lithuania	0.10	5.22	-0.01	13.00	10.47	9.97	0.09	3.10	1.06	0.25	3.61	21.54	11.19	1.06	0.15	2.46	131
Malaysia	0.72	7.20	0.03	4.23	8.01	8.64	0.58	3.93	1.18	0.37	3.05	13.40	11.66	1.69	-0.19	4.84	9215
Moldova	0.00	3.28	-0.07	6.23	0.73	8.12	0.43	4.40	1.19	0.55	2.26	8.44	6.99	1.60	0.47	3.44	2394
Pakistan	-0.06	8.61	-0.81	10.70	7.18	9.52	-0.10	3.16	1.20	0.64	4.11	21.02	10.50	1.75	-0.06	3.49	1969
Philippines	1.04	11.67	-0.19	5.92	5.84	12.60	-0.65	5.03	1.19	0.34	2.31	9.29	7.37	2.05	0.93	4.26	24383

Poland	-0.22	11.52	-0.40	5.19	9.59	16.08	0.20	4.78	1.11	0.32	2.52	10.20	7.40	1.82	0.22	3.42	212520
Romania	-0.56	17.54	-0.63	6.65	4.59	33.22	-0.84	5.48	1.25	0.72	2.70	10.52	4.53	1.89	0.39	3.54	1159575
Russia	-0.36	6.62	-2.37	25.26	8.44	8.15	-0.05	3.34	1.21	0.65	5.04	30.30	14.49	1.85	-0.15	3.73	636
Saudi Arabia	-0.25	6.03	-0.17	4.58	10.63	9.17	0.68	3.23	1.19	0.42	3.70	17.38	13.25	1.64	0.60	3.79	592
Serbia	-0.32	8.23	-0.40	6.93	7.86	14.02	0.45	4.82	1.17	0.55	2.84	11.76	6.13	1.98	0.17	3.18	111002
Singapore	0.98	9.14	0.09	4.22	6.69	10.20	-0.20	4.44	1.15	0.29	1.94	7.32	12.00	1.64	0.52	3.79	4946
Slovakia	-1.09	20.56	-1.20	7.48	9.08	23.24	-0.65	5.46	1.26	0.79	3.30	14.31	5.72	1.93	0.42	3.20	229708
Slovenia	-0.07	14.55	-0.67	6.54	19.95	33.34	2.44	9.69	1.16	0.46	2.83	11.42	5.24	2.18	0.29	3.15	132266
Sri Lanka	0.86	6.57	0.36	5.10	7.19	6.87	0.17	3.18	1.25	0.56	3.82	17.82	10.17	1.61	-0.37	3.82	1165
Thailand	0.74	7.83	0.10	4.79	9.54	10.30	0.43	3.78	1.17	0.34	2.62	10.38	10.05	1.98	-0.22	3.96	14070
Turkey	-0.29	11.11	-0.22	4.03	-0.03	17.01	-1.23	5.79	1.41	0.73	1.28	3.20	10.70	1.50	-0.13	2.53	297
Ukraine	-2.25	17.89	-1.59	8.57	-0.47	30.19	-1.21	6.41	1.39	1.08	3.12	12.90	4.49	2.36	0.34	2.91	767482
United Arab Emirates	0.21	6.03	-0.06	5.98	6.23	6.42	-0.14	3.80	1.23	0.69	3.86	18.36	13.39	1.65	0.09	3.00	318
Vietnam	0.57	7.78	0.06	3.96	8.26	8.01	0.60	3.39	1.16	0.36	2.53	10.69	9.90	1.41	0.45	3.56	4826

Table 3a. Country Level Regression Results for the Investment-cash Flow Sensitivity Model

Table 3a reports investment-cash flow sensitivity across Belt and Road countries. The sample covers 36 countries from 2009 to 2015 Countries with fewer than 200 observations are dropped from our sample for robustness. Definitions of the regressors follow Mclean et al. (2012). The dependent variable *I* is measured by the ratio of firms' *Capital Expenditure* deflated by beginning-of-period *Total Assets*. *Capital Expenditure* is proxied by the annual net change of *Fixed Assets. L.CF* is measured by firms' prior period's *Cash Flow* deflated by beginning-of-period *Total Assets*. *Growth* is proxied by firms' three-year average growth rate in *Operating Revenue*. For Kazakhstan, Lithuania, Moldova, Turkey and Russia, the ratio of *Earnings Before Extraordinary Items* to beginning-of-period *Total Asset* is substituted for *L.CF* due to lack of *Cash Flow* data. All regressions include year and firm fixed effects, coefficient estimates of which are suppressed. t statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable: *I*									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Country Name	Bangladesh	Bosnia and Herzegovina	Bulgaria	China	Croatia	Czech Republic	Egypt	Estonia	Hungary
L.CF	0.559	0.054***	0.027***	0.191***	-0.061	0.023***	0.093	0.034***	0.023***
	[1.598]	[10.491]	[12.009]	[5.614]	[-1.169]	[9.719]	[1.067]	[11.331]	[20.213]
Growth	0.014	0.019***	0.006***	0.074***	0.057**	0.005***	0.006	0.028***	0.015***
	[0.177]	[13.981]	[13.139]	[14.359]	[2.020]	[7.066]	[0.486]	[23.636]	[27.906]
Constant	-0.031	-0.065***	-0.045	-0.037***	-0.125***	-0.062***	-0.004	-0.100***	-0.010
	[-0.317]	[-39.713]	[-1.346]	[-5.869]	[-3.638]	[-11.484]	[-0.211]	[-8.081]	[-0.349]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	375	89,136	367,261	18,161	270	334,687	1,005	168,418	696,067
R-squared	0.397	0.347	0.400	0.341	0.507	0.345	0.343	0.317	0.389

Dependent Variable: *I*									
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Country Name	India	Indonesia	Iraq	Israel	Jordan	Kazakhstan	Kuwait	Latvia	Lithuania
L.CF	0.139***	0.266***	0.071	-0.040	0.083	0.032	0.078	0.006	0.112***
	[6.397]	[3.195]	[1.234]	[-0.642]	[1.225]	[0.538]	[0.960]	[0.442]	[2.624]
Growth	0.004***	0.023***	-0.021	0.022**	-0.001	0.006	-0.002	0.023***	0.007
	[3.242]	[3.686]	[-0.947]	[2.035]	[-0.359]	[1.390]	[-0.545]	[3.109]	[0.546]
Constant	-0.067**	-0.025	0.069**	-0.046***	-0.004	-0.036***	-0.056*	-0.070***	-0.113**
	[-2.366]	[-0.229]	[2.141]	[-2.593]	[-0.260]	[-3.229]	[-1.696]	[-2.644]	[-2.402]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	22,339	1,956	258	1,419	952	5,986	816	7,577	3,744
R-squared	0.385	0.360	0.273	0.437	0.312	0.372	0.258	0.469	0.608

Dependent Variable: *I*									
	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
Country Name	Malaysia	Moldova	Pakistan	Poland	Romania	Russia	Saudi Arabia	Serbia	Singapore
L.CF	0.130***	0.093**	0.142***	0.048***	0.024***	0.024***	0.199*	0.050***	0.096***
	[4.931]	[2.325]	[3.491]	[18.512]	[26.291]	[29.304]	[1.888]	[10.902]	[2.740]
Growth	0.016***	0.009	0.000	0.021***	0.016***	0.002***	0.016	0.018***	0.045***
	[5.990]	[1.576]	[0.036]	[14.925]	[43.997]	[10.600]	[0.993]	[16.632]	[3.710]
Constant	-0.086***	-0.112***	0.011	-0.075**	-0.067***	-0.039	0.012	-0.071***	-0.059***
	[-8.737]	[-12.134]	[1.231]	[-2.051]	[-125.205]	[-0.403]	[0.343]	[-43.932]	[-3.023]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	10,193	2,436	1,976	224,427	1,206,569	1,216,967	593	121,475	4,931
R-squared	0.381	0.482	0.309	0.384	0.319	0.359	0.379	0.432	0.338

Dependent Variable: *I*									
	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)
Country Name	Slovakia	Slovenia	Sri Lanka	Thailand	Turkey	Ukraine	United Arab Emirates	Vietnam	the Philippines
L.CF	0.037***	0.068***	0.325***	0.041*	0.136***	0.010***	0.289**	0.286***	0.030
	[9.918]	[17.182]	[2.808]	[1.930]	[6.361]	[12.948]	[2.000]	[6.357]	[1.231]
Growth	0.015***	0.026***	0.011	0.023***	0.011***	0.006***	0.026*	0.019**	0.072***
	[13.767]	[12.687]	[0.659]	[4.326]	[2.786]	[23.434]	[1.711]	[2.547]	[7.868]
Constant	-0.054***	-0.089***	0.022	-0.014	-0.049	-0.174***	-0.036	-0.019	-0.028
	[-7.245]	[-36.015]	[0.991]	[-0.379]	[-0.990]	[-314.236]	[-1.018]	[-0.391]	[-0.432]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	237,155	154,460	1,172	14,697	25,781	901,761	319	4,732	24,569
R-squared	0.346	0.495	0.270	0.470	0.507	0.408	0.296	0.372	0.519

Table 3b. Country Level Regression Results for the Cash Flow Sensitivity of Cash Model

Table 3b reports cash flow sensitivity of cash across Belt and Road countries. The sample covers 36 countries from 2009 to 2015. Countries with fewer than 100 observations are dropped from our sample for robustness. Definitions of the regressors follow Almeida, Campello and Weisbach (2004). The dependent variable *ChgCash* is measured by the ratio of firms' change in *Cash and Cash Equivalent* deflated by beginning-of-period *Total Assets*. *CF* is measured by firms' current period's *Cash Flow* deflated by beginning-of-period *Total Assets*. *Growth* is proxied by firms' three-year average growth rate in *Operating Revenue*. For Kazakhstan, Lithuania, Moldova, Turkey and Russia, the ratio of *Earnings Before Extraordinary Items* to beginning-of-period *Total Asset* is substituted for *CF* due to lack of *Cash Flow* data. *Size* is the log of *Total Asset*. All regressions include year and firm fixed effects, coefficient estimates of which are suppressed. t statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable: *ChgCash*									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Country Name	Bangladesh	Bosnia and Herzegovina	Bulgaria	China	Croatia	Czech Republic	Egypt	Estonia	Hungary
CF	0.295*	0.151***	0.262***	0.179***	0.160**	0.238***	0.327***	0.410***	0.198***
	[1.739]	[25.186]	[56.932]	[6.812]	[2.502]	[60.018]	[4.121]	[103.718]	[93.940]
Growth	-0.019	0.005***	0.004***	0.018***	-0.006	0.001	-0.008	0.001	0.008***
	[-0.518]	[4.069]	[6.869]	[5.860]	[-0.143]	[0.939]	[-0.963]	[0.982]	[10.237]
Size	0.088***	0.047***	0.102***	0.029***	0.050*	0.090***	0.051***	0.053***	0.088***
	[2.626]	[26.944]	[59.671]	[10.771]	[1.726]	[60.508]	[3.537]	[29.693]	[81.987]
Constant	-0.956***	-0.300***	-0.607***	-0.407***	-0.249*	-0.610***	-0.584***	-0.326***	-0.509***
	[-2.606]	[-28.865]	[-15.906]	[-11.563]	[-1.673]	[-50.407]	[-3.658]	[-19.203]	[-15.010]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	366	82,040	316,525	18,171	235	327,554	1,019	165,037	684,334
R-squared	0.413	0.238	0.430	0.203	0.325	0.307	0.207	0.383	0.371

Dependent Variable: *ChgCash*									
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Country Name	India	Indonesia	Iraq	Israel	Jordan	Kazakhstan	Kuwait	Latvia	Lithuania
CF	0.082***	0.059	0.421***	0.291***	0.210***	0.122***	0.153**	0.185***	0.124***
	[7.297]	[1.590]	[3.467]	[5.098]	[3.687]	[6.978]	[2.568]	[8.626]	[3.257]
Growth	0.000	0.000	-0.005	-0.016	0.000	-0.002	0.000	-0.003	0.003
	[0.444]	[0.053]	[-0.185]	[-1.582]	[0.043]	[-1.640]	[0.004]	[-0.262]	[0.306]
Size	0.008***	0.012***	0.073	0.046***	0.023	0.025***	0.031*	0.139***	0.017
	[4.691]	[2.805]	[1.158]	[3.577]	[1.531]	[5.759]	[1.775]	[9.759]	[1.416]
Constant	-0.067***	-0.181***	-0.197	-0.545***	-0.241	-0.221***	-0.388*	-0.700***	-0.065
	[-3.156]	[-3.125]	[-0.335]	[-3.556]	[-1.534]	[-5.967]	[-1.808]	[-9.238]	[-0.638]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	19,273	1,951	257	1,392	942	5,892	816	7,144	3,593
R-squared	0.218	0.175	0.338	0.466	0.229	0.221	0.180	0.448	0.506

Dependent Variable: *ChgCash*									
	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
Country Name	Malaysia	Moldova	Pakistan	Poland	Romania	Russia	Saudi Arabia	Serbia	Singapore
CF	0.216***	0.066***	0.097**	0.192***	0.157***	0.093***	0.231***	0.114***	0.253***
	[9.423]	[4.155]	[2.214]	[49.363]	[131.352]	[48.705]	[3.097]	[23.222]	[7.861]
Growth	0.010**	0.001	0.001	0.003*	0.007***	0.001***	0.004	0.000	0.000
	[2.494]	[0.748]	[0.140]	[1.947]	[18.512]	[2.789]	[0.435]	[0.464]	[0.048]
Size	0.031***	0.008**	0.003	0.049***	0.054***	0.069***	0.022	0.030***	0.013***
	[8.070]	[2.271]	[0.300]	[39.085]	[89.945]	[116.137]	[1.254]	[21.652]	[2.660]
Constant	-0.403***	-0.061**	-0.040	-0.390***	-0.270***	-0.431***	-0.357	-0.189***	-0.181***
	[-9.068]	[-2.446]	[-0.338]	[-24.552]	[-96.989]	[-7.403]	[-1.468]	[-22.587]	[-3.060]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,215	2,394	1,969	212,520	1,159,575	1,101,124	592	111,002	4,946
R-squared	0.320	0.138	0.266	0.269	0.295	0.325	0.162	0.331	0.269

