Input Source Allocation in Foreign Direct Investments with Expropriation Risk: China in Africa

by

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Abstract

China is now a major source of foreign direct investment (FDI) in Africa. Unlike FDI from other nations, much of the investment by Chinese firms involves hiring a large proportion of workers from the investing country. This paper examines if this pattern of using Chinese workers is a logical response to the possibility that the host nation might expropriate if the investment could be operated with just domestic workers. This paper models the incentives of Chinese firms to invest and a host country's incentives to expropriate investment. An investment will not be expropriated if Chinese management is sufficiently productive that domestic low skill workers earn a substantial income. The use of Chinese workers is effective in preventing expropriation if most of them leave in the event of expropriation. The use of Chinese workers is not effective, if they generate tensions which increase the probability of expropriation.

Special Thanks

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1. Introduction

It is nothing new to say that China is commanding a greater presence in the international investment marketplace. However, China has taken a notably strong position towards Africa, making it clear that the continent is a target for China's foreign direct investment (FDI) interests. Although Africa has long been a cradle of Western economy FDI, the relative decline in interest from these economies in the continent has given China a greater opportunity to enter. It is clear upon entry to host countries, the manner in which the Chinese conduct FDI is different.

The relative share of FDI in Africa generated by China and other developing countries has been on a clear increase while developed countries have decreased their interest in the region. According to the 2015 World Investment Report, developed countries such as France and the United Kingdom continue to divest from Africa though strong demand from developing countries ensure swift transitions in ownership of the assets. From 2013 to 2014, announced Chinese greenfield FDI in Africa went from $289 million to $6.132 billion (United Nations, 2015). Actual investment for the first half of 2015 totalled only $568 million according to fDi Markets. Compared to the year prior, Chinese investment in extractive, raw materials industries doubled in the region (Klasa, 2015).

One of the most fitting and current examples of the growing Sino-African trade relationship is the announcement in December 2015 at the Forum on China-Africa Cooperation (FOCAC) of US$60 billion in Chinese-backed funding to be invested in Africa over three years. This is triple the value of the contribution China made in 2012 of US$20 billion, at a time when concerns about growth in China's domestic economy mount. Financing pledges at previous FOCAC meetings totaled US$10 billion and US$5 billion in 2009 and 2006 respectively. The composition of 2015's sum is US$5 billion in grants and interest free loans, US$35 billion in

concessional loans and US$20 billion in commercial financing (Sun, 2015). The value of the financial commitment reflects China's confidence in and commitment to Africa as a destination for investment.

Chinese FDI in Africa is characterized uniquely in terms of where and how it occurs. China has a keen interest in Africa's resource endowment to fuel the growing Chinese economy. From the onset of this investment trend, there has been a strong focus on the primary sector such as resource extraction and mining, as well as the secondary sector as many projects are in textiles, machinery, foodstuffs, transportation and plastics manufacturing. Infrastructure projects are also plentiful, such as the recently completed US$475 million Addis Ababa Light Rail train in Ethiopia, managed by state-owned China Railway Group Ltd and funded by the Export-Import Bank of China (Yewondwossen, 2015). As Chinese FDI becomes more established, a greater presence of projects in the service sector is seen. In fact, from 1998 to 2012, Chen, Dollar and Tang (2015) reported that of the 3,220 projects investigated, 2,285 were in the business service, wholesale and retail, and export and import service industries. However, service-sector projects tend to be much smaller than primary or secondary sector projects.

Africa's persistent label as a risky continent appears to have a lesser effect on Chinese FDI as a lower degree of risk aversion is seen. China is attracted to resource-rich African countries as are Western investors. Unlike Western investment however, China is much less discriminant with regard to the extent of property rights and rule of law. It is found that China has similar shares of investment in strong and weak governance environments. As such, its share of FDI in politically risky countries is higher relative to Western investment (Chen, Dollar & Tang, 2015). In support of this claim, Chinese FDI is "associated with high levels of political risk in, and cultural proximity to, host countries throughout" (Buckley, Clegg, Cross, Liu, Voss

& Zheng, 2007). Risk can also include financial risk, such as exchange rate and interest rate volatility and counterparty risk. As the focus of this paper is on expropriation, political risk is of greater importance for current purposes. Expropriation is an extreme consequence of political risk. According to Hajzler & Rosborough (2016), 162 expropriation acts occurred from 1990-2014 in 44 countries, several of which in Africa. It occurs primarily in resource-based industries such as mining and petroleum. An upward trend has been seen, with two acts in 1990 increasing to 20 in 2011, although the number has decreased to seven in 2014. To the Chinese firm in Africa, expropriation is a legitimate concern.

