

# Economic, Political and Resource-Based Models of Chinese Contracts in Africa: An Empirical Analysis

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This paper studies the pattern and determinants of contractual projects by Chinese contractors in Africa. Contracts by Chinese in Africa are a dominant component of China's economic relations with Africa. They exceed China's foreign direct investment in Africa. While similar to direct investments, contracts are based on some different considerations and are, therefore, subject to different determinants from foreign investment. This work is the first empirical study conducted on China's contracts overseas. It explores three models: economic, political, and resource based. Of the three, the resource-based model best explains the pattern and determinants of China's contracts in Africa. The countries abundant in petroleum and minerals tend to have Chinese projects. In addition to natural resources, we also look into the effects on contracts of market size, economic growth, education, investment, inflation, economic openness, exchange rate, regime type, governance, and bilateral relations with China. Our finding indicates that China's contractual projects are drawn to the African countries that are well endowed in natural resources.

**Keywords:** Africa, China, contractual projects, economic relations, natural resources

## INTRODUCTION

China has been *going global* as it continues its economic reforms. Its involvement in Africa has been extensive. According to *BusinessWire*, "China's investment in Africa's has increased a staggering 30-fold since 2005, with 2,000 Chinese firms now present in 50 African countries." China also remains the largest trade partner for Africa, with a great variety of Chinese products flowing into African households. At the same time, the majority of Chinese imports from Africa are mineral products. The consequences of such interactions are multidimensional. While Chinese exports to and imports from Africa have contributed to the economy of both China

and Africa, inevitably, China draws criticism as a neocolonial power because of its extraction of natural resources from Africa and exports of cheap consumer products to Africa. Simultaneously, as *The Economist* magazine notes, China wins praises from African communities for job creation, technology transfer, and local investment.

Moran (2010) finds that China's procurements of natural resources in the world, including Africa, are conducive to the expansion, diversification, and efficiency of the global supplier system of natural resources. However, he also points out Chinese resource procurements may promote "rogue states," "authoritarian leadership," "civil wars," "corrupt payments," "the deterioration of governance standards," and "environmental damage."

In this article, we focus on the patterns of China's contractual projects in Africa, with a particular interest in evaluating the effect of the natural resources of the recipient country on China's contracts in Africa, among many other variables, economic and political. Contractual projects are the major form of economic relations between China and Africa, leading foreign direct investment and other kinds of international economic and commercial activities. While foreign direct investment involves long-term goals and objectives, with the ownership remaining in the home country, contractual projects are performed with the agreement that the producer do not own the product, be it bridges, railroads, or hospitals. Once the project is done, it is eventually turned over to the recipient country. By contrast, foreign direct investment involves the purchase or creation of a business entity and ownership by the investor. In this sense, contractual projects take place within a shorter time horizon of returns on capital than direct investment.

In China, 2006 was the Year of Africa. During early winter of the year, thirty-five presidents or heads of state representing African countries arrived in Beijing and participated in the Forum on China-African Cooperation (FOCAC), in conjunction with the Third Ministerial Conference between Africa and China. The Beijing Summit adopted a declaration announcing the establishment of "a new type of strategic partnership" between China and Africa. The declaration, read by Chinese President Hu Jintao, Ethiopian Prime Minister Meles Zenawi, and Egyptian President Mohammed Hosni Mubarak, emphasized the themes of "political equality and mutual trust, economic win-win cooperation and cultural exchanges."

Six years later, none of the three leaders of the declaration was in office, but the legacy and work they left behind continued. Every three years since 2000, ministers from 52 African countries and China convene in China or Africa, discuss issues of common interest, and issue a communiqué. No other non-African countries engage African countries on such a comprehensive scale as China does. China's relations with Africa constituted an important component of its foreign policy with strong political content in the past and are now also based on economic rationales and reflect the ongoing liberal economic order of the world. The wars of ideologies between the East and the West in Africa have been replaced by competition and cooperation under the principle of returns of profits. With China's ascension to the status of the world's second largest economy and because of the rise in its political influence, those relations will become increasingly crucial not only for African countries and China, but also for the rest of the world.

China's economic relations with Africa take three distinct forms: contracts, foreign direct investment, and labor export.<sup>1</sup> Of the three, contractual projects are the largest categories in terms of the dollar value by agreement and by completion of the project. This essay exclusively focuses on Chinese contractual projects in Africa. Specifically, we aim at discerning the determinants of the Chinese projects in Africa through data and contextual analyses. First, we present an outline of China's foreign aid policy for Africa, which has gone through various forms. Next,

is a discussion of the econometric models to be used in this article and data, which is followed by a presentation of the processes and the results of data analyses. This article concludes with a review of implications of the statistical results.

## A BRIEF HISTORY OF CHINESE INTERNATIONAL CONTRACTORS

Chinese contractual projects have been a relatively new phenomenon in China's involvement in Africa. However, it has taken a giant stride. Compared to direct investment and export of labor, overseas contracting has become a dominant form of international economic collaboration for China. By the end of 2009, the total value of completed Chinese overseas contracts reached \$340.7 billion, 1.5 times that of China's foreign direct investment (\$220 billion) and 5.3 times that of labor export (\$64.8 billion) (Zhang and Pei 2011).

Until 1978, the year that witnessed the start of China's economic reform, there had been no Chinese contractors anywhere in the world, not to mention Africa. What had been characteristic of China's involvement in Africa had been in the name of foreign aid. For a long time, the foreign aid approach by China in Africa was based on ideology rather than economics. In 1963, Chairman Mao Zedong stated, "the people who had achieved victory in their revolution should help those who are seeking their liberation. This is our duty under internationalism." Under Mao's direction, China sponsored various projects in Africa, deploying medical teams to Uganda and Yemen, building The TAZARA Railway that links the Tanzanian port of Dar es Salaam with the town of Kapiri Mposhi in Zambia's Central Province, and erecting the Bandaranaike Memorial International Conference Hall in Sri Lanka.