Dependent Variable: *ChgCash*									
	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)
Country Name	Slovakia	Slovenia	Sri Lanka	Thailand	Turkey	Ukraine	United Arab Emirates	Vietnam	the Philippines
CF	0.166***	0.057***	0.253***	0.125***	0.129***	0.152***	0.234***	0.199***	0.140***
	[35.613]	[9.235]	[4.148]	[7.536]	[5.186]	[101.136]	[2.865]	[5.297]	[7.009]
Growth	0.001	0.009***	-0.001	-0.001	0.008**	-0.001***	0.002	0.003	0.012**
	[0.532]	[4.152]	[-0.185]	[-0.228]	[2.103]	[-4.701]	[0.248]	[0.500]	[2.114]
Size	0.112***	0.121***	0.018	0.042***	0.044***	0.044***	-0.006	0.031***	0.074***
	[56.314]	[40.917]	[1.488]	[12.128]	[11.202]	[72.432]	[-0.268]	[4.615]	[23.132]
Constant	-0.658***	-0.653***	-0.187	-0.410***	-0.389***	-0.260***	0.051	-0.323***	-0.581***
	[-47.915]	[-41.838]	[-1.536]	[-10.046]	[-9.812]	[-99.556]	[0.164]	[-4.585]	[-10.708]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	229,708	132,266	1,165	14,070	25,550	767,482	318	4,826	24,383
R-squared	0.355	0.439	0.162	0.376	0.329	0.302	0.283	0.221	0.487

Table 4a. Industry Level Regression Results for the Investment-cash Flow Sensitivity Model

Table 4a reports investment-cash flow sensitivity across industry divisions per the Standard Industrial Classification code. The sample covers all 10 divisions from 2009 to 2015. Definitions of the regressors follow Mclean et al. (2012). The dependent variable *I* is measured by the ratio of firms' *Capital Expenditure* deflated by beginning-of-period *Total Assets*. *L.CF* is measured by firms' prior period's *Cash Flow* deflated by beginning-of-period *Total Assets*. *Capital Expenditure* is proxied by the annual net change of *Fixed Assets. Growth* is proxied by firms' three-year average growth rate in *Operating Revenue*. For firms in Kazakhstan, Lithuania, Moldova, Turkey and Russia, the ratio of *Earnings Before Extraordinary Items* to beginning-of-period *Total Asset* is substituted for *L.CF* due to lack of *Cash Flow* data. All regressions include year and firm fixed effects, coefficient estimates of which are suppressed. t statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable: *I*										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Industry Name	Agriculture, Forestry & Fishing	Construction	Finance, Insurance & Real Estate	Manufacturing	Mining	Public Administration	Retail Trade	Services	Transportation & Public Utilities	Wholesale Trade
L.CF	0.053***	0.019***	0.016***	0.026***	0.025***	0.026	0.011***	0.024***	0.031***	0.018***
	[20.434]	[14.590]	[7.537]	[21.531]	[2.963]	[0.924]	[10.613]	[28.617]	[17.113]	[16.559]
Growth	0.018***	0.012***	0.005***	0.015***	0.015***	0.029	0.010***	0.014***	0.014***	0.006***
	[25.133]	[32.241]	[10.512]	[39.501]	[7.780]	[0.867]	[23.143]	[41.236]	[24.273]	[26.887]
Constant	-0.006***	-0.025***	-0.001	-0.016***	0.002	-0.023	-0.019***	-0.030***	-0.036***	-0.008***
	[-4.187]	[-28.716]	[-1.181]	[-24.079]	[0.472]	[-0.490]	[-25.117]	[-40.695]	[-30.081]	[-15.596]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	305,311	504,095	406,818	882,126	25,602	1,359	845,304	1,299,175	462,231	991,668
R-squared	0.457	0.349	0.382	0.347	0.395	0.396	0.336	0.341	0.360	0.335

Table 4b. Industry Level Regression Results for the Cash Flow Sensitivity of Cash Model

Table 4b reports investment-cash flow sensitivity across industry divisions per the Standard Industrial Classification code. The sample covers all 10 divisions from 2009 to 2015. Definitions of the regressors follow Almeida, Campello and Weisbach (2004). The dependent variable *ChgCash* is measured by the ratio of firms' change in *Cash and Cash Equivalent* deflated by beginning-of-period *Total Assets*. *CF* is measured by firms' current period's *Cash Flow* deflated by beginning-of-period *Total Assets*. *Growth* is proxied by firms' three-year average growth rate in *Operating Revenue*. For firms in Kazakhstan, Lithuania, Moldova, Turkey and Russia, the ratio of *Earnings Before Extraordinary Items* to beginning-of-period *Total Asset* is substituted for *CF* due to lack of *Cash Flow* data. *Size* is the log of *Total Asset*. All regressions include year and firm fixed effects, coefficient estimates of which are suppressed. t statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable: *ChgCash*										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Industry Name	Agriculture, Forestry & Fishing	Construction	Finance, Insurance & Real Estate	Manufacturing	Mining	Public Administration	Retail Trade	Services	Transportation & Public Utilities	Wholesale Trade
CF	0.148***	0.195***	0.168***	0.160***	0.096***	0.235***	0.090***	0.209***	0.143***	0.119***
	[45.652]	[80.920]	[53.468]	[81.580]	[10.146]	[4.483]	[58.285]	[147.649]	[62.218]	[57.994]
Growth	0.003***	0.003***	0.001	0.002***	0.000	0.007	0.005***	0.003***	0.002***	0.003***
	[4.227]	[5.102]	[1.190]	[5.212]	[0.420]	[0.459]	[9.417]	[7.270]	[3.597]	[7.303]
Size	0.031***	0.070***	0.052***	0.055***	0.034***	0.060***	0.051***	0.091***	0.056***	0.060***
	[28.471]	[72.219]	[48.290]	[75.747]	[10.337]	[3.270]	[69.488]	[132.726]	[60.565]	[91.632]
Constant	-0.207***	-0.425***	-0.333***	-0.359***	-0.280***	-0.424***	-0.254***	-0.460***	-0.338***	-0.362***
	[-30.346]	[-80.004]	[-50.937]	[-79.546]	[-10.685]	[-3.457]	[-74.446]	[-143.718]	[-64.649]	[-96.820]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	274,996	465,491	380,549	825,160	24,164	1,288	762,855	1,226,781	431,845	915,056
R-squared	0.321	0.322	0.334	0.289	0.263	0.369	0.319	0.354	0.324	0.313

Table 5. Country Level Financing Needs Index

Table 5 tabulates the Financing Needs Index scores and the respective rankings for each Belt and Road country in the sample. A country with a higher Financing Needs Index score or rank means that firms in that country have greater financing needs due to more binding financial constraints. To capture different dimensions of binding financial constraints, the statistically significant coefficients for investment-cash flow sensitivity and cash flow sensitivity of cash in each country are normalised in between zero and one and averaged to obtain the Financing Needs Index. If only one of the coefficients is significant, then the normalised score of that coefficient is used as the index score. The Financing Needs Index score for Indonesia is obtained by the normalised investment-cash flow sensitivity score only, whereas those for Bangladesh, Croatia, Egypt, Iraq, Israel, Jordan, Kazakhstan, Kuwait, Latvia and the Philippines are obtained by the normalised cash flow sensitivity of cash score only.

Country	Financing Needs Index	Financing Needs Index Ranking
Iraq	1	1
Indonesia	0.813	2
Sri Lanka	0.769	3
Egypt	0.742	4
United Arab Emirates	0.686	5
Bangladesh	0.654	6
Israel	0.643	7
Vietnam	0.633	8
Saudi Arabia	0.539	9
Estonia	0.523	10
China	0.455	11
Jordan	0.42	12
Malaysia	0.409	13
Singapore	0.406	14
Latvia	0.352	15
Bulgaria	0.309	16
Turkey	0.299	17
Croatia	0.283	18
Czech Republic	0.269	19
Pakistan	0.264	20
Kuwait	0.264	21
Lithuania	0.254	22
Poland	0.246	23
India	0.239	24
the Philippines	0.228	25
Hungary	0.214	26
Bosnia and Herzegovina	0.199	27
Slovakia	0.193	28
Kazakhstan	0.179	29
Romania	0.16	30
Thailand	0.143	31
Serbia	0.142	32
Ukraine	0.13	33
Slovenia	0.092	34
Russia	0.072	35
Moldova	0.03	36

Table 6. Industry Level Financing Needs Index

Table 6 tabulates the Financing Needs Index scores and the respective rankings for each industry division in the Belt and Road countries in the sample. An industry with a higher Financing Needs Index score or rank means that firms in that industry have greater financing needs due to more binding financial constraints. To capture different dimensions of binding financial constraints, the statistically significant coefficients for investment-cash flow sensitivity and cash flow sensitivity of cash in each country are normalised in between zero and one and averaged to obtain the Financing Needs Index. If only one of the coefficients is significant, then the normalised score of that coefficient is used as the index score.

Industry Division	Financing Needs Index	Financing Needs Index Ranking
Agriculture Forestry & Fishing	0.701	1
Public Administration	0.679	2
Services	0.568	3
Construction	0.460	4
Transportation & Public Utilities	0.422	5
Manufacturing	0.422	6
Finance Insurance & Real Estate	0.330	7
Mining	0.188	8
Wholesale Trade	0.184	9
Retail Trade	0.010	10

Table 7a – The Financing Obstacles Index

Table 7a tabulates the Financing Obstacles Index and the subindex scores. The Financing Obstacles Index uses data from the Enterprise Surveys to gauge the magnitude of financing obstacles in the Belt and Road countries in four dimensions: (1) availability of credit facility, (2) requirement for collateral, (3) difficulty in loan application, and (4) perception of financing obstacles. The Financing Obstacles Index is obtained by aggregating the subindex scores, which is then normalized in between zero and one. The higher the index/subindex score, the more financing obstacles there are in a country.

Country	Availability of Credit Facility	Requirement for Collateral	Difficulty in Loan Application	Perception of Financing Obstacles	Financing Obstacles Index
Iraq	0.8666	1	0.9129	1	0.9449
Afghanistan	0.8299	0.102	0.7409	0.9534	0.6565
Yemen	0.8306	0.1665	0.5924	0.6974	0.5717
Myanmar	1	0.3177	0.5252	0.2937	0.5341
Mongolia	0.4296	0.0697	0.7871	0.7996	0.5215
Jordan	0.5954	0.058	0.4968	0.903	0.5133
Indonesia	0.6739	0.0501	0.9198	0.4048	0.5121
Sri Lanka	0.2567	0.0994	1	0.6763	0.5081
Cambodia	0.8792	0.3142	0.3809	0.4387	0.5032
Ukraine	0.4548	0.0484	0.7887	0.6777	0.4924
Egypt	0.7906	0.119	0.375	0.6843	0.4922
Azerbaijan	0.7199	0.0614	0.6568	0.5247	0.4907
Kyrgyz Republic	0.6355	0.0692	0.6332	0.5682	0.4765
Romania	0.5677	0.0511	0.545	0.6965	0.4651
Pakistan	0.7128	0.0378	0.5925	0.489	0.4580
Bangladesh	0.1287	0.2054	0.7116	0.7674	0.4533
Lao PDR	0.61	0.2599	0.5263	0.4017	0.4495
Nepal	0.4037	0.1526	0.6082	0.632	0.4491
Russia	0.512	0.055	0.6159	0.5833	0.4416
Timor-Leste	0.7223	0	0.7093	0.3131	0.4362
India	0.338	0.1529	0.8255	0.4013	0.4294
Tajikistan	0.6709	0.0564	0.4817	0.4871	0.4240
Malaysia	0.4217	0.0341	0.6976	0.5296	0.4208
Armenia	0.3674	0.0585	0.4419	0.7507	0.4046
Belarus	0.4251	0.0503	0.6164	0.5183	0.4025
Bhutan	0.2537	0.244	0.5625	0.5497	0.4025
Kazakhstan	0.5251	0.0451	0.5341	0.4868	0.3978
Montenegro	0.2882	0.103	0.7877	0.3616	0.3851
Macedonia	0.3624	0.0815	0.4507	0.5822	0.3692
Lebanon	0.2144	0.0865	0.3763	0.7713	0.3621
Uzbekistan	0.6505	0.0758	0.4343	0.2826	0.3608
Moldova	0.4333	0.065	0.483	0.4516	0.3582
Georgia	0.4247	0.1	0.3762	0.5169	0.3544
Vietnam	0.5781	0.1346	0.3843	0.2936	0.3477
Latvia	0.5116	0.0475	0.3397	0.4679	0.3417
Serbia	0.122	0.039	0.6109	0.5842	0.3390
Lithuania	0.4417	0.0511	0.4044	0.4439	0.3353

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China	0.4499	0.0651	0.6325	0.1906	0.3345
Bosnia and Herzegovina	0.1483	0.0667	0.4925	0.5629	0.3176
Bulgaria	0.3693	0.0537	0.4018	0.4436	0.3171
Slovakia	0.4444	0.0396	0.3133	0.4635	0.3152
Thailand	0.3351	0.0491	0.7666	0.0479	0.2997
Poland	0.2915	0.0278	0.309	0.4837	0.2780
Czech Republic	0.233	0.0432	0.2265	0.5303	0.2582
Philippines	0.4463	0.0501	0.2905	0.2082	0.2488
Croatia	0.161	0.0568	0.2446	0.4746	0.2342
Hungary	0.3443	0.0549	0.3606	0.1434	0.2258
Slovenia	0.0977	0.038	0.2084	0.4491	0.1983
Turkey	0.2316	0.0254	0.2317	0.2054	0.1735
Albania	0.2329	0.0774	0	0.3286	0.1597
Estonia	0.2049	0.0507	0.2184	0	0.1185
Israel	0	0.0296	0.0281	0.0125	0.0176

Table 7b – Augmented Financing Needs Index of Belt and Road Countries

Table 7b tabulates the Augmented Financing Needs Index scores and the respective rankings for each Belt and Road country in the sample. A country with a higher index score or rank means that firms in that country have greater financing needs due to more binding financial constraints. The Augmented Financing Needs Index is constructed by normalizing the average of the Financing Needs Index and the Financing Obstacle Index. Countries marked with (#) use information from the Financing Needs Index only, whereas countries marked with (*) use information from the Financing Obstacles Index only.