Despite the presence of risk, Chinese investment in Africa is long-term and relationship-based in nature. Duanmu (2014) finds that healthy relations between China and the host country reduces political risk. While China stands to benefit greatly from the FDI output, Chinese President Hu Jintao used language like “sincere friendship,” “reciprocal benefit” and “win-win cooperation” to frame the trade relationship in a mutually beneficial way at a visit to Cameroon in 2007 (Khan & Baye, 2008). African leaders view China as an acceptable trade partner because of China’s policy of non-interference in other states’ affairs. However, others describe the relationship in less congenial terms but still acknowledge its necessity, such as when workers in Namibia were told by officials to “suffer now so future generations can enjoy” (Otieno, Turana & Mayanja, 2010).

Labour usage in Chinese FDI projects has become a contentious issue that has drawn much scrutiny. Although workers for foreign-owned projects in Africa receive wages that are 10 - 40% higher than those in the host country, there are questions surrounding the number of host country workers actually employed (te Velde, 2003). Many claim that Chinese workers are used in a seemingly high proportion. There are several notable cases of projects where China has

employed a high number of Chinese workers relative to host country workers. Some of the most drastic cases come from Angola. In 2010, the Luanda stadium used 700 Chinese workers and only 250 Angolans to construct. The Benguela Railway rehabilitation project, also in Angola, required 300 Chinese workers and 300 local workers. The China International Trust and Investment Corporation (CITIC) employed 10,000 Chinese workers and 5,000 Angolan workers as part the Kilamba Kiaxi social housing project. Other countries have experienced similar situations. In Mozambique, a stadium was constructed with labour in a ratio of one Chinese worker for every two local workers (*Data: Chinese workers in Africa,* 2016).

The combination of a drastic increase in Chinese interest and financial commitment to Africa, a higher risk tolerance exhibited and a theme of relatively high employment of Chinese labour lacks a proper explanation. While the trend is fairly recent, understanding the rationale behind the behavior is imperative if action is to be taken.

This paper will assess the theoretical motivations and rationale behind the effects of foreign labour usage in Chinese FDI in Africa. As well, it will discuss the incentives behind and conditions for the usage of foreign and domestic inputs in Chinese foreign direct investments in Africa facing the risk of expropriation.

2. Literature Review

The literature on FDI is extensive and spans decades. Expropriation is also a well researched topic as the issue has plagued firms around the world for some time. Phillip an de Meulen (2011) considers FDI that is susceptible to expropriation and assesses the labour skill differential in FDI projects resulting in productivity and wage premiums in less developed countries. He argues that high-skilled workers benefit from FDI and that expropriation risk

decreases when more high skill workers are employed. This model will provide a structural basis for the model in this paper, although this paper's model differs in several ways. The model in an de Meulen's paper is explicitly based in macroeconomics, while this paper will adapt it to the situation of a firm entering Africa by introducing new variables. As well, this model does not assume that all labour is domestic; it will allow for Chinese labour and model the payoffs and expropriation conditions for China and the host country in both domestic and foreign labour situations.

Eaton and Gersovitz (1984) analyze the utility maximizing behaviour of investing firms and host governments with an incentive to expropriate. The firms change their production behaviour to reduce this risk depending on factors such as the number of competitors and the penalty imposed after expropriation. It is also noted that firms can alter the technology of their capital in such a way to make it less workable for the host country, thereby reducing expropriation risk. Varying levels of competition in the host market are considered and the effects on expropriation risk change accordingly.

Among many other papers on the topic, Thomas & Worrall (1994) discusses the contracting problem between the investing firm and the host country that has conflicting incentives to both expropriate and develop long-term trade relationships and finds that initially investment is underprovided but would increase over time. Incomplete information about a multinational enterprise's technology may induce expropriation at a certain probability argues Raff (1992), claiming that countries are better off if they commit to not expropriating. A model of FDI, risk and aid was developed by Asiedu, Jin & Nandwa (2009) to demonstrate that the threat of expropriation leads to underinvestment, but aid mitigates the adverse effect of expropriation risk on FDI.