After embarking on economic reforms, China started to diversify its format of relations with Africa and deviated from foreign aid as the major platform for economic activities in Africa. Foreign direct investment and international contracts have been adopted as alternative economic approaches by China for its projects in Africa. In 1978, the Chinese government approved the set-up of the China State Construction Engineering Corporation (CSCEC), a step toward China's participation in international construction projects through contracts. The next year, the China Road and Bridge Corporation (CRBC) and the China Civil Engineering Construction Corporation (CCECC) were established. The business of these corporations was international contracting. Together with the China National Machinery Exports Corporation, which was founded in 1959 and renamed the China National Imports and Exports Corporation (CMEC) in 1993, CSCEC, CRBC, and CCECC debuted as international contractors.

Zhao (2010) defines the period of 1978 to 1990 as the first stage of China's overseas contracting. During this period, China's four international contractors started business in the Middle East and West Asia. In 1979, China's contractors secured only 36 contracts with a total value of \$50 million. By the end of this period, in 1990, Chinese contractors won new projects worth \$2.5 billion, and about 100 new companies joined the ranks of China's international contractors (Zhao 2010).

During the second stage (1991–2003), Chinese contractors made great progress in winning bids. The 1990s saw the total value of contracts increase three-folds. The momentum carried on through 2003 in which the total value of the new contracts of the year reached \$17.7 billion and the number of China's international contracting firms rose to about 1,500.

The third stage began in 2004. During that year, for the first time, the value of the new Chinese overseas contracts exceeded the \$20 billion mark. On the list of the largest 225

international contractors published in 2012 Engineering News-Records, China owned 52, which comprises 23 percent of the group, more than any other country on the list. It took first place, with 14 percent of the aggregate value of all contracts by the 225 companies (Zhao 2010, 24–27). The scale of the Chinese projects has augmented appreciation, with many of the contractors winning large contracts. China also diversified its contracts. In the past, civil engineering projects were in the majority. Now, Chinese contracts can be found in the areas of oil, electricity, mining, digital communications, environment protection, aerospace, high-speed train, nuclear technology (Diao 2008).

The level of sophistication and complexity of Chinese contracting has also been elevated. Now large contractors are involved in overseas contracts that take forms of BOT (build, operate, and transfer), PPP (public-private partnerships), EPC (engineering, procurement, and construction), or PMC (project management contract).

In 2011, the value of contracts signed in Africa alone reached \$45.77 billion. Chinese companies signed construction contracts worth \$4.4 billion in Angola and \$6.4 billion in Algeria in 2011. While Angola constituted 10 percent of the total value of the Chinese contracts, Algeria reached 14 percent (Chang 2012). There are precedent-setting events. China's largest train manufacturer, China South Locomotive & Rolling Stock (CSR) Corporation Limited, secured a contract worth 400 million U.S. dollars to supply freight electric locomotives to South African logistics firm Transnet. Not too far away, Nigeria signed a contract of \$81.75 million with Hydro China and Harbin Electricity Corporation of China to rehabilitate Kainji Power Station.

Africa is a land of opportunity, but also an area of conflict and uncertainty. Its rich natural resources in minerals, oil, water, and timber are part of the last frontier of the world's heritage. It is the last continent that has yet to catch up with the rest in economic development. In contrast with the enormous potentials of development, or to be direct, money to be made, ethnic violence is inveterate and religious animosity runs rampant from country to country. For the International Monetary Fund (IMF), World Bank, and a number of OECD (Organization for Economic Cooperation and Development) countries, international aid is determined by conformity to certain political and economic standards. For some Western liberal democracies, consideration of the type of political regime in the host country precedes, or at least hinders, economic decisions. China's investment in Africa does not abide by this conditionality, nor does it hinge upon the characteristics of the domestic government of the client country. Still, what determines the variations in China's contractual decisions in Africa is an open question. What are the determinants of China's contractual projects in Africa? What are the contextual characteristics that attract Chinese contractors? This article, as the first analytical and empirical study ever on China's contracts in Africa, intends to find some answers to these questions.

## MODEL SPECIFICATION AND DATA

While no statistical research into the determinants of foreign contracts has been made, many studies have been conducted on what drives foreign direct investment. Political, economic, and social factors have been identified as determinants of capital that flows to other countries to secure foreign assets in order to produce goods or provide services overseas. It would be very interesting to compare the two sets of parameters that define the flows of foreign direct

investment and contracts, respectively. As the first important step, we make some basic discoveries of the patterns of contracts, about which no scholarly work has yet been made.

Foreign direct investment and contracts are coherently and intrinsically related as international economic phenomena and may be driven by the same economic incentives. Conceivably, what affects foreign direct investment may have plausible impact on contracts. Among the variables that have been used in the studies of foreign direct investment are the size of the economy of the recipient country, human capital stock, physical infrastructure, political and economic institutions, political and economic stability, and bilateral relationship between the recipient and investing countries. Two studies on China's outward foreign direct investment (Buckley et al. 2007; Cheung et al. 2012) discuss an array of variables that are particularly of interest to Chinese investors in other countries. In the following, we compare our findings on China's contractual projects with their findings on China's foreign direct investment (FDI).

Our dependent variable is the total value of all the contracts signed by Chinese contractors and their African sponsors. Therefore, the value includes all four kinds of overseas contracts by the Chinese: engineering, labor, design, and consulting. The data on this variable are from the *China Statistical Yearbook* (denoted as Contract in this article). We focus on three categories of variables for independent variables, which largely constitute three hypotheses—macro-economic, politico-sociological, and resource-based perspectives—for exploring determinants of to whom Chinese contracts are granted.