Country	Augmented Financing Needs Index	Augmented Financing Needs Index Ranking
Iraq	1	1
Afghanistan (*)	0.6181	2
United Arab Emirates (#)	0.6537	3
Indonesia	0.6252	4
Sri Lanka (*)	0.5965	5
Egypt	0.5703	6
Yemen (*)	0.5156	7
Bangladesh	0.4937	8
Myanmar (*)	0.4702	9
Mongolia (*)	0.4549	10
Saudi Arabia (#)	0.4761	11
Cambodia (*)	0.4328	12
Azerbaijan (*)	0.4177	13
Kyrgyz Republic (*)	0.4005	14
Vietnam	0.4173	15
Jordan	0.3888	16
Lao PDR (*)	0.3678	17

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Nepal (*)	0.3674	18
Timor-Leste (*)	0.3517	19
Tajikistan (*)	0.3371	20
Malaysia	0.3259	21
Armenia (*)	0.3136	22
Belarus (*)	0.3111	23
Bhutan (*)	0.3110	24
Singapore (#)	0.3150	25
China	0.3016	26
Montenegro (*)	0.2900	27
Macedonia (*)	0.2708	28
Lebanon (*)	0.2622	29
Uzbekistan (*)	0.2606	30
Pakistan	0.2612	31
Georgia (*)	0.2530	32
Latvia	0.2436	33
India	0.2286	34
Israel	0.2237	35
Ukraine	0.2010	36
Romania	0.2020	37
Estonia	0.2122	38
Bulgaria	0.2027	39
Lithuania	0.1806	40
Kazakhstan	0.1729	41
Russia	0.1347	42
Czech Republic	0.1433	43
Kuwait (#)	0.1433	44
Poland	0.1411	45
Bosnia and Herzegovina	0.1367	46
Croatia	0.1371	47
Slovakia	0.1314	48
Serbia	0.1151	49
Philippines	0.1127	50
Turkey	0.1100	51
Thailand	0.0918	52
Hungary	0.0905	53
Moldova	0.0593	54
Albania (*)	0.0176	55
Slovenia	0.0000	56

Table 7c – Macroeconomic Impact of Financial Constraints

Table 7c tabulates the results for the macroeconomic impact of financial constraints. The dependent variable is the cumulative investment growth from 2009 to 2014. The independent variables are the Augmented Financing Needs Index and the natural logarithm of the average GDP per capita during 2009 and 2014. The growth statistics are obtained from Economy Watch, where investment statistics are readily available. t statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Cumulative Investment Growth
Augmented Financing Needs Index	-0.346*
	(-1.76)
Ln(GDP Per Capita)	0.008
	(0.26)
Constants	0.015
	(0.05)
Observations	50
R Squared	0.05

Figure 1. GDP Growth and the Investment Rate

Figure 1 plots the GDP growth rate and the average investment rate across the Belt and Road countries. GDP growth rate is the cumulative growth rate from 2009 to 2014. The average investment rate is proxied by the average gross capital formation to GDP rate during 2009 and 2014. All the data are obtained from the World Bank.

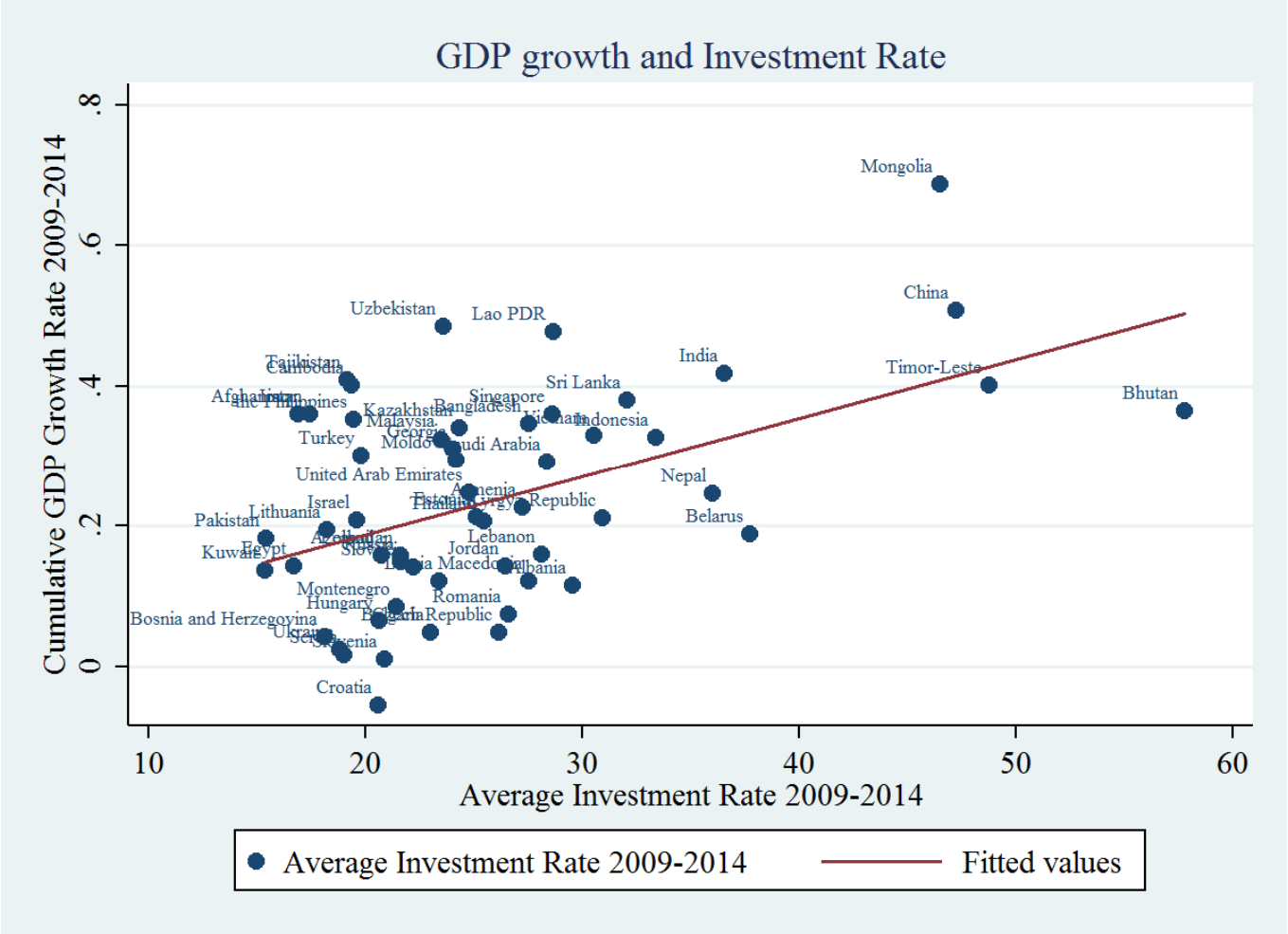


Figure 2. Geographical Visualization of the Country Level Financing Needs Index Ranking

Figure 2 visualizes the geographical distribution of financing needs by charting the map of the Belt and Road countries in the sample according to the ranking in Financing Needs Index. Countries with a lower number of in the ranking (a warmer color on the map) are more financially constrained.

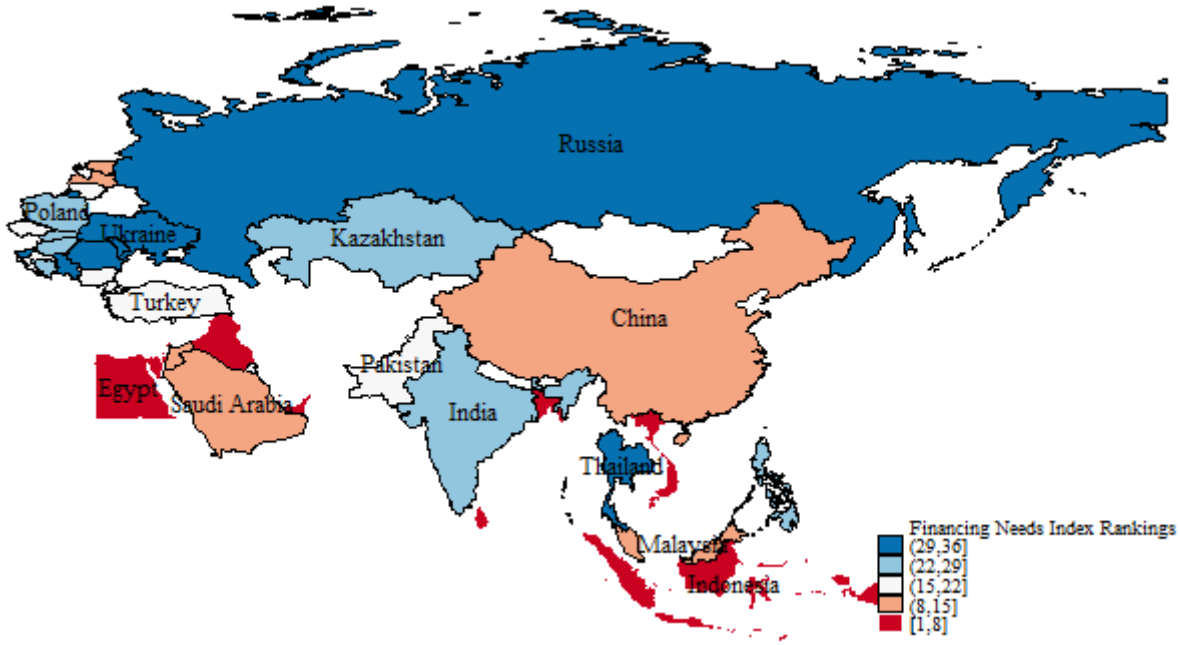


Figure 3. Region Level Financing Needs Index

Figure 3 visualizes the Financing Needs Index across geographical regions. The geographical region pertaining to each Belt and Road country is taken from the Hong Kong Trade and Development Council, with *Middle East and Africa* renamed as *Middle East* due to the absence of African countries that have a large enough sample size.

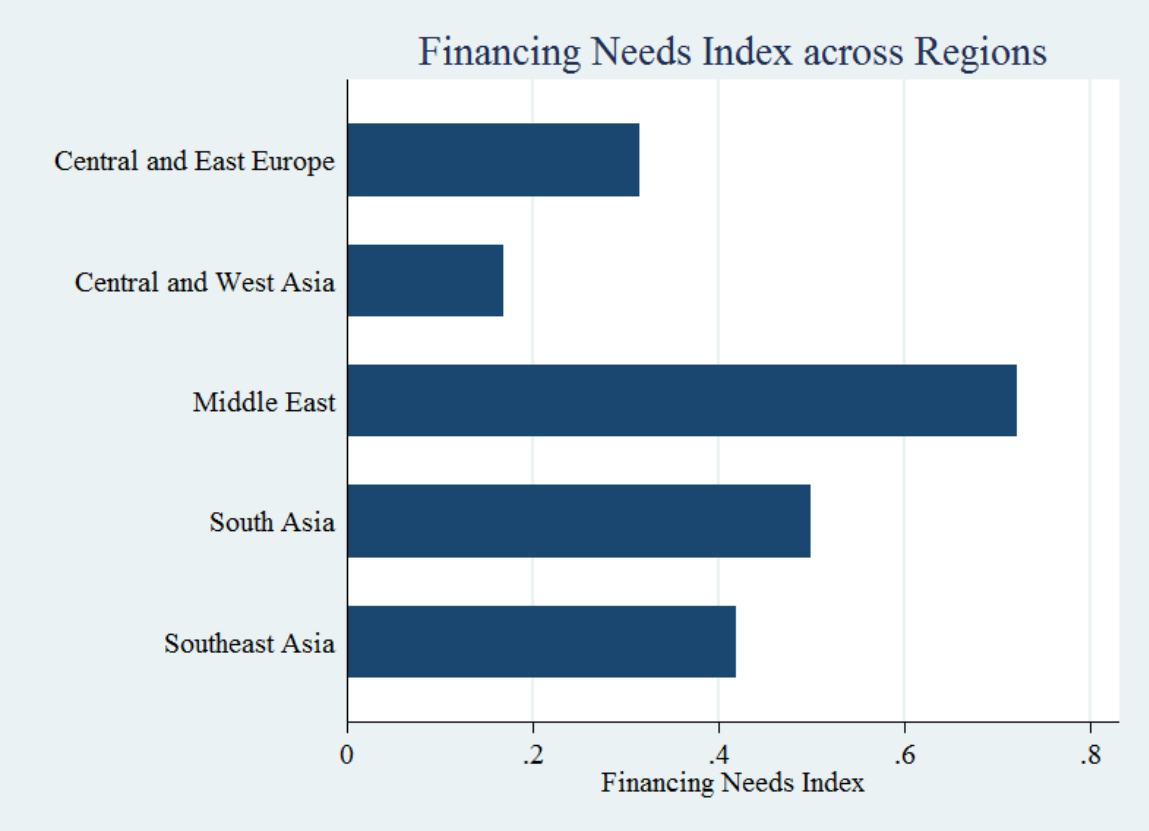


Figure 4. Evolution of the Country Level Financing Needs Index from 2009 to 2014

Figure 4 graphs how the country level Financing Needs Index evolved from 2009 to 2014. The index scores for each country behaved differently, indicating domestic economic conditions and shocks had a first order impact on the magnitude of financial constraints faced by indigenous firms in the sample period.