There is a gap in the research with regard to the issue of Chinese employment of foreign inputs in a FDI project that faces expropriation risk. Previous literature has not fully analyzed the motivations and impacts of this trend. As such, the principal contributions this paper intends to make are to develop a new model and apply it to the situation of Chinese FDI in Africa. By adding emphasis to the breakdown of labour between foreign and domestic sources, greater attention can be paid to the incentives behind their use as well as the conditions for expropriation.

3. Model

3.1 Modelling the Chinese Firm in Africa: Background Assumptions

The following model will outline a scenario where a Chinese firm enters a country in Africa to produce output as part of a contractual foreign direct investment arrangement. The aim is to show how inputs to production and the distribution of output affect the incentives for the host country to expropriate.

The Chinese firm will, prior to entry, negotiate with the host government to establish a contract which permits the Chinese firm to enter the country, investing a fixed amount of capital to produce output in exchange for some fixed level of employment of host country workers. There are no taxes or direct lump-sum transfers in this model. The Chinese firm will provide a benefit through wages to the host country workers by giving them employment at a wage higher than they would receive in the host economy. That is, the wage the Chinese pay is higher than the opportunity cost wage. This is reflected in the literature cited previously, stating that foreign owned projects in Africa pay higher wages. The labour force for the firm is segmented into two distinct roles. It is useful to describe these roles as corresponding to high and low-skilled

workers, where high-skilled workers conduct work at a higher, more complex level and low-skilled workers conduct general, manual tasks. The contract will specify the wages that will be paid to the high and low-skilled workers, which will remain constant throughout the production period. The promised wages could be of any value above the domestic opportunity cost of labour up to the marginal product of labour. In my analysis, I concentrate of the case where host workers are paid the maximum value which is equal to the marginal product. This maximizes the benefit to the host country and allows me to derive the conditions under which the host country is least likely to expropriate. The contract will also establish a set labour force required for the project. The size of the labour force corresponds to the amount of labour where the marginal products of labour equal the set wages given the contracted amount of capital. This is level of capital and labour corresponds to the output desired and infers the necessary size and scope of the project.

Capital will also be acknowledged in the contract, as its rate of return that it will receive from the project will be set out. In all situations in the model it is assumed that capital is successfully installed. It will be sourced from China's domestic capital market and provided to the firm. The rate of return capital receives in the host country is assumed to be greater than the minimum rate of return in China, or the internal cost at which the capital was provided. This internal cost is the opportunity cost of capital. Within this assumption, the foreign firm does not earn a direct profit, but the suppliers of the capital in China do earn a profit. I do not explicitly model the profit for China.

Importantly, I assume that the investment project is characterized by putty-clay capital, where capital is optimally structured prior to construction and is restricted to a fixed quantity of labour for the duration of its operation (Hu, 1972). Thus, there is no substitution between capital

and labour after investment. In practice there may be a possibility for substitution but the putty-clay assumption indicates that it is not easy to adjust labour or capital and not optimum to do so. Besides being quite a realistic assumption regarding actual investments, the putty-clay assumption makes may analysis much easier as I am able to compare the same quantities of inputs before and after expropriation. Putty-clay capital is customizable only prior to investment and fixed and non-recyclable thereafter. As the rate paid to capital and the wages paid to labour are given, a fixed labour supply is justified. At the end of the project, the capital will have completely depreciated with no scrap value.

I initially assume that the host country is motivated only by its aggregate payoff from the FDI project and does not consider the harm to its reputation in the global community if it expropriates the Chinese firm. Without expropriation the aggregate payoff to the host country is the wages that are paid to the domestic workers. With expropriation, the aggregate payoff to the host country is the output of the project when it is under host country control. The host country expropriates when the benefits of doing so are greater.

If the investment is operated under Chinese control, it is assumed that total factor productivity is higher than if the project was under the host country's control. This is due to the Chinese firm having greater experience using the technology associated with the capital than the host does. As a result, output is lower under host country management for the production period, all else equal.