### Standard Economic Factors

In the literature of studies of economic growth, the level of economic development has been considered one of the most important determinants. It has also been adopted as an independent variable in the studies of foreign direct investment. Normally, it is measured through GDP per capita. It has been found that a lower level of initial GDP per capita tends to be associated with a higher level of growth. The impact of this variable on contracts, however, may be ambiguous. Poor nations are in dire need of basic construction. However, relatively well-to-do societies are able to afford large scale, expensive contracts. In addition, as some studies on foreign direct investment point out, high GDP per capita may reflect high wages, and high wages have a negative effect on foreign direct investment. In the case of contracts, Chinese contractors normally bring Chinese workers to the recipient country. Therefore, high domestic wages in the recipient African country should be irrelevant for Chinese contractor. In addition, high GDP per capita may also indicate relatively good physical infrastructures, which should encourage foreign direct investment. However, in our interest, the existing infrastructure may not be an issue for Chinese contractors. Many of them actually go to Africa to build roads, bridges, and rails. In this article, we use real GDP per capita for the year 2005 as an indicator of the level of development, which is denoted as RGDP05. The source of this variable is Penn World Table. In general, we expect the effects on *Contract* of RGDP05 to be ambiguous.

A second related variable is economic growth. This variable usually is represented by the rate of change in GDP per capita and is designated as Growth in this study. A high-growth country attracts foreign investors. A country may be poor, but it may enjoy high economic growth while gradually catching up with others. A persistent high growth phenomenon reflects a general positive environment for economic activities typical of investment-led momentum. China

itself is such an example. As the result of high growth, large contracts tend to be generated by further needs.

Human capital has been considered a factor for foreign direct investment, as it represents the quality of labor. Keeping everything else constant, a country of higher educational attainment tends to attract more foreign direct investment. In the case of a contract, the quality of the domestic labor is irrelevant to the bidding decision of a Chinese contractor, although it might be relevant for a Chinese investor. Whenever labor is concerned, Chinese contractors bring Chinese labor from China to Africa. Human capital accumulation is often indexed by educational attainment, such as the enrollment rate of elementary or secondary education. In this article, we use the average duration of primary school years for the year 2005 as an index (Prim05). For the reason we have discussed above, we do not expect that it has strong impact of education on Contract.

Domestic investment coexists with an investment environment and economic outlook. It has been found that domestic investment and foreign capital inflow go together. While domestic investments—such as investments in ports, rails, and roads—may increase foreign direct investment, the latter may lead to further domestic investment. This article does not study the causality between the two, but hypothesizes that domestic investment signals, in general a positive environment for contracts while recognizing the possibility of a “crowding-out” effect of domestic capital on foreign contracts. Domestic investment is measured by the share of domestic investment in GDP. The source of the data is Penn World Table. The variable is denoted as *CI*.

International trade as a measure of the openness of the economy deserves consideration. An open economy is consistent with project bids for international contractors. International trade may bring foreign currency that can be used to pay for projects undertaken or completed by foreign contractors. In this article, we use the percentage of trade in GDP (*Open*) as a proxy for openness of the economy and expect the sign on the parameter estimate of Openness to be positive.

Inflation may indicate economic uncertainty. It may have negative impact on foreign direct investment, as foreign direct investment is meant to lead to long-term operations in a foreign country. While an international company may sacrifice short-term profits in exchange for long-run growth and profitability, permanent or semipermanent high inflation will make the investment worthless. Mostly, contracts are short-term projects compared to direct investment and, therefore, the impact of inflation on contractors may not be the same. Inflation itself may coexist with high economic activities and with expansion of the money supply; the country may generate demands for projects, and new projects attract contractors. There is more money to spend during inflation than during deflation. Therefore, on the whole, we expect to find a positive effect of inflation on contracts. In this study, we use the rate of change of the GDP price deflator as an indicator for inflation (*Inf*).

We also look at currency exchange rates as a potential determinant. In the case of contracts, the agreement is settled in the U.S. dollar, which contributes to both transactional convenience and price certainty. Chinese contractors may worry more about the exchange rate change between the U.S. dollar and the RMB, rather than between the U.S. dollar and South African rand or Botswana pula. Furthermore, in some African countries, payments were made by natural resources rather than currency. Considering these nuances, we tend to think that currency depreciation may not have a strong effect on contracts. We use the exchange rates data from IMF and calculate the change of the currency exchange rate with the U.S. dollar. Denoted as *Xrate*, it is not expected to have strong impact on Contract.

The full economic model is given as

$$\begin{aligned} \text{Contract}_i = & \beta_0 + \beta_1 \text{RGDP05}_i + \beta_2 \text{Pr im05}_i \\ & + \beta_3 \text{Growth}_i + \beta_4 \text{CI}_i + \beta_5 \text{Open}_i + \beta_6 \text{Inf}_i + \beta_7 \text{Xrate}_i + \varepsilon_i \end{aligned} \quad [1]$$

where the letter  $i$  represents an African country,  $\beta_0 - \beta_7$  are parameter estimates, and  $\varepsilon$  is an error term. *Contract* is the average contract value for the period of 2005 through 2010. *GDPPC* is the value for the year 2005, the beginning of the contract period. Similarly, *Primary* takes the 2005 value. The rest of the independent variables are averages for the period of 2000 through 2004. Cross-section analysis will help us identify aggregate patterns over a number of years. Using initial or lagged independent variables for the period of time when contracts occur significantly reduces endogeneity or reversed causality problems.

### Political Factors

Politics matters in the economic arena. Over the years, a large body of empirical literature has emerged concerning the relationship between political systems and economic development. For instance, scholars have found that a liberal democratic system has an effect on various economic activities, from investment to education, from international trade to foreign investment. In our study of Chinese contracts, however, we are faced with a different scenario compared to cross-country studies of long-run economic phenomena such as economic growth.