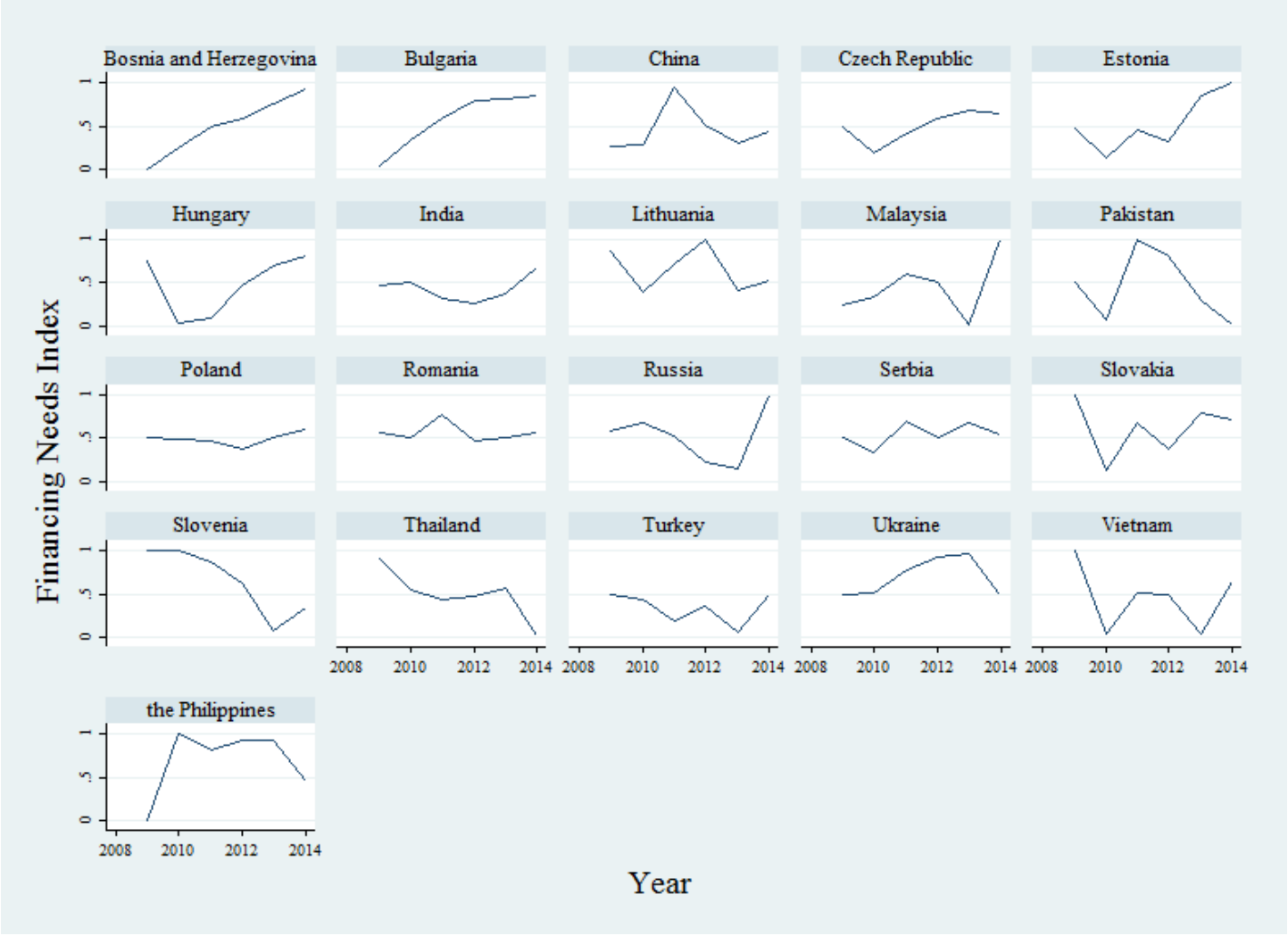


Figure 5. Evolution of Industry Level Financing Needs Index from 2009 to 2014

Figure 5 graphs how the industry level Financing Needs Index evolved from 2009 to 2014. The left-hand-side y-axis gauges the Financing Needs Index of Industries across time, while the right-hand-side y-axis gauges the percentage of the average real GDP growth rate of our sample countries across time. The index scores for each industry exhibited a parabolic pattern, with an initial increase and a subsequent decrease. The pattern corresponds to the average growth in GDP.

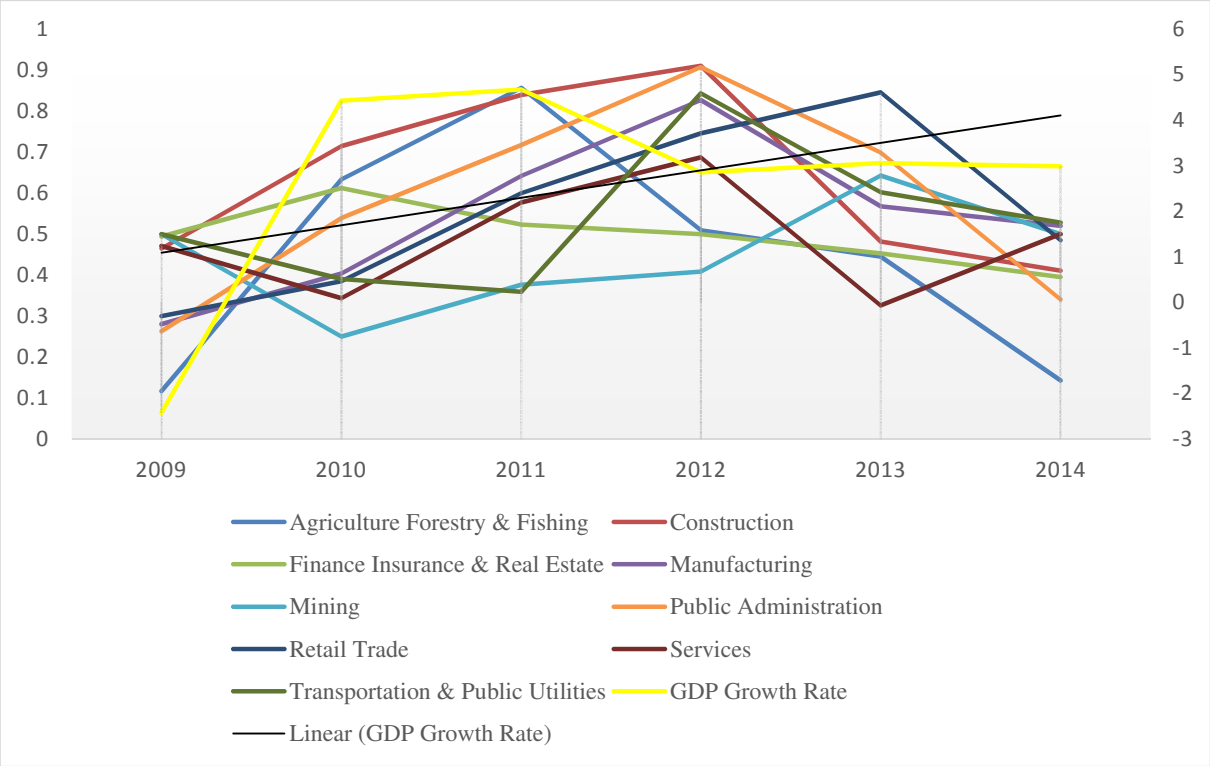


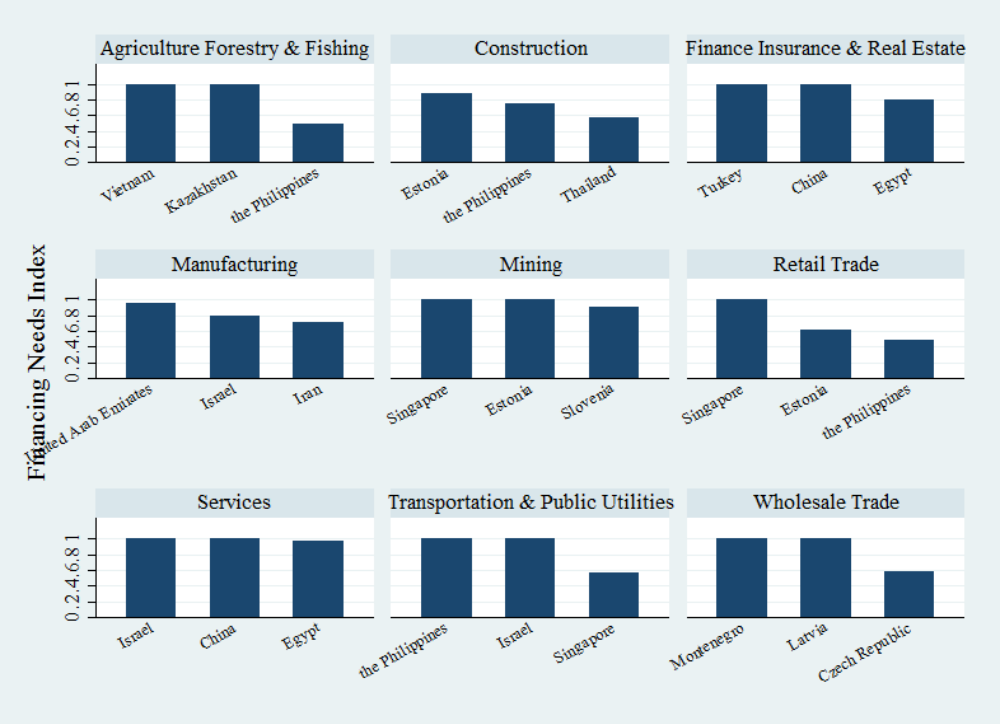
Figure 6a. Comparison of Industrial Financing Needs Index within the Belt and Road Countries

Figure 6a graphs Comparison of Industrial Financing Needs Index within each of the Belt and Road Country. The Financing Needs Index is formalized within each country, therefore this figure shows that comparative constraints of industries in each country. Countries or industries with insufficient observations or no Financing Needs Index scores are not shown in this figure.

Industry Division	Industry Number
Agriculture Forestry & Fishing	1
Construction	2
Finance Insurance & Real Estate	3
Manufacturing	4
Mining	5
Retail Trade	6
Services	7
Transportation & Public Utilities	8
Wholesale Trade	9

Figure 6b. Comparison of Industrial Financing Needs Index across the Belt and Road Countries

Figure 6b graphs the industrial Financing Needs Index across the Belt and Road countries. The Financing Needs Index is formalized within each industry, therefore this figure shows that comparative constraints of industries across all countries. Figure (6b.1) graphed the three most constrained countries for each industry. Figure (6b.2) graphed the three least constrained countries for each industry.

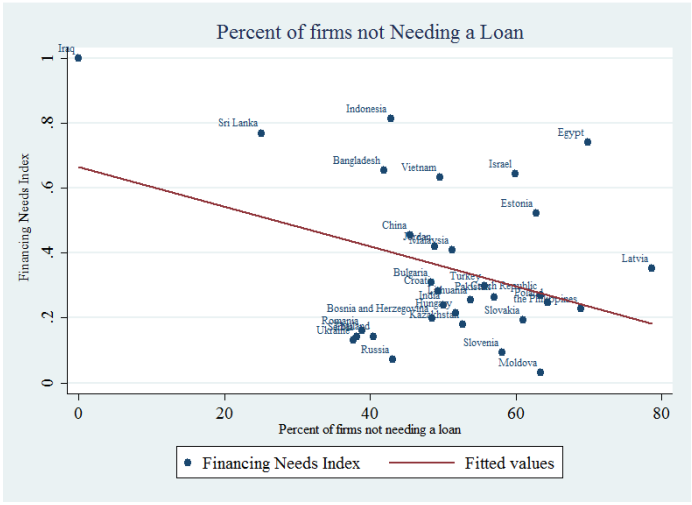


(Figure 6b.1)

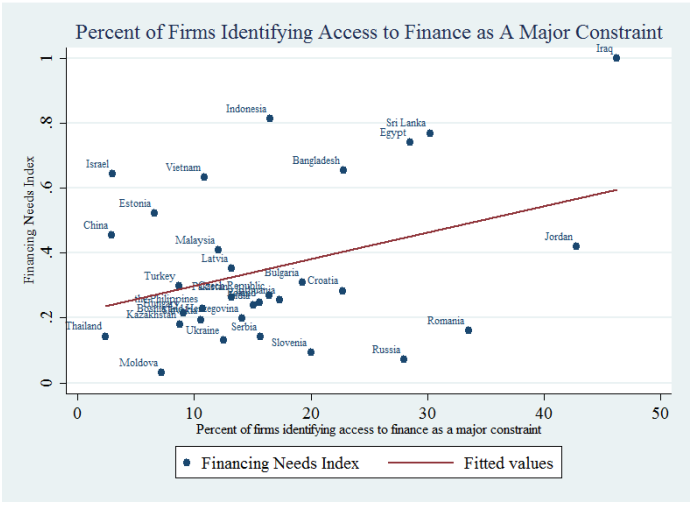
(Figure 6b.2)

Figure 7. Financing Needs Index and the World Bank Enterprise Survey

Figure 7 plots the Financing Needs Index scores and graphs the fitted line of the relationship between Financing Needs Index and World Bank Enterprise Surveys for each Belt and Road country in the sample. The Enterprise Surveys are firm level surveys of a representative sample of a country's private sector, covering topics such as access to finance, corruption, infrastructure, crime, competition and performance measures (World Bank, 2016). Due to the scope of the survey interviews, only a subset of countries is investigated each year, with survey data from different countries collected at different points in time. To ensure data comparability, the Enterprise Survey Global sampling methodology is used, which enables cross country analyses. The standardized and aggregated country level data in the *Finance* subsection is publicly available on the Enterprise Surveys website, covering 15 aggregated indicators that mainly assess whether firms need loans and evaluating firms access to external finance.



(Figure 7.a)



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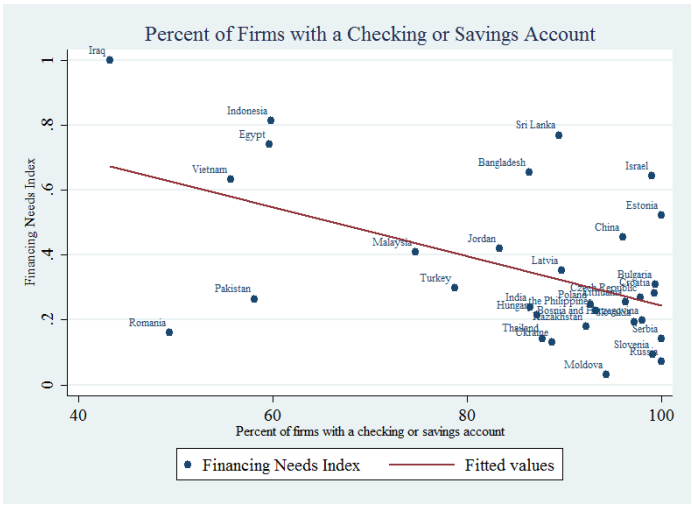

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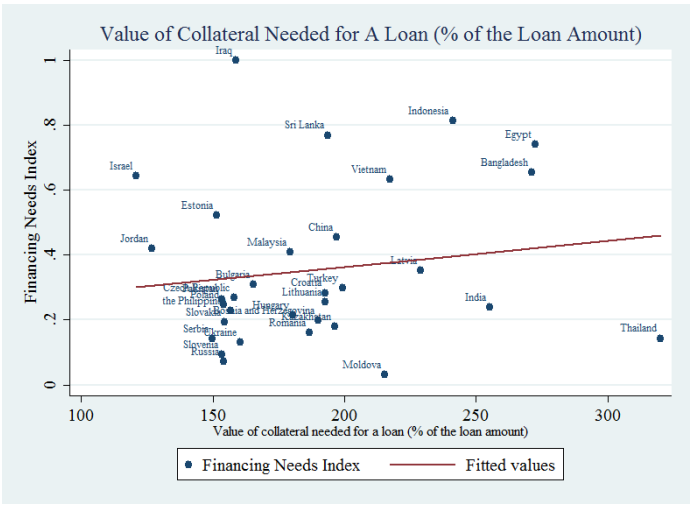


(Figure 7.d)

Figure 8. Augmented Financing Needs Index and Financial Reform Index

Figure 8 plots the Augmented Financing Needs Index scores and graphs the fitted line of the relationship between Augmented Financing Needs Index and Financial Reform Index in 2005 for each Belt and Road country in the sample. The Financial Reform Index introduced by Abiad, Detragiache and Tressel (2008) measures the level of financial liberalisation of 91 economies over the period 1973–2005. It covers eight dimensions that are first coded into a raw liberalization score normalized between zero and three, then combines the raw scores into a graded index that is normalized between zero and one. A higher Financial Reform Index score means better financial liberalization.