China's involvements in contracts, first of all, are relatively short-term events, although the execution of a contract may last several years. Second, more importantly, China may not consider a liberal democratic government a necessary attraction. Rather, pragmatism tends to prevail in bidding on a project; ideology has no place in commercial decisions by Chinese contractors. Third, a liberal democracy may find alternatives through partnerships with Western countries and does not necessarily need Chinese contractors. Finally, some who find Chinese contractors particularly useful cannot get loans or other types of aid from IMF. Instead, they either obtain loans from China or use natural resources as leverage. China does not follow the "conditionality" demanded by the IMF, World Bank, regional development banks, and some OCED countries. Countries that cannot get IMF aid or Western help tend not to be liberal democracies. In such cases, the type of regime of an African country may be a determinant for Chinese contracts: those that are not liberal democracies tend to draw Chinese contractors who can win bids, keeping all other factors constant.

As a basic probe of the effect of the political system on Chinese contracts, we use the Political Rights from Freedom House. The Freedom House scores nations on two separate seven-point scales measuring their levels of political rights and civil liberties.<sup>2</sup> In terms of political rights, those countries rated one come closest to political democracy, while seven indicates the complete opposite of a democracy. Under Freedom House's criteria of democracy, elections are held freely, fairly, and competitively, and opposition parties play an important role in the checks and balances of power. If a country holds national elections to determine the formation of a government but opposition parties play no important roles or are prevented from being substantial political competition, the country is not considered a "free" country in the dataset. Accordingly, it will not be ranked high in political rights (that is, it will not receive a lower score).<sup>3</sup> States that receive a score of two are still regarded as free, though political violence, discrimination against

minorities, military intervention, and political corruption all occasionally impair political rights. Countries receiving a score between three and five are considered “partly free.” They bear the same negative factors that hold for countries scoring two, plus other forms of political abuse, such as civil war, extensive military intervention in politics, the existence of a strong royal influence, unfair elections, or the domination of a single party. Countries that receive a score of six or seven are considered “unfree.” According to Freedom House, these states are likely to be ruled by a single party, military dictatorships, autocrats, or theocracies.<sup>4</sup>

We convert the seven-point scale into a range of zero to one, with one indicating the highest freedom and zero no freedom under Freedom House’s standard. For the reason we discussed above, we expect PR to have a negative effect on Chinese contracts.

Researchers have developed, over the years, political variables, such as the processes of political competition and the rights of political opposition, that do not necessarily focus on the obvious elements of a liberal democracy. Rather, they stay away from defining and measuring political democracy, but work on the quality of the governance of a country. For instance, a recently edited book (Kugler and Tammen 2012) measures a government’s capacity through its ability to obtain resources from society, to mobilize the nation, and to allocate resources for economic development. The range of government capacity—from low to high—may apply to all kinds of governments. In the literature, the concept and measurement of the quality of a government have been frequently adopted (Kaufman and Zoido-Lobaton 1999). This variable has six dimensions:

1. voice, political freedom, and civil liberties;
2. political instability, terrorism, and violence;
3. the rule of law, crime, contract enforcement and property rights;
4. The level of graft and corruption in public and private institutions;
5. the extent of regulations and market openness, including tariffs and import controls;
6. measures of government effectiveness and efficiency.

In their efforts to measure governance rather than focusing entirely on freedoms and rights, Kaufman and Zoido-Lobaton (1999) also include stability, rule of law, economic openness, and government efficacy. Driven by market incentives, contractors will bid for projects where working-market conditions exist. Political instability, such as war, would make contracts difficult, if not impossible; corruptions would raise the costs of contracts; lack of contract enforcement would make contract value less attractive. Chinese contractors, like any others, would prefer to undertake contracts in an auspicious governance environment. These six variables are highly correlated; including all of them in a multivariate analysis results in multicollinearity problems.

In this article, following Gliberman and Shapiro (2002), we use the first principal component of the six dimensions to measure the quality of governance. We expect this variable—denoted as *GOV*—to have a positive impact on *Contract*. The original data are from the World Bank. We calculate the first component of the six variables through a principal component procedure. In the political model, we also consider whether China has a diplomatic relationship with an African country as a determinant. The literature shows that countries that experience hostile relations do not work well as economic partners. We expect that not having diplomatic relations will have a negative effect on Chinese contracts. Taiwan has been said to adopt a money-based diplomacy, providing financial and monetary support in order to keep the few countries that still recognize Taiwan’s sovereignty and sustain diplomatic relations with Taiwan. Mainland China,

with its status as a UN Security Council standing member and a rising economic superpower, would by itself hold great attraction for the countries that waver between Mainland China and Taiwan, such as Chad and Senegal, both of which deserted Taiwan. When China denies benefits to the countries that maintain diplomatic relations with Taiwan, it may serve a punishment. In the data set, five African countries did not have diplomatic connections with China at the time of the 2006 Beijing Summit of FACOC: Burkina Faso, Gambia, Malawi, Sao Tome and Principe, and Swaziland. In this article, a dummy variable is created with a value of one for those five countries that do not have diplomatic relations with China. This variable is denoted as *Taiwan*. We expect this variable to take a negative sign. Keeping everything constant, a country that has diplomatic relations with Taiwan will see few Chinese contractors bidding and winning contracts.

Likewise, we expect those African countries that have a strong tradition of goodwill toward China to gain contracts more than others, keeping everything else constant. Goodwill or friendship is a qualitative variable. We examine historical events to identify these traditionally friendly African countries. In particular, we use several benchmarks. First, ten African countries received a high-level Chinese delegation headed by Premier Zhou Enlai and Foreign Minister Chen Yi from December 13, 1963, to February 5, 1964. This was the first major visit by the Chinese government to Africa. Over the years, China has sent medical teams to selected African countries. These countries have been among the strong supporters of China and have helped China maintain its seat at the United Nations. We examined the composition of these countries over the years. Particularly, we chose three milestones: October 1971, the year in which the People’s Republic of China replaced the Republic of China in the United Nations; September 1976, the year in which Mao Zedong died; and July 1978, the year in which Chinese economic reform started. During these years, China sent medical teams to 9, 22, and 27 African countries, respectively. We create a qualitative variable, assigning one to those who were on the lists of all four events and zero otherwise. We name this variable *Friendship* and expect it to have a positive effect on Chinese contracts.

In sum, our political model of contract is as follows:

$$\begin{aligned}
 Contract_i = & \beta_8 + \beta_9 PR_i + \beta_{10} GOV_i + \beta_{11} Taiwan_i \\
 & + \beta_{12} Friendship_i + \partial_i
 \end{aligned}
 \tag{2}$$

Again, *Contract* takes the average value for the period of 2005–2010; *PR* takes the average of 2000 through 2004, and *Taiwan* and *Friendship* take the value as noted.

### Resource-Based Factors

In the particular case of Africa, one potential determinant of contracts is natural resources, including oil and minerals. These resources are the kind of strategic materials that any rising powers cannot do without. By 1993, China switched from an oil-exporting country to an oil-importing country. Currently, China is the second largest oil consumer, following the United States. It was predicted that by 2020, China could surpass the United States as the largest oil consumer in the world (Yergin 2010). China is also the largest steel-producing country in the world, with an output over 683 million tones, three times more than the combination of the outputs of second- place Japan and third-place United States. China has a long way to go with its internally driven development through urbanization. Currently, China’s urbanization is only

about 50 percent. Even an increase by 1 percent of its people moving to or living in the newly created urban areas means grand scale construction, which requires energy and raw materials. China naturally would make efforts to maintain a strategic partnership with those countries abundant with oil, minerals, timber, or other materials needed for China's sustainable economic development and create a constructive political environment for economic cooperation. Such government-to-government relations would be auspicious for China's contractors who tend to be owned by the government. In addition, the recipient countries abundant with natural resources are in a position to leverage their natural endowment to sponsor the projects by foreign contractors. In terms of model specification, we expect a positive relationship between natural resources and the value of contracts. In this article, we include three variables to analyze the relationship between natural resources and Chinese contracts.

The first is the net output value of mining and quarrying, which is the value added in mining and quarrying, defined as the value of output of mining and quarrying industries less the value of intermediate consumption (intermediate inputs). The data are from the World Bank. It is denoted as Mining in this study. It would be desirable to decompose mining and quarrying products into some subcategories, such as ferrous and nonferrous, but subdivisions of the data on mining and quarrying are not available.

The second is the rent by the government of natural resources. Total natural resource rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents. The data are from the World Bank. The symbol for this variable in the article is Rent. The third variable is the reserve of oil of the country and is denoted as Oil. The value is denominated in millions of barrels, and the source of the data is CIA's *World Factbook*.<sup>5</sup> We expect all three variables to have a positive influence on the amount of the values in the Chinese contracts.

Finally, we add a variable that takes into consideration China's thrust into green technology. In 2010, China became the world's largest wind energy provider. The country has also been steadily producing solar power products. The development and use of nonfossil energy has increasingly and urgently become a national priority. In Africa, a group of countries holds regular gatherings to coordinate their need for power; the East Africa Power Pool (EAPP) held its sixteenth—and last—steering committee meeting in conjunction with its fifth ministerial meeting in Ethiopia. The eight members of the group visited Ethiopia's Adama wind power project constructed by two Chinese teams that leveraged their experience in green technology. It can be expected that African countries that are conscious of energy and the environment may have similar agendas and needs that match Chinese contractors. In this article, a dummy variable is created for those eight African countries under the name "Power." It is expected that Power will take a positive sign. Keeping everything else constant, these countries, which share the same need for power, will get more Chinese contracts than others.

The resource-based model is summarized as follows:

$$\begin{aligned} Contract_i = & \beta_{12} + \beta_{13}Rent + \beta_{14}Mining_i + \beta_{15}Oil_i \\ & + \beta_{16}Power_i + \epsilon_i \end{aligned} \quad [3]$$

Again, *Contract* takes the average value for the period of 2005–2010; the rest take the average of 2000 through 2004, except as noted otherwise. By using an aggregate approach, we focus on the long-run and secular trends of China's contractual projects in Africa without having to deal with the short-term changes. The estimation method for this aggregate mode is Ordinary Least Squares (OLS).<sup>6</sup>

A full model will incorporate the economic, political, and resource-based models, including all the independent variables on the right hand side of the equation.

## STATISTICAL RESULTS

### Bivariate Statistics

First, we will examine some bivariate statistics in Table 1. *Contract* is moderately correlated with two economic variables: negatively correlated with initial education but positively correlated with initial level of development. *Contract* is strongly, or fairly strongly, correlated with resource variables, all positively: 0.60 with rent, 0.71 with mining and 0.72 with oil reserve. Its correlation with political right is negative at  $-0.32$ . These bivariate results are consistent with most of our theoretical expectations, particularly in the resource-based model.

In terms of levels of development, GDP per capita for 2004 is correlated with economic growth, trade, and investment for the period of 2000 through 2004. Higher growth, higher trade ratio to GDP, and higher ratio of investment in GDP are associated with a higher level of GDP per capita. Two out of the three resource variables—rent and oil reserve—are also positively related to GDP per capita.

Education is moderately correlated with political rights and governance in a positive direction, but negatively correlated with rent. For the countries that receive more rent from natural resources, ironically, the level of education measured by primary school enrollments tends to be less.

Growth is positively correlated with GDP per capita, as mentioned above. It is also positively corrected with trade and investment, confirming the empirical literature on determinants of economic growth. It is also positively correlated with the rent from natural resources.