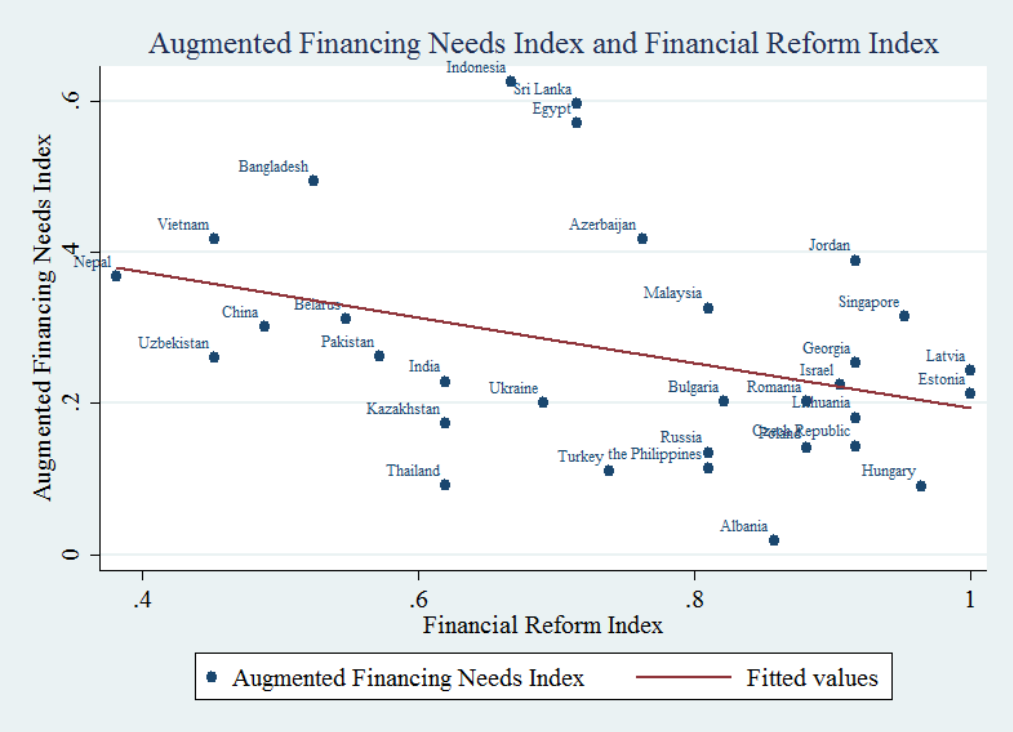
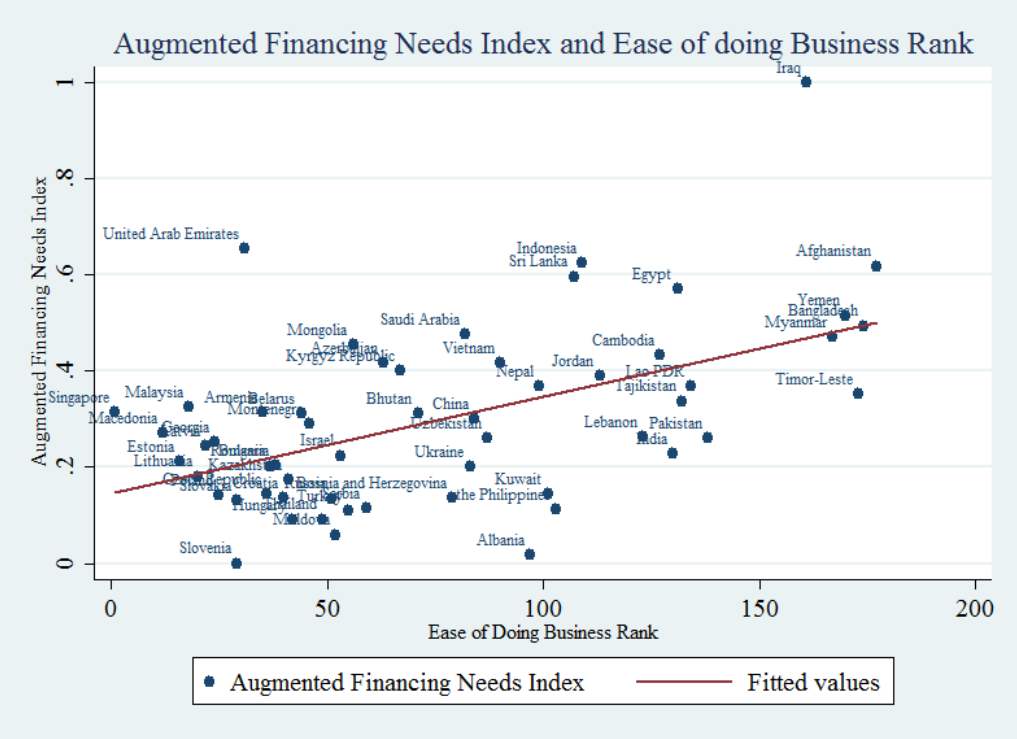


Figure 9. Augmented Financing Needs Index and Doing Business Index

Figure 9 plots the Augmented Financing Needs Index scores and graphs the linear relationship between the Augmented Financing Needs Index and the overall Doing Business rank for the Belt and Road countries in the sample. In the Doing Business report, each economy receives a distant-to-frontier score through a comparison with the regulatory best practice, which is then rounded to two decimal places to attain the Ease of Doing Business Rank. The higher (lower) the distance-to-frontier score (Ease of Doing Business Rank), the less regulatory constraints an economy has, which can be interpreted as having a better business climate.



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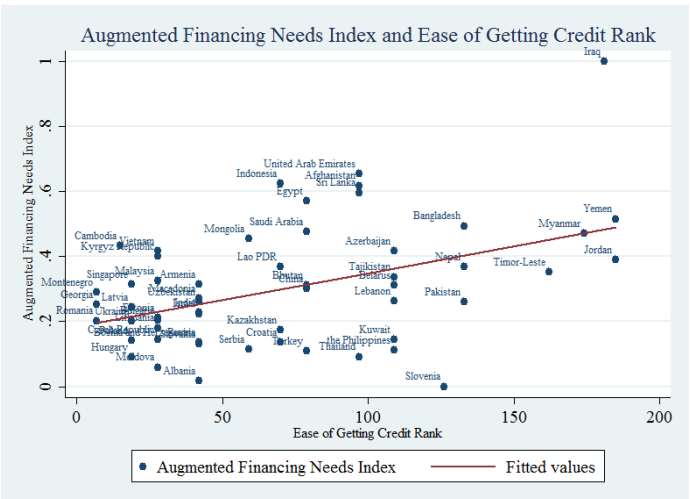

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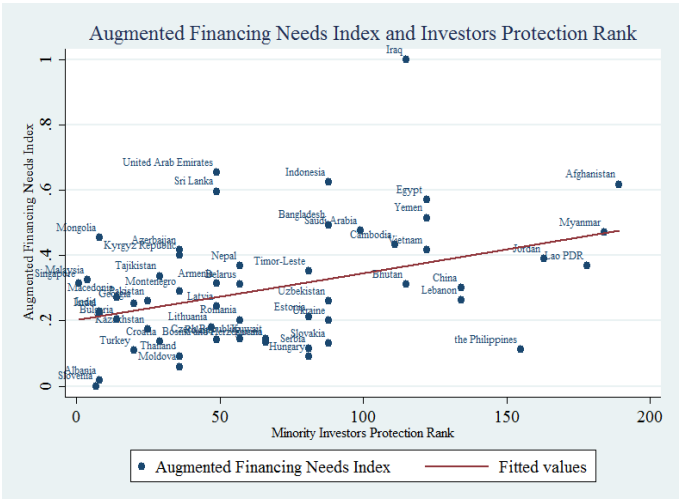

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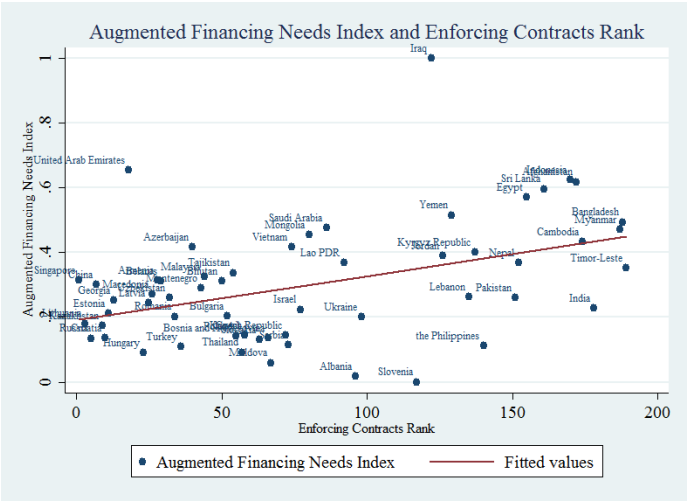

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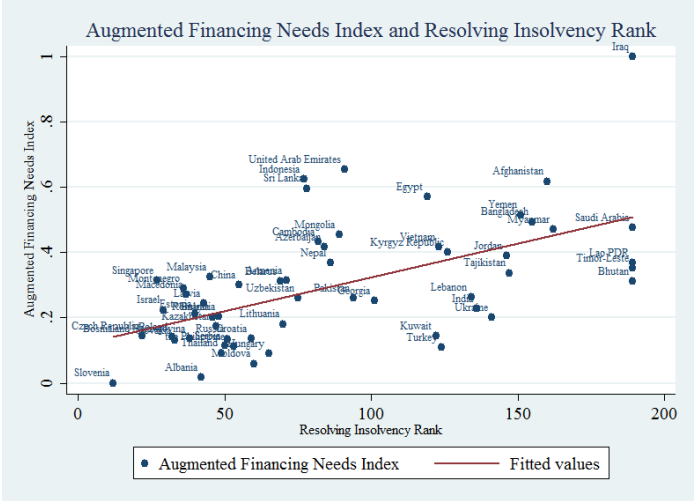

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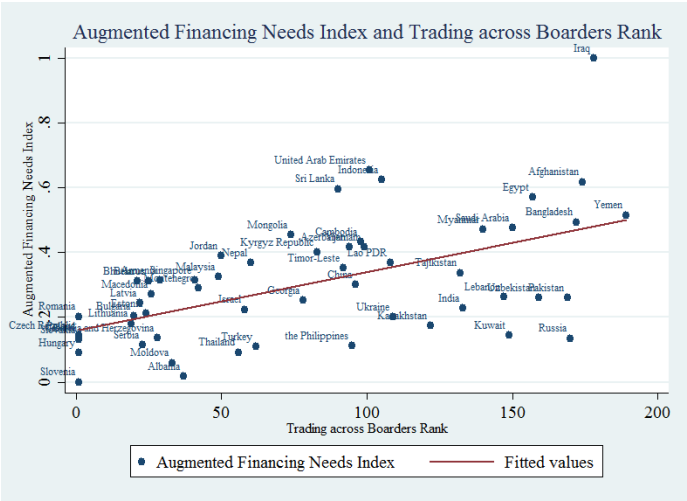

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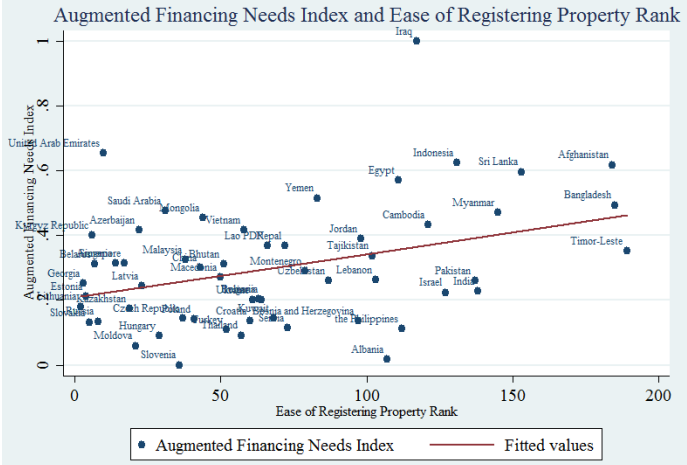
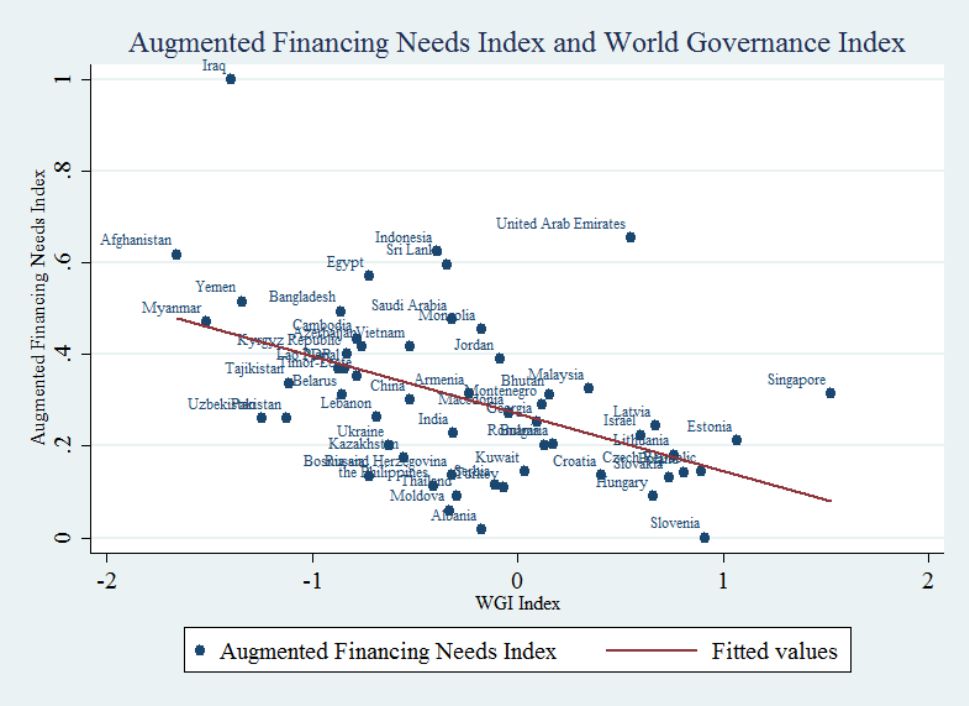


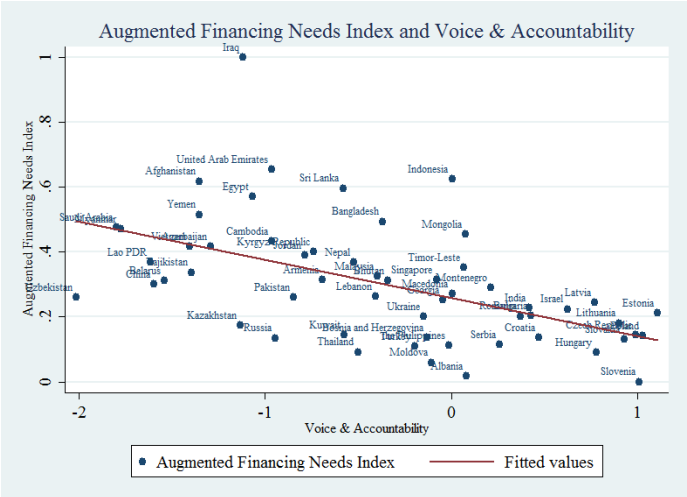
(Figure 9.g)

Figure 10. Augmented Financing Needs Index and Governance

Figure 10 plots the Augmented Financing Needs Index score and graphs the fitted line of the relationship between Augmented Financing Needs Index and World Governance Index by modifying the World Governance Indicators constructed by Kaufmann and Kraay and Mastruzzi (2008). The World Governance Project sources data from over 30 entities and create indicators by aggregating views on institutional governance from enterprises, citizens and expert survey. We construct the World Governance Index by first averaging each Indicator in a country from 2009 to 2014, then averaging across all Indicators. This Index examines how authority in a country is exercised for 215 economies from 1996-2014 in 6 dimensions. The score follows a standard normal distribution with mean zero and a unit standard deviation, with virtually all scores lying in the range from -2.5 to 2.5. A high score translates into better governance quality.