Investment is also strongly correlated with trade, in addition to growth. Interestingly, it is positively correlated with two political variables. More investment tends to occur in freer countries and in better-governed nations, although the correlation between investment and political rights is weaker (0.31) than that between investment and governance (0.44).

In addition to its correlations with economic variables, trade is positively correlated with rent at 0.36. Inflation is weakly correlated with all variables except oil reserve ( $-0.45$ ). Countries with large oil reserves tend to have lower inflation. Similarly, exchange rate changes are not highly correlated with any variable except governance, with a correlation of  $-0.32$ . Better-governed economies have less currency devaluation.

Political rights is highly and positively correlated with the quality of governance at 0.81, which should not be too surprising, as one component of the governance index is political rights. Political rights is also positively correlated with education and trade, but negatively correlated with contract, as was discussed earlier.

The high correlation between political rights and governance quality, however, does not guarantee that they are correlated with other variables in the same direction or with the same strength. For instance, while contract is negatively correlated with political rights, it is positively correlated with governance at 0.60, which is quite high. While political rights is positively correlated with education, governance is negatively correlated with education.

All three resources variables are positively correlated in the range of 0.38 to 0.49. The fact that they are not highly correlated will benefit our multivariate test, as rent, mining, and oil



reserves represent different kinds of, although related, resource-based revenue, or potential revenue.

### Multivariate Analysis

Through multivariate regression reported in Table 2, we test the various hypotheses about the Chinese contracts in Africa. Understanding problems associated with potentially biased results due to the exclusions of relevant variables, we run the three models separately before using an integrative model that includes all variables in the three separate models. First, from the economic model, only two variables are statistically significant. While GDP per capita has a positive effect on *Contract*, the education variable has negative impact on *Contract*. The predicative power of the model is weak. The adjusted R square stands only at 0.13. Without controlling for other important variables, such as political and resource-based factors, the results from the economic model may not be very meaningful.

Out of the political model, the signs of the parameter estimates are as expected. Political rights has a negative effect on Chinese contracts, confirming our discussion that Chinese contractors tend to get contracts from countries where liberal democracy does not exist. However, this result should not be interpreted exclusively as China's political support for dictatorship. First, those African countries that are not democracies may not get the financial collaboration they need from liberal Western democracies, and contracts from any country will be welcome. Second, China has been known for not getting politically involved in the domestic conflicts of other countries; its commercial or economic activities in those countries do not necessarily underscore any political message. Two studies on China's outward direct foreign investment have found that the Chinese investors tend to be "attracted" to high political risk countries (Buckley 2007; Cheung 2012). This enigmatic outcome can be explained by our findings. Liberal democracies are highly correlated with low political risks. Our finding that China's contractors tend not to go to a liberal democracy is consistent with the earlier studies on China's FDI. It is not that Chinese contractors enjoy working with dictatorship or countries of high political risks, but they go where their bids are made and accepted.

The governance indicator takes an expected positive sign, but it is not statistically significant. The friendship variable is positive and statistically significant. The positive sign is consistent with earlier findings about the effect of governance on foreign direct investment (Globerman and Shapiro 2002, 2003).

The countries that historically and consistently have received China's attention through state visits or medical teams are expected to have Chinese contractors. This result may simply reflect the fact that China has been familiar with those countries and it is easy to do business there because of the knowledge of the country. It may also, of course, reflect the positive relations and good will between China and the African country. Although the political model produces expected signs for its political variables, the goodness of fit is poor. The adjusted R square is only 0.13, which is close to the goodness of fit of the economic model of 0.13 also.

The most promising model of the three is the resource-based model. This model not only produces significant parameter estimates with expected signs for all four variables, but it has also a very high adjusted R square in this cross-section multivariate procedure. The adjusted R square is about 0.75, which is a 4.8 times improvement over the political model or the economic model.

TABLE 2  
Regression Results

	<i>Model 1</i> <i>Economic Model</i>	<i>Model 2</i> <i>Political Model</i>	<i>Model 3</i> <i>Resource Model</i>	<i>Model 4</i> <i>Full Model</i>
<i>Constant</i>	378800** (183297)	136938* (52287)	4689.825 (5005.409)	89891 (96029)
<i>Rgdp05</i>	10.041** (4.417)			-6.906* (2.252)
<i>Prim05</i>	-51455** (30407)			-13567 (15095)
<i>Growth</i>	359654 (352796)			138975 (108227)
<i>CI</i>	-1645.219 (1769.113)			513.923 (649.509)
<i>Open</i>	-182.436 (507.004)			386.802** (218.957)
<i>Inf</i>	-106265 (414727)			554001* (147935)
<i>Xrate</i>	29612 (24572)			11703 (11372)
<i>PR</i>		-186969** (110067)		-58528** (31165)
<i>GOV</i>		21791 (25612)		18827** (9354.421)
<i>Taiwan</i>		-46286* (19025)		-24495*** (15164)
<i>Friendship</i>		110042*** (85533)		50233** (29163)
<i>Rent</i>			1615.034** (737.929)	901.512** (428.017)
<i>Mining</i>			133.416* (37.948)	113.700* (30.105)
<i>Oil</i>			5.010* (0.899)	8.692* (1.057)
<i>Power</i>			53983** (28737)	75145* (16443)
$R^2$	0.133	0.130	0.745	<b>0.834</b>
$\sigma$	97308	97509	52781	42581
N	53	53	53	53

\*significant at the 0.01 level; \*\*significant at 0.05 level; \*\*\*significant at 0.10 level, all at one tail.  
Standard error in the parentheses.

The standard error of the regression of the resource-based model is 52,781, down from the 97,509 of the political model and 97,308 of the economic model, which reduces the standard errors of the regression by the economic model and political model by about 46 percent. This significant reduction in the standard error of the regression and appreciable increase in the goodness of fit of the model are both very satisfactory. Oil reserve, products in the mining sector, and the rent from natural resources are all positive indicators for the Chinese contractors bidding and securing contracts in Africa. Being in the East African Power Pool group and being keen on alternative power generation, such as wind power, also are positively related to China's contracts.

Finally, we include in the multivariate regression all the variables from the three separate models. The result is an improvement for all of them. Now the adjusted R square, as a measure of goodness of fit, reaches 0.834, and the standard of error for the regression decreases to 42,581, representing an improvement over the resource-based model by 12 percent for the former and 19 percent for the latter. Given the nature of multivariate regression on cross-section data, the predictive power of the full model is strong. Most of the individual variables have both the expected signs and are statistically significant. All four resource-based variables have positive effects on China's contracts and are statistically significant, particularly oil reserves and mining.

After controlling for resource and economic variables, all four political variables exhibit expected directions of impact and are statistically significant. Keeping all other factors constant, we find that being a liberal democracy in Africa does not tend to attract Chinese contractors. Keeping the political system and other variables the same, a country with good governance is more likely to get Chinese contracts than a country with poor governance. This joint effect of democracy and governance confirms the previous findings of politics on FDI (Buckley et al. 2007; Cheung et al. 2012; Globerman and Shapiro 2002, 2003).

Those countries that have diplomatic relations with Taiwan have lower contract values than those that have diplomatic relations with the People's Republic of China. This observation can stem from two different perspectives. Those pro-Taiwan African countries may not want to open their markets to Chinese contractors in the first place, and Chinese contractors do not typically go to those countries for contracts. It is evident that the money diplomacy theory does not receive strong support in the data, as we do not find that contract values are higher for those countries maintaining diplomatic relations with Taiwan. By contract, the African countries that have been consistently on the list of China's most-favored African nations do receive a larger portion of China's contractual work, keeping all other variables constant.

Among economic variables in the full model, initial GDP per capita remains statistically significant, although its sign now turns negative. Given the resources and political institutions, a poor African country is more likely to have Chinese contractors than a rich African country. International trade has a positive impact on Chinese contracts. A more open economy tends to have more Chinese contracts. In this study, we do not test the relationship between openness and overall contracts, namely contracts with all countries. However, we believe that being an open economy is consistent with opening contracts for international bidding.

Inflation is found to have a positive effect on Chinese contracts. This is an interesting result. Often, inflation is the result of the increase in money supply. When a nation is abundant with capital through borrowing or possession, it has a greater demand for projects. The data are consistent with this observation. Keeping everything else constant, inflation is positively related to Chinese contracts.

Currency value changes do not affect Chinese contracts in the data. This finding may result from two scenarios. First, the contract value is denominated in the U.S. dollar, and the price has been negotiated and settled ahead of the project. Second, the payment for some projects is through the domestic raw material, the value of which is against currency depreciation. “Sometimes, African or Middle-eastern countries abundant with natural resources pay for the costs of the projects undertaken by Chinese contractors with metals, minerals, oil or natural gas ... namely, exchange of projects for resources” (Zhang and Pei 2011, 20). Therefore, currency depreciation in African countries may have little impact on Chinese contracts, which the data support.

The effect of economic growth on *Contract* is almost marginally significant at the 10 percent level and is positive, as expected. Chinese contractors tend to go relatively fast growing African countries. The share of domestic investment in GDP has a positive sign, but is not statistically significant. The education level is not statistically significant. As mentioned, Chinese contractors may not directly base their decisions for projects on the level of human capital of the African country, as they will bring labor from China.

## A Profile Analysis

What kind of African countries tend to have Chinese contractors? In our regression analysis, we have found some variables highly significant while others are not. Next in Table 3, we examine the standardized coefficients to determine the relative importance of these variables. As they refer to how many standard deviations a dependent variable will change, given a standard deviation increase in the independent variable, their units are in percentages. The calculation of the standardized coefficients shows the following results for the independent variables in the full model.

Of all the independent variables, the most *important* ones are—in the order of magnitude of the absolute value—as follows: Oil Reserve (0.692), Mining (0.358), Inflation (0.284), Real

TABLE 3  
Importance of the Determinants

<i>Intercept</i>	0
<b>GDP per Capita</b>	<b>-0.268</b>
Primary school enrollment	-0.076
Growth rate of GDP per capita	0.059
Investment share of GDP	0.057
Trade share of GDP	0.147
<b>Inflation</b>	<b>0.284</b>
Currency depreciation	0.059
Political rights	-0.127
Quality of governance	0.176
Diplomatic relations with Taiwan	-0.063
Historical friendship	0.128
Rent from natural resources	0.147
<b>Value added in mining industry</b>	<b>0.358</b>
<b>Oil reserve</b>	<b>0.692</b>
<b>East Africa power pool (Wind)</b>	<b>0.260</b>

GDP per capita (-0.268), and the selected members in the East Africa Power Group (0.260). The standardized coefficients for the rest are below 0.2 in the absolute value.

The typical countries that use Chinese contractors tend to be rich and abundant in oil reserves, active and busy in the mining industry, concerned about power and interested in alternative energies, relatively low in living standards, and experiencing inflation. Using the combined score of the five important variables, our top five African countries are Libya, Nigeria, Algeria, Angola, and the Sudan. Furthermore, they are, as expected, Chinese contractors' top five countries in Africa. The order, however, is not the same: Angola, Algeria, Libya, Nigeria, and the Sudan.

Other results in the multivariate regression also identify other tributes of the African countries where Chinese contractors go. These determinants may not be as important as the five above, but they can be critical as they represent some underlying structure of the country's political and economic institutions. Keeping everything else constant, and in addition to the resource endowments, these African countries also tend to have the following traits: they are not liberal democracies, they have relatively good governance, they have an open economy, and they have been friendly with China traditionally.