(Figure 10.a)



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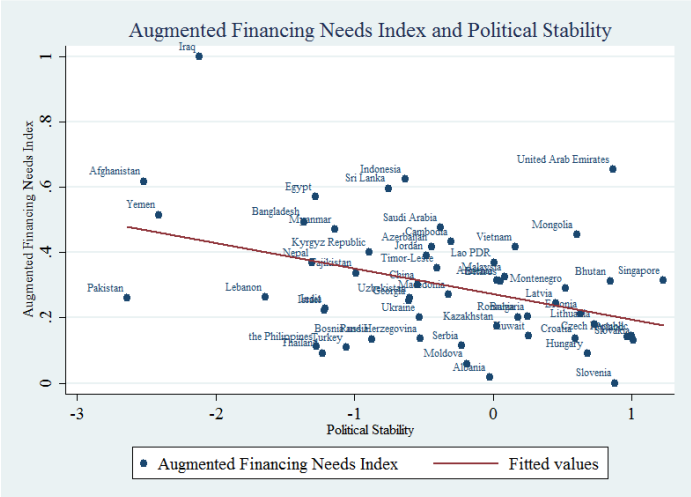
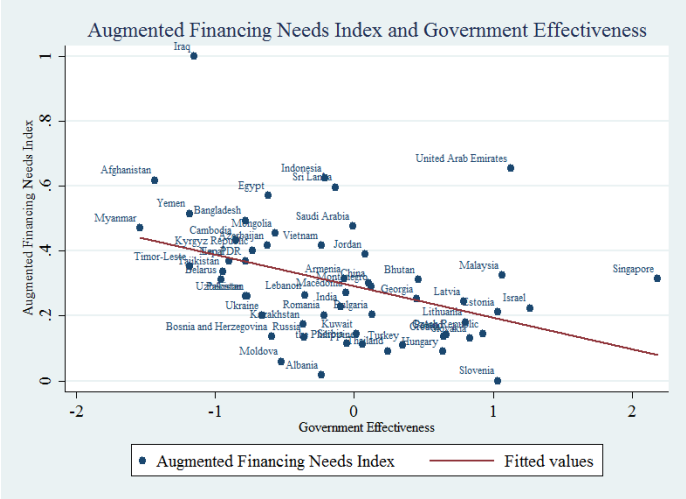


(Figure 10.c)



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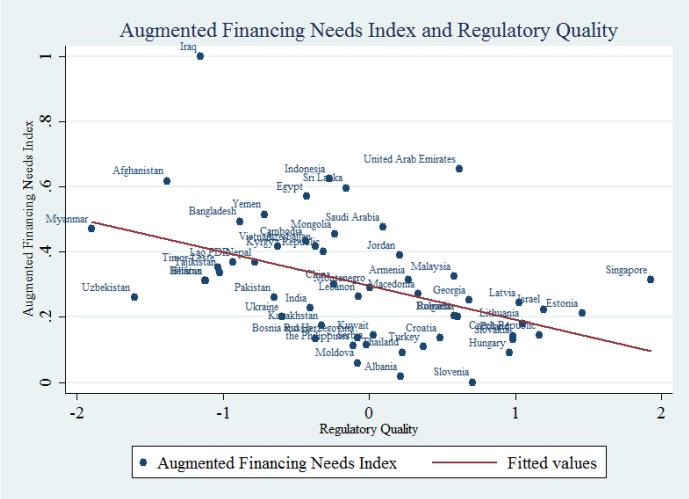

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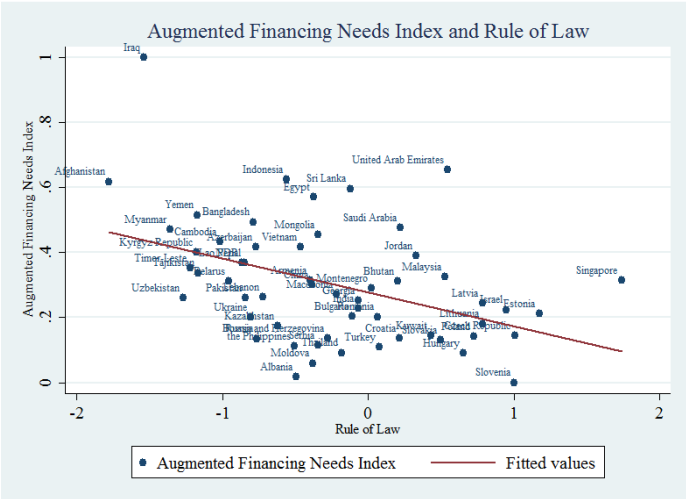

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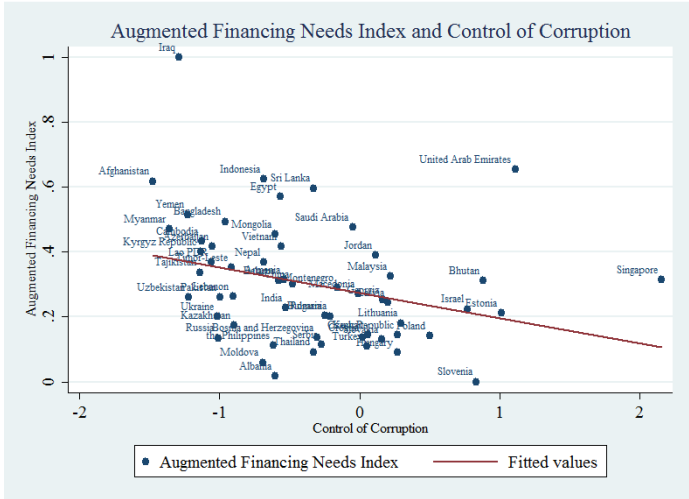


(Figure 10.g)

APPENDICES

Appendix 1. Variables and Development Indicators Description

Variables	Description
Cash and Cash Equivalents	The amount of cash at bank and in hand of the company
Cash Flow	Net income plus depreciation
Extraordinary Items	All extraordinary and other result not belonging to the 'ordinary' activities of the Company
Fixed Asset	Total amount (after depreciation) of non-current assets
Net Income	Net income for the Year. Before deduction of Minority interests if any
Operating Revenue	Total operating revenues, i.e. the sum of Net Sales, Other Operating Revenues and Stock Variations. The figures do not include VAT. Local differences may occur regarding excises taxes and similar obligatory payments for specific market of tobacco and alcoholic beverage industries.
Total Asset	Book value of Fixed Asset plus book value of Current Asset
Capital Expenditure	Change in book value of Fixed Asset
ChgCash	Difference in Cash and Cash Equivalent of current and the previous year
Earnings Before Extraordinary Items	Net income minus extraordinary profit
Growth	Three-year arithmetic average growth rate in Operating Revenue
I	Capital Expenditures divided by beginning-of-year book value of Total Asset

Development Indicators	Definition
Financial Reform Index	An index normalized in between zero and one by combining liberalization scores for eight categories, devised by Abdul Abiad, Enrica Detragiache, and Thierry Tressel. A higher Financial Reform Index score means better financial liberalization. The index covers data from 1974 to 2005.
Doing Business Rank	A numerical rank aggregating ranks of ten sub-components that gauges the overall level of ease of conducting economic activity in a particular country, prepared by the World Bank. A lower rank translates into a more business-congenial environment.
- Getting Credit	A component of the Doing Business ranking procedure that gauges the strength of legal rights of borrowers and lenders with respect to secured transactions
- Enforcing Contract	A component of the Doing Business ranking procedure that gauges judicial quality by measuring time and cost for resolving a commercial dispute through a local first-instance court
- Protecting Minority Investor	A component of the Doing Business ranking procedure that gauges the protection of minority investors and shareholders' right in corporate governance
- Resolving Insolvency	A component of the Doing Business ranking procedure that gauges strength of the legal framework governing the liquidation and reorganization process

- *Trading across Borders*	A component of the Doing Business ranking procedure that gauges the ease of cross border trading and business
-*Registering Property*	A component of the Doing Business ranking procedure that gauges the ease of registering properties.
World Governance Index	An index examining how authority in a country is exercised for 215 economies from 1996-2014. We construct the World Governance Index based on the World Governance Indicators introduced by Kaufmann and Kraay and Mastruzzi (2008). The Index is obtained by first averaging the six in a country from 2009 to 2014, and then averaging across all Indicators. The score follows a standard normal distribution with mean zero and a unit standard deviation, with virtually all scores lying in the range from -2.5 to 2.5. A high score translates into better performance in the respective dimension.
- *Voice and Accountability*	A component of the World Governance Indicators that gauges the extent that citizens can participate in selecting their governments and the accountability of a government to its citizens
- *Political Stability and Absence of Violence*	A component of the World Governance Indicators that gauges whether the political authority is stable and unthreatened by politically motivated violence and terrorism
- *Government Effectiveness*	A component of the World Governance Indicators that gauges the quality of public and civil service, policy formulation and implementation and governmental credibility
- *Regulatory Quality*	A component of the World Governance Indicators that gauges the quality of regulations in promoting and permitting development in the private sector
- *Rule of Law*	A component of the World Governance Indicators that gauges the perception of the extent to which agents to which agents have in and abides by the rules of the society
- *Control of Corruption*	A component of the World Governance Indicators that gauges the extent to which public power is exercised for private gains

Appendix 2. Financing Needs Index for SIC 2 Digit Industries

Major Group (SIC 2 Digit)	Division (SIC 1 Digit)	Financing Needs Index	Financing Needs Index Ranking
National Security and International Affairs	Public Administration	1	1
Private Households	Services	1	1
Administration of Human Resource Programs	Public Administration	0.6945	2
Administration of Economic Programs	Public Administration	0.6885	3
Social Services	Services	0.6881	4
Justice, Public Order and Safety	Public Administration	0.5659	5
Museums, Art Galleries and Botanical and Zoological Gardens	Services	0.5524	6
Motion Pictures	Services	0.5273	7
Depository Institutions	Finance, Insurance & Real Estate	0.5241	8
Water Transportation	Transportation & Public Utilities	0.4116	9
Forestry	Agriculture, Forestry, & Fishing	0.4085	10
Security & Commodity Brokers, Dealers, Exchanges & Services	Finance, Insurance & Real Estate	0.4006	11
Health Services	Services	0.3835	12
Fishing, Hunting and Trapping	Agriculture, Forestry, & Fishing	0.3622	13
Engineering, Accounting, Research, Management & Related Services	Services	0.3363	14
Pipelines, Except Natural Gas	Transportation & Public Utilities	0.3344	15
Measurement/Analysis/Control Instruments; Photo/Med/Opt Goods; Watches/Clocks	Manufacturing	0.3337	16
Educational Services	Services	0.3247	17
Miscellaneous Repair Services	Services	0.2929	18
Insurance Agents, Brokers and Service	Finance, Insurance & Real Estate	0.291	19
Agricultural Services	Agriculture, Forestry, & Fishing	0.2822	20
Membership Organizations	Services	0.2765	21
Construction - Special Trade Contractors	Construction	0.2744	22
Heavy Construction, Except Building Construction - Contractors	Construction	0.2706	23
Legal Services	Services	0.2647	24
Metal Mining	Mining	0.2643	25