### CONCLUDING REMARKS

Chinese contractors take a leading role in China's international strategy of "going global." As the largest overseas market for Chinese contractors, Africa offers important opportunities for China. The continent is known for its abundant natural resources, including petroleum, precious metals, minerals, and timber. Despite abundant natural endowments, the continent is lacking in economic development and basic infrastructure. In recent years, the continent has registered relatively high economic growth, with one-third of the countries enjoying an annual growth rate above six percent. While it is not within the scope of this work to ascertain the exact contribution of China's, or any other country's, contractors to the economy of the continent, it can be concluded qualitatively that foreign contracts, like foreign direct investment, are conducive to economic growth. Over the years, the shortage in capital, human and physical, has constrained the development goals of African countries. On the other side of the equator, China has made great strides in its economic reform, successfully emerging as the second largest economy of the world and poised to take over as the largest during the next few decades, according to a growing number of confident forecasts. Its achievements in infrastructure construction—bridges, roads, highways, railroad, ports, airports, and so forth—give it advantages in competing for overseas contracting projects. Its experienced, but inexpensive, labor makes the cost of construction appealing.

Africa is a good match for the Chinese contractors because China is good at many infrastructure projects badly needed in Africa. China is a good match for some African countries because China is the only option for some countries that have failed to get support from the IMF, World Bank and Western nations. Some African governments may give China's contractor a boost because of China's foreign policy of noninterference and respect for sovereignty. China's contractors may find projects in African nations that have maintained a friendly relation with China in the past, but ideology is not likely to be a guiding principle for Chinese contractors. The African countries that have natural resources—petroleum, iron ore, gold, diamonds, and

natural gas—not only means to pay for the projects but also possess commodities direly needed for China’s economic development.

While China’s contractors may not pay attention to ideology, they do attach importance to political risk and stability in the hosting countries. The data analysis indicates that Chinese projects tend to take place in countries under good governance. On the one hand, nations with good governance tend to focus on economic development, thus creating economic opportunities. On the other hand, contractors would like to commence and complete their projects in a stable environment. What happened in Libya should offer some very useful lessons to the Chinese contractors. Libya’s wealth of oil is very attractive, but political uncertainty may underwrite financial losses, as the withdrawal of Chinese contractors has recently shown. Recently, as Diao Chunhe, chairman of China’s Overseas Contractors’ Association, pointed out, “we have to pay attention to political and financial risks. Most of our projects are now in Asian and African developing countries. Some of them do not have stable political and economic environment. Operation there is not conventional and risks are substantially larger” (Diao 2008, 27).

Going Global is a major component of China’s current economic strategy. China has benefited immensely from the liberalization of global markets. For the last thirty years of its economic reform, China’s economic growth has been boosted through two major channels—its exports of products to and its imports of capital from other countries. For the next thirty years, China will increasingly invest in other countries. The world will find more and more Chinese capital and labor integrated in the domestic markets. What we see today in Africa about Chinese contractors represents China’s “going global” strategy, which entails a dynamic process through which international economic and political order may redefine itself.

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## NOTES

1. Labor export in this article refers to the employment of Chinese labor in other countries by the local employers.

2. The following description is based on Freedom House, “Survey Methodology,” *Freedom Review* 28 (1997): 8–11.

3. A prime example is Singapore—it has elections, but the role played by opposition parties is minimal. In every election held since the inception of the city-state in 1965, the People’s Action Party (PAP) has overwhelmingly won national office. The score of political rights for Singapore has been typically four or five on the seven-point scale (seven indicating the most unfree).

4. The difference between “partly free” and “unfree” nations lies in the minimal freedoms that citizens in the former category possess, such as the right to organize national political parties and to compete in national elections. The difference between countries designated six and seven also lies in whether local governments are elected competitively and whether minorities have some political autonomy. For those countries that fall in the “seven” category, even these limited freedoms are nonexistent or extreme political violence prevails.

5. In the original data, Niger has a missing value for reserve. However, data from another source on the internet estimates Niger to have a reserve of 650 million barrels, which is used in this paper.
6. Because we do not use time-series in our cross-sections of fifty-three African countries, we do not face typical potential problems associated with time-series data and do not employ tests or corrections as required for such problems, including serial correlations and nonstationary time series.

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APPENDIX: COUNTRIES IN THE DATA

APPENDIX

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ALG	Algeria
ANG	Angola
BEN	Benin
BOT	Botswana
BFO	Burkina Faso
BUI	Burundi
CAO	Cameroon
CAP	Cape Verde

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(Continued)

APPENDIX  
Continued

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CEN	Central African Republic
CHA	Chad
COM	Comoros
ZAR	Congo, Dem. Rep.
COG	Congo, Rep.
CIV	Côte d'Ivoire
DJI	Djibouti
EGY	Egypt
EQG	Equatorial Guinea
ERI	Eritrea
ETI	Ethiopia
GAB	Gabon
GAM	Gambia
GHA	Ghana
GUI	Guinea
GNB	Guinea-Bissau
KEN	Kenya
LES	Lesotho
LBR	Liberia
LIB	Libya
MAG	Madagascar
MAW	Malawi
MLI	Mali
MAA	Mauritania
MAS	Mauritius
MOR	Morocco
MZM	Mozambique
NAM	Namibia
NIR	Niger
NIG	Nigeria
RWA	Rwanda
STP	Sao Tome & Principe
SEN	Senegal
SYC	Seychelles
SIE	Sierra Leone
SOM	Somalia
SAF	South Africa
SUD	Sudan
SWA	Swaziland
TAZ	Tanzania
TOG	Togo
TUN	Tunisia
UGA	Uganda
ZAM	Zambia
ZIM	Zimbabwe

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