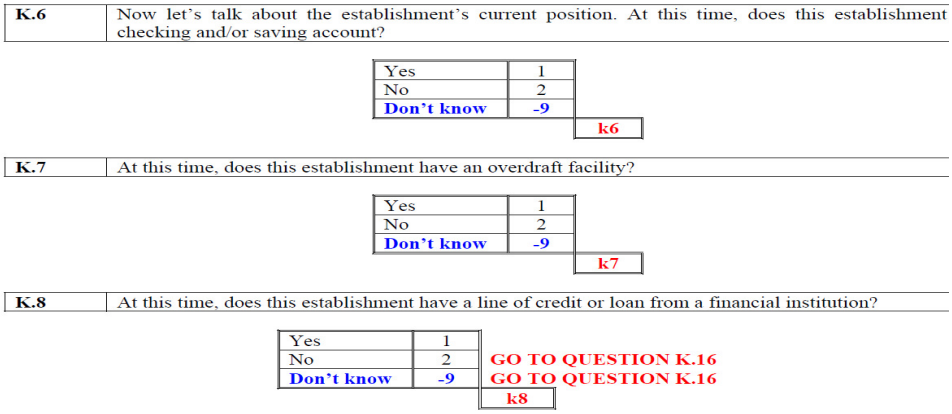
Insurance Carriers	Finance, Insurance & Real Estate	0.2637	26
Agricultural Production - Crops	Agriculture, Forestry, & Fishing	0.2623	27
Electronic, Electrical Equipment & Components, Except Computer Equipment	Manufacturing	0.2586	28
United States Postal Service	Transportation & Public Utilities	0.2579	29
Fabricated Metal Products, Except Machinery & Transport Equipment	Manufacturing	0.2558	30
Printing, Publishing and Allied Industries	Manufacturing	0.2519	31
Business Services	Services	0.2511	32
Paper and Allied Products	Manufacturing	0.2463	33
Transportation Services	Transportation & Public Utilities	0.2442	34
Agricultural Production - Livestock and Animal Specialties	Agriculture, Forestry, & Fishing	0.2422	35
Leather and Leather Products	Manufacturing	0.2402	36
Primary Metal Industries	Manufacturing	0.2376	37
Electric, Gas and Sanitary Services	Transportation & Public Utilities	0.2347	38
Amusement and Recreation Services	Services	0.2335	39
Hotels, Rooming Houses, Camps, and Other Lodging Places	Services	0.2242	40
Chemicals and Allied Products	Manufacturing	0.2182	41
Lumber and Wood Products, Except Furniture	Manufacturing	0.2165	42
Motor Freight Transportation	Transportation & Public Utilities	0.2163	43
Building Construction - General Contractors & Operative Builders	Construction	0.209	44
Industrial and Commercial Machinery and Computer Equipment	Manufacturing	0.209	45
Miscellaneous Manufacturing Industries	Manufacturing	0.2083	46
Apparel, Finished Products from Fabrics & Similar Materials	Manufacturing	0.2056	47
Home Furniture, Furnishings and Equipment Stores	Retail Trade	0.2034	48
Personal Services	Services	0.2024	49
Furniture and Fixtures	Manufacturing	0.1983	50
Transportation by Air	Transportation & Public Utilities	0.1961	51
Real Estate	Finance, Insurance & Real Estate	0.1917	52
Automotive Repair, Services and Parking	Services	0.1881	53
Communications	Transportation & Public Utilities	0.1879	54
Holding and Other Investment Offices	Finance, Insurance & Real Estate	0.1817	55

Automotive Dealers and Gasoline Service Stations	Retail Trade	0.1813	56
Textile Mill Products	Manufacturing	0.1784	57
Oil and Gas Extraction	Mining	0.1768	58
Transportation Equipment	Manufacturing	0.1715	59
Local, Suburban Transit & Interurban Highway Passenger Transport	Transportation & Public Utilities	0.169	60
Stone, Clay, Glass, and Concrete Products	Manufacturing	0.1447	61
Rubber and Miscellaneous Plastic Products	Manufacturing	0.1404	62
Building Materials, Hardware, Garden Supply & Mobile Home Dealers	Retail Trade	0.1243	63
Wholesale Trade - Durable Goods	Wholesale Trade	0.1225	64
Wholesale Trade - Nondurable Goods	Wholesale Trade	0.1197	65
Food and Kindred Products	Manufacturing	0.1159	66
Railroad Transportation	Transportation & Public Utilities	0.1093	67
Miscellaneous Retail	Retail Trade	0.0959	68
Non-depository Credit Institutions	Finance, Insurance & Real Estate	0.0932	69
Mining and Quarrying of Nonmetallic Minerals, Except Fuels	Mining	0.0836	70
Coal Mining	Mining	0.0675	71
General Merchandise Stores	Retail Trade	0.0661	72
Petroleum Refining and Related Industries	Manufacturing	0.0482	73
Apparel and Accessory Stores	Retail Trade	0.045	74
Eating and Drinking Places	Retail Trade	0.0434	75
Food Stores	Retail Trade	0.0322	76
Tobacco Products	Manufacturing	0.01	77

Appendix 3. The Construction of Financing Obstacle Index

This appendix details the procedure for constructing the Financing Obstacles Index based upon the World Bank Enterprise Surveys data. We sort and group survey questions listed in the World Bank Enterprise Surveys Core Module (2007) into four key attributes and construct four scores that gauge financing obstacles faced by firms: (1) the availability of credit facility score (see questions K.6 to K.8); (2) the requirement for collateral score (see question K. 13-15); (3) the difficulty in loan application score (see questions K.16 – K.19); and (4) the perception of financing obstacles (see question K.30). the credit facility score (See questions K.6-K8 in The World Bank Enterprise Survey Core Module (2007)

We refer to and codify questions K.6 to K.8 into binary variables to construct the availability of credit facility score. If the response to each question is "Yes" ("No"), we codify the corresponding variables k6, k7 or k8 as "1" ("0"); and if the response is "Don't know", we codify it as a missing value. We code the credit facility score to be equal to 1 minus the mean of (k6, k7, k8). We then take the average of the availability of credit facility scores within each country in our sample. For the list of 52 countries, we normalize the scores to get a normalized availability of credit facility score. A higher availability of credit facility score means greater financing obstacles.

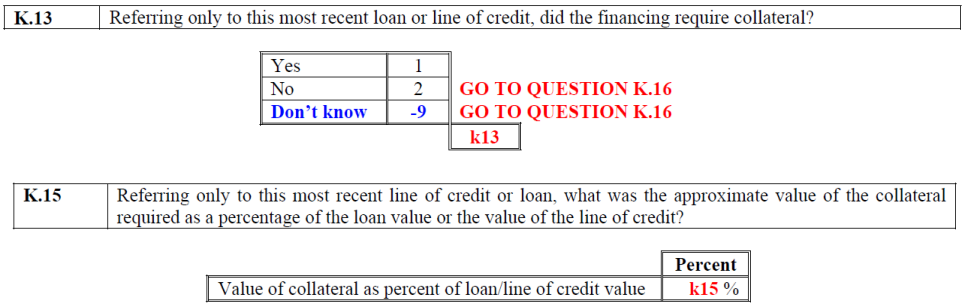


K.6	Now let's talk about the establishment's current position. At this time, does this establishment checking and/or saving account?		
	Yes	1	
	No	2	
	Don't know	-9	
			k6

K.7	At this time, does this establishment have an overdraft facility?		
	Yes	1	
	No	2	
	Don't know	-9	
			k7

K.8	At this time, does this establishment have a line of credit or loan from a financial institution?		
	Yes	1	
	No	2	GO TO QUESTION K.16
	Don't know	-9	GO TO QUESTION K.16
			k8

We refer to and codify questions K.13 and K.15 to construct the requirement for collateral score. If a firm does not have to post collateral for the most recent loan or line of credit in K.13 or it reports to have posted a negative collateral in K.15, it receives a score of "0". To mitigate the influence of extreme values in question K. 15, we winsorize the response at the 1st- and the 95th percentiles. The winsorized score is then normalized in between 0 and 1 in the entire dataset, and is taken as the requirement for collateral score for firms that responded with "Yes" in K.13. We then take the average of the requirement for collateral scores within each country in our sample. For a list of 52 countries, we normalize the scores to get a normalized collateral requirement score. A higher requirement for collateral score means greater financing obstacles.



K.13	Referring only to this most recent loan or line of credit, did the financing require collateral?		
	Yes	1	
	No	2	GO TO QUESTION K.16
	Don't know	-9	GO TO QUESTION K.16
			k13

K.15	Referring only to this most recent line of credit or loan, what was the approximate value of the collateral required as a percentage of the loan value or the value of the line of credit?	
		Percent
	Value of collateral as percent of loan/line of credit value	k15 %

We refer to and codify questions K.16 to K.19 to construct the difficulty in loan application score. If a firms reports "No" in question K.16 and "No need for a loan" in K.17, then it receives a score of "0". If a firm reports "No" in K.16 and chooses options other than "No need for a loan", then it receives a score of "1". If a

firm reports "Yes" in question K.16, it receives a score equaling the proportion of rejected loans calculated by the ratio of "Loan applications rejected" to "Loan applications submitted" in questions K.19 and K.18 respectively. We take the average of the difficulty in loan application scores within each country in our sample. For a list of 52 countries, we normalize the scores to get a normalized difficulty in loan application score. A higher difficulty in loan application score means greater financing obstacles.

K.16	Going back to the past, in fiscal year [insert last complete fiscal year], did this establishment apply for loans or lines of credit?

Yes	1	GO TO QUESTION K.18
No	2	
Don't know	-9	
	k16	

K.17	What was the main reason why this establishment did not apply for line of credit or loan in fiscal year [insert last complete fiscal year]? INTERVIEWER: SHOW CARD 13

No need for a loan - establishment has sufficient capital	1	GO TO QUESTION K.21
Application procedures for loans or line of credit are complex	2	GO TO QUESTION K.21
Interest rates are not favorable	3	GO TO QUESTION K.21
Collateral requirements for loans or line of credit are unattainable	4	GO TO QUESTION K.21
Size of loan and maturity are insufficient	5	GO TO QUESTION K.21
Did not think it would be approved	6	GO TO QUESTION K.21
Other	7	GO TO QUESTION K.21
	k17	

K.18	In fiscal year [insert last complete fiscal year], how many times did this establishment apply for new loans or new lines of credit?

	Number	
Loan applications submitted	k18	IF DOES NOT KNOW, GO TO QUESTION K.21

K.19	How many of those loan or line of credit applications were rejected?

	Number
Loan applications rejected	k19

We refer to question K.30 to construct the perception of financing obstacles score. The responses are codified as "0", "1", "2", "3" and "4" if a firm responds with "No Obstacle", "a Minor Obstacle", "a Major Obstacle", and "a Very Severe Obstacle" respectively. Then we take the average of the financing obstacles scores within each country in our sample. For a list of 52 countries, we normalize the scores to get a normalized financing obstacle score. A higher perception of financing obstacles score means greater financing obstacles.

K.30	Is **access to financing**, which includes availability and cost [interest rates, fees and collateral requirements], No Obstacle, a Minor Obstacle, a Major Obstacle, or a Very Severe Obstacle to the current operations of this establishment? INTERVIEWER: SHOW CARD 14

	No obstacle	Minor obstacle	Moderate obstacle	Major obstacle	Very Severe Obstacle	Do Not Know	Does Not Apply
Access to financing k30	0	1	2	3	4	-9	-7

Finally, we take the average of the four scores, namely the normalized financing obstacle score, normalized loan rejection score, normalized collateral requirement score and normalized credit facility score to obtain the Financing Obstacle Index.

Appendix 4a. Country-level Regression Results for the Investment-Cash flow model with macroeconomics controls

Appendix 4a reports investment-cash flow sensitivity across Belt and Road countries. The sample covers 36 countries from 2009 to 2015 Countries with fewer than 200 observations are dropped from our sample for robustness. Definitions of the regressors follow Mclean et al. (2012). The dependent variable I is measured by the ratio of firms' Capital Expenditure deflated by beginning-of-period Total Assets. Capital Expenditure is proxied by the annual net change of Fixed Assets. L.CF is measured by firms' prior period's Cash Flow deflated by beginning-of-period Total Assets. Growth is proxied by firms' three-year average growth rate in Operating Revenue. For Kazakhstan, Lithuania, Moldova, Turkey and Russia, the ratio of Earnings Before Extraordinary Items to beginning-of-period Total Asset is substituted for L.CF due to lack of Cash Flow data. All regressions include year, firm fixed effects and macroeconomics control variables (GDP per capita, real GDP growth, CPI inflation and Broad money supply to GDP ratio), coefficient estimates of which are suppressed. t statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable: Investment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Country Name	Bangladesh	Bulgaria	China	Croatia	Czech Republic	Egypt	Estonia	Hungary	India	Indonesia
Cash Flow	0.559	0.027***	0.191***	-0.061	0.023***	0.093	-0.007	0.023***	0.139***	0.266***
	[1.598]	[12.009]	[5.614]	[-1.169]	[9.719]	[1.067]	[-1.066]	[20.213]	[6.397]	[3.195]
Q	0.014	0.006***	0.074***	0.057**	0.005***	0.006	0.019***	0.015***	0.004***	0.023***
	[0.177]	[13.139]	[14.359]	[2.020]	[7.066]	[0.486]	[5.953]	[27.906]	[3.242]	[3.686]
Constant	0.196	-0.508***	-1.080***	0.930	0.184***	7.388***	-0.029***	1.000	5.859***	5.836
	[0.510]	[-70.288]	[-2.698]	[1.084]	[3.711]	[3.693]	[-6.809]	[0.930]	[2.877]	[0.888]
Macro Factors	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	375	367,261	18,161	270	334,687	1,005	47,763	696,067	22,339	1,956
R-squared	0.397	0.400	0.341	0.507	0.345	0.343	0.620	0.389	0.385	0.360

Dependent Variable: Investment

	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Country Name	Iraq	Israel	Jordan	Kazakhstan	Kuwait	Malaysia	Moldova	Oman	Pakistan	Poland
Cash Flow	0.071	-0.040	0.083	0.015	0.078	0.130***	0.093**	0.171	0.142***	0.048***
	[1.234]	[-0.642]	[1.225]	[0.284]	[0.960]	[4.931]	[2.325]	[1.543]	[3.491]	[18.512]
Q	-0.021	0.022**	-0.001	0.006	-0.002	0.016***	0.009	-0.021	0.000	0.021***
	[-0.947]	[2.035]	[-0.359]	[1.403]	[-0.545]	[5.990]	[1.576]	[-0.699]	[0.036]	[14.925]
Constant	0.284	1.137	0.293	3.548	-0.412	0.696***	0.752***	0.316	-0.173	0.281
	[0.246]	[0.241]	[1.353]	[1.234]	[-0.157]	[9.306]	[10.496]	[0.532]	[-0.292]	[1.070]

Macro Factors	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	258	1,419	952	6,005	816	10,193	2,436	569	1,976	224,427
R-squared	0.273	0.437	0.312	0.372	0.258	0.381	0.482	0.278	0.309	0.384

Dependent Variable: Investment

	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)
Country Name	Romania	Russia	Saudi Arabia	Serbia	Singapore	Sri Lanka	Thailand	Turkey	Ukraine	Vietnam	the Philippines
Cash Flow	0.024***	0.012***	0.199*	0.050***	0.096***	0.325***	0.041*	0.051***	0.010***	0.286***	0.030
	[26.291]	[18.102]	[1.888]	[10.902]	[2.740]	[2.808]	[1.930]	[3.336]	[12.948]	[6.357]	[1.231]
Q	0.016***	0.002***	0.016	0.018***	0.045***	0.011	0.023***	0.012***	0.006***	0.019**	0.072***
	[43.997]	[11.419]	[0.993]	[16.632]	[3.710]	[0.659]	[4.326]	[3.093]	[23.434]	[2.547]	[7.868]
Constant	0.411***	1.866***	2.429	1.084***	-0.178	-0.003	-0.117	0.987	0.290***	0.230	-1.440*
	[13.679]	[9.932]	[0.226]	[17.408]	[-0.413]	[-0.014]	[-0.862]	[0.815]	[80.733]	[0.918]	[-1.689]
Macro Factors	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,206,569	1,229,991	593	121,475	4,931	1,172	14,697	27,805	901,761	4,732	24,569
R-squared	0.319	0.360	0.379	0.432	0.338	0.270	0.470	0.513	0.408	0.372	0.519

Appendix 4b. Country-level Regression Results for the Cash Flow Sensitivity of Cash Model with Macroeconomics Controls

Appendix 4b reports cash flow sensitivity of cash across Belt and Road countries. The sample covers 36 countries from 2009 to 2015. Countries with fewer than 100 observations are dropped from our sample for robustness. Definitions of the regressors follow Almeida, Campello and Weisbach (2004). The dependent variable ChgCash is measured by the ratio of firms' change in Cash and Cash Equivalent deflated by beginning-of-period Total Assets. CF is measured by firms' current period's Cash Flow deflated by beginning-of-period Total Assets. Growth is proxied by firms' three-year average growth rate in Operating Revenue. For Kazakhstan, Lithuania, Moldova, Turkey and Russia, the ratio of Earnings Before Extraordinary Items to beginning-of-period Total Asset is substituted for CF due to lack of Cash Flow data. Size is the log of Total Asset. All regressions include year, firm fixed effects, and macroeconomics control variables (GDP per capita, real GDP growth, CPI inflation and Broad money supply to GDP ratio), coefficient estimates of which are suppressed. t statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable: Change in Cash Holding										
Dependent Variable: Change in Cash Holding	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Country Name	Bangladesh	Bulgaria	China	Croatia	Czech Republic	Egypt	Estonia	Hungary	India	Indonesia
Cash Flow	0.295*	0.262***	0.179***	0.160**	0.238***	0.327***	0.395***	0.198***	0.082***	0.059
	[1.739]	[56.932]	[6.812]	[2.502]	[60.018]	[4.121]	[38.304]	[93.940]	[7.297]	[1.590]
Tobin's Q	-0.019	0.004***	0.018***	-0.006	0.001	-0.008	-0.005	0.008***	0.000	0.000
	[-0.518]	[6.869]	[5.860]	[-0.143]	[0.939]	[-0.963]	[-1.301]	[10.237]	[0.444]	[0.053]
Firm Size	0.088***	0.102***	0.029***	0.050*	0.090***	0.051***	0.115***	0.088***	0.008***	0.012***
	[2.626]	[59.671]	[10.771]	[1.726]	[60.508]	[3.537]	[14.941]	[81.987]	[4.691]	[2.805]
Constant	-0.865**	-0.628***	-0.341***	-0.302*	-0.587***	-0.584***	-0.617***	-0.464***	-0.072***	-0.113**
	[-2.566]	[-63.835]	[-10.409]	[-1.837]	[-61.993]	[-3.672]	[-16.748]	[-89.697]	[-4.150]	[-2.372]
Macro Factors	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	366	316,525	18,171	235	327,554	1,019	46,792	684,334	19,273	1,951
R-squared	0.413	0.430	0.203	0.325	0.307	0.207	0.616	0.371	0.218	0.175

Dependent Variable: Change in Cash Holding										
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Country Name	Iraq	Israel	Jordan	Kazakhstan	Kuwait	Malaysia	Moldova	Oman	Pakistan	Poland
Cash Flow	0.421***	0.291***	0.210***	0.107***	0.153**	0.216***	0.066***	0.140	0.097**	0.192***
	[3.467]	[5.098]	[3.687]	[6.558]	[2.568]	[9.423]	[4.155]	[1.477]	[2.214]	[49.363]
Tobin's Q	-0.005	-0.016	0.000	-0.002	0.000	0.010**	0.001	0.022	0.001	0.003*
	[-0.185]	[-1.582]	[0.043]	[-1.507]	[0.004]	[2.494]	[0.748]	[1.059]	[0.140]	[1.947]
Firm Size	0.073	0.046***	0.023	0.025***	0.031*	0.031***	0.008**	-0.014	0.003	0.049***
	[1.158]	[3.577]	[1.531]	[5.796]	[1.775]	[8.070]	[2.271]	[-1.046]	[0.300]	[39.085]
Constant	-0.546	-0.511***	-0.261*	-0.184***	-0.411*	-0.365***	-0.060**	0.117	-0.065	-0.378***
	[-1.059]	[-3.370]	[-1.702]	[-4.470]	[-1.913]	[-8.474]	[-2.398]	[0.784]	[-0.562]	[-41.475]
Macro Factors	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	257	1,392	942	5,904	816	9,215	2,394	568	1,969	212,520
R-squared	0.338	0.466	0.229	0.220	0.180	0.320	0.138	0.226	0.266	0.269

Dependent Variable: Change in Cash Holding											
	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)
Country Name	Romania	Russia	Saudi Arabia	Serbia	Singapore	Sri Lanka	Thailand	Turkey	Ukraine	Vietnam	the Philippines
Cash Flow	0.157***	0.072***	0.231***	0.114***	0.253***	0.253***	0.125***	0.201***	0.152***	0.199***	0.140***
	[131.352]	[50.155]	[3.097]	[23.222]	[7.861]	[4.148]	[7.536]	[11.553]	[101.136]	[5.297]	[7.009]
Tobin's Q	0.007***	0.002***	0.004	0.000	0.000	-0.001	-0.001	0.007*	-0.001***	0.003	0.012**
	[18.512]	[5.392]	[0.435]	[0.464]	[0.048]	[-0.185]	[-0.228]	[1.872]	[-4.701]	[0.500]	[2.114]
Firm Size	0.054***	0.066***	0.022	0.030***	0.013***	0.018	0.042***	0.043***	0.044***	0.031***	0.074***
	[89.945]	[111.375]	[1.254]	[21.652]	[2.660]	[1.488]	[12.128]	[10.979]	[72.432]	[4.615]	[23.132]
Constant	-0.290***	-0.401***	-0.319	-0.194***	-0.137**	-0.168	-0.405***	-0.363***	-0.217***	-0.296***	-0.538***
	[-100.953]	[-115.151]	[-1.373]	[-22.945]	[-2.469]	[-1.441]	[-12.190]	[-10.820]	[-77.802]	[-4.571]	[-22.374]
Macro Factors	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,159,575	1,105,097	592	111,002	4,946	1,165	14,070	27,520	767,482	4,826	24,383
R-squared	0.295	0.326	0.162	0.331	0.269	0.162	0.376	0.355	0.302	0.221	0.487

Appendix 4c. Country-level Financing Needs Index estimated with Macroeconomics Controls

Appendix 4c tabulates the Financing Needs Index scores and the respective rankings for each Belt and Road country in the sample using regression results from Appendix 4a-4b. A country with a higher Financing Needs Index score or rank means that firms in that country have greater financing needs due to more binding financial constraints. To capture different dimensions of binding financial constraints, the statistically significant coefficients for investment-cash flow sensitivity and cash flow sensitivity of cash in each country are normalised in between zero and one and averaged to obtain the Financing Needs Index. If only one of the coefficients is significant, then the normalised score of that coefficient is used as the index score. The Financing Needs Index score for Indonesia is obtained by the normalised investment-cash flow sensitivity score only, whereas those for Bangladesh, Croatia, Egypt, Iraq, Israel, Jordan, Kazakhstan, Kuwait, Latvia and the Philippines are obtained by the normalised cash flow sensitivity of cash score only.

Country	Financing Needs Index	Financing Needs Index Ranking
Iraq	1.000	1
Estonia	0.927	2
Indonesia	0.813	3
Sri Lanka	0.763	4
Egypt	0.735	5
Bangladesh	0.645	6
Israel	0.634	7
Vietnam	0.625	8
Saudi Arabia	0.532	9
Jordan	0.406	10
Poland	0.404	11
Singapore	0.400	12
Pakistan	0.387	13
Bulgaria	0.303	14
Croatia	0.265	15
Moldova	0.263	16
Czech Republic	0.263	17
Turkey	0.255	18
Kuwait	0.245	19
India	0.227	20
the Philippines	0.208	21
Hungary	0.207	22
Malaysia	0.190	23
Romania	0.150	24
Thailand	0.132	25
Serbia	0.131	26
Ukraine	0.121	27
Kazakhstan	0.115	28
Russia	0.012	29

Appendix 5. Country-level Regression Results for the Cash Flow Sensitivity of Cash Model with Macroeconomics Controls

Appendix 5 reports cash flow sensitivity of cash across Belt and Road countries. The sample covers 36 countries from 2009 to 2015. Countries with fewer than 100 observations are dropped from our sample for robustness. Definitions of the regressors follow Almeida, Campello and Weisbach (2004). The dependent variable ChgCash is measured by the ratio of firms' change in Cash and Cash Equivalent deflated by beginning-of-period Total Assets. CF is measured by firms' current period's Cash Flow deflated by beginning-of-period Total Assets. Size*Cash Flow is the cross term of CF and Firm Size. Growth is proxied by firms' three-year average growth rate in Operating Revenue. For Kazakhstan, Lithuania, Moldova, Turkey and Russia, the ratio of Earnings Before Extraordinary Items to beginning-of-period Total Asset is substituted for CF due to lack of Cash Flow data. Size is the log of Total Asset. All regressions include year, firm fixed effects, and macroeconomics control variables (GDP per capita, real GDP growth, CPI inflation and Broad money supply to GDP ratio), coefficient estimates of which are suppressed. t statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable: Change in Cash Holding									
Dependent Variable: Change in Cash Holding	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Country Name	Bangladesh	Bulgaria	China	Croatia	Czech Republic	Egypt	Estonia	Hungary	India
Cash Flow	-0.721	0.359***	0.440**	0.174	0.315***	0.361	0.591***	0.198***	-0.074
	[-0.918]	[24.502]	[2.567]	[0.814]	[25.339]	[0.834]	[22.023]	[45.594]	[-1.381]
Tobin's Q	-0.022	0.005***	0.018***	-0.006	0.001	-0.008	-0.003	0.008***	0.000
	[-0.583]	[7.214]	[5.924]	[-0.143]	[1.257]	[-0.966]	[-0.743]	[10.205]	[0.533]
Firm Size	0.076**	0.104***	0.031***	0.050*	0.090***	0.051***	0.117***	0.088***	0.008***
	[2.198]	[60.463]	[10.669]	[1.715]	[60.719]	[3.646]	[15.188]	[82.052]	[4.826]
Size * Cash Flow	0.097	-0.019***	-0.022	-0.004	-0.015***	-0.003	-0.051***	0.000	0.017***
	[1.169]	[-7.660]	[-1.606]	[-0.079]	[-7.395]	[-0.081]	[-8.713]	[0.237]	[3.138]
Constant	-0.745**	-0.640***	-0.358***	-0.302*	-0.589***	-0.586***	-0.627***	-0.464***	-0.076***
	[-2.122]	[-64.412]	[-10.304]	[-1.823]	[-62.075]	[-3.777]	[-16.988]	[-89.753]	[-4.376]
Macro Factors	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	366	316,525	18,171	235	327,554	1,019	46,792	684,334	19,273
R-squared	0.417	0.430	0.203	0.325	0.307	0.207	0.619	0.371	0.219

Dependent Variable: Change in Cash Holding									
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Country Name	Iraq	Israel	Jordan	Kuwait	Malaysia	Oman	Pakistan	Poland	Romania
Cash Flow	1.933***	0.522**	-0.052	0.935	0.356**	0.165	-0.201	0.260***	0.124***
	[3.191]	[2.084]	[-0.125]	[1.419]	[2.287]	[0.197]	[-1.126]	[17.758]	[49.014]
Tobin's Q	0.001	-0.015	0.000	0.000	0.010**	0.022	0.001	0.004**	0.007***
	[0.020]	[-1.485]	[0.041]	[0.006]	[2.491]	[1.056]	[0.174]	[2.264]	[16.865]
Firm Size	0.105	0.044***	0.024	0.029*	0.031***	-0.014	0.003	0.049***	0.054***
	[1.650]	[3.185]	[1.571]	[1.690]	[8.034]	[-0.915]	[0.233]	[39.165]	[90.270]
Size * Cash Flow	-0.201**	-0.026	0.027	-0.065	-0.013	-0.002	0.031*	-0.011***	0.012***
	[-2.510]	[-0.970]	[0.669]	[-1.215]	[-0.938]	[-0.031]	[1.817]	[-5.188]	[17.092]
Constant	-0.809	-0.478***	-0.277*	-0.388*	-0.365***	0.115	-0.058	-0.380***	-0.291***
	[-1.558]	[-2.973]	[-1.735]	[-1.836]	[-8.425]	[0.694]	[-0.511]	[-41.482]	[-101.570]
Macro Factors	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	257	1,392	942	816	9,215	568	1,969	212,520	1,159,575
R-squared	0.353	0.467	0.230	0.183	0.320	0.226	0.268	0.269	0.296

Dependent Variable: Change in Cash Holding									
	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)
Country Name	Saudi Arabia	Serbia	Singapore	Sri Lanka	Thailand	Turkey	Ukraine	Vietnam	the Philippines
Cash Flow	0.965**	0.221***	0.357*	0.074	0.099	0.564***	0.218***	0.128	0.166**
	[2.025]	[14.771]	[1.657]	[0.197]	[1.055]	[2.910]	[82.263]	[0.547]	[2.526]
Tobin's Q	0.005	0.001	0.001	-0.001	-0.001	0.000	-0.001**	0.003	0.012**
	[0.529]	[0.727]	[0.071]	[-0.189]	[-0.238]	[0.028]	[-2.416]	[0.475]	[2.132]
Firm Size	0.026	0.031***	0.013***	0.017	0.042***	0.013	0.043***	0.030***	0.075***
	[1.447]	[22.312]	[2.679]	[1.448]	[11.855]	[1.117]	[70.325]	[4.558]	[23.120]
Size * Cash Flow	-0.060	-0.019***	-0.010	0.019	0.003	-0.020*	-0.024***	0.008	-0.004
	[-1.593]	[-8.607]	[-0.503]	[0.488]	[0.288]	[-1.660]	[-40.308]	[0.318]	[-0.410]

Constant	-0.369	-0.201***	-0.137**	-0.166	-0.403***	-0.075	-0.211***	-0.294***	-0.539***
	[-1.549]	[-23.529]	[-2.479]	[-1.406]	[-11.883]	[-0.634]	[-75.223]	[-4.510]	[-22.282]
Macro Factors	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	592	111,002	4,946	1,165	14,070	295	767,482	4,826	24,383
R-squared	0.165	0.333	0.269	0.162	0.376	0.266	0.306	0.221	0.487