Spillover effects from the Chinese firm's entry are not considered directly in the model. Though by the act of capital being installed in the host country, it is possible for there to be some transfer of technology or know-how. This benefit for the host country does not affect my results

if it occurs after capital is installed and before expropriation. However, my results will change if the spillover is prevented by expropriation.

3.2 Model Description

The production function is a constant returns to scale Cobb-Douglas with three inputs: high-skilled labour, low-skilled labour and capital.. After China enters the host country, it installs its production capital to produce output according to the following:

$$Y = AH^{\alpha+\beta}L^{\alpha-\beta}K^{(1-2\alpha)}$$

where H denotes high-skilled labour, L refers to low-skilled labour and K is capital. The coefficients satisfy $0 \leq \beta < \alpha < 0.5$, and are determined exogenously depending on the industry. Total factor productivity $A = A^* > 1$ if the project is under Chinese control, and $A = A^E = 1$ if it is under host country control after it expropriates.

As the contract specifies a set workforce for the project, the labour force is normalized such that $H + L = 1$ where $L = 1 - H$. This normalization is for convenience. As I show below it implies corresponding fixed quantities of K and Y in fixed proportions. Alternatively, we could have normalized capital or output. The fixed quantities settles on the size of the project which otherwise in our set up has constant returns to scale.

Real factor prices are as follows: w_H is the wage for high-skilled labour, w_L is the wage for low-skilled labour and r is the rate paid to capital. As mentioned previously, there is an opportunity cost of capital, r_{OC}, which is lower than this rate, $r > r_{OC} > 0$. Thus the implicit profit for China is $(r - r_{OC})K$. This ensures that even if the firm's operation in the host country breaks even in explicit terms, there is still a benefit for China to invest. I assume the Chinese firm is takes *r* as given from China and negotiates with the host country to recover the cost of

capital. For simplicity, the analysis concentrates on the profits of the firm rather than China, though the profits for China can be worked out easily as above.

There are opportunity costs for the domestic wages, assumed to be lower than those paid by the Chinese firm; i.e., $w_H > w_H^{OC}$ and $w_L > w_L^{OC}$. If the host country is suffering high unemployment this opportunity costs could be thought to be as low as zero, $w_H^{OC} = w_L^{OC} = 0$. The famous Lewis (1954) model examines the case where there is an excess supply of labour which means the benefit of investment is the full wage received. Though the total benefit to the host country is decreasing in w_H^{OC} and w_L^{OC}, we show below they do not affect the decision to expropriate.

The Chinese firm maximizes profits taking as given the wage rates and return to capital specified in the contract. It optimally sets the marginal product of the inputs to equal the prices of the inputs.

$$\prod = Y - w_H H - w_L L - rK$$

$$\frac{\partial \pi}{\partial H} \rightarrow \frac{(\alpha + \beta)Y}{H} = w_H > w_H^{OC}$$

$$\frac{\partial \pi}{\partial L} \rightarrow \frac{(\alpha - \beta)Y}{L} = w_L > w_L^{OC}$$

$$\frac{\partial \pi}{\partial K} \rightarrow \frac{(1 - 2\alpha)Y}{K} = r > r_{OC}$$

Simplifying to find factor ratio of low to high-skilled labour given their respective wages:

$$\frac{L}{H} = \frac{(\alpha - \beta)w_H}{(\alpha - \beta)w_L}$$

Where $H + L = 1$,

$$\frac{(1-H)}{H} = \frac{(\alpha-\beta)w_H}{(\alpha-\beta)w_L}$$

$$H = \frac{1}{1 + \frac{(\alpha-\beta)w_H}{(\alpha-\beta)w_L}}$$

Finding the factor ratio of capital to low-skilled labour,

$$\frac{K}{L} = \frac{(1-2\alpha)w_L}{(\alpha-\beta)r}$$

Notice that the first order conditions yield that the factors are in fixed proportion according to wages and interest and independent of scale. Setting H +L =1 pins down their absolute quantities.

Substituting the values of the real wages and real rate to capital:

$$\prod = Y - \frac{(\alpha+\beta)Y}{H}H - \frac{(\alpha-\beta)Y}{L}L - \frac{(1-2\alpha)Y}{K}K = 0$$

The fact that the firm earns zero profits is because of the assumption of constant returns to scale and given factor prices. This result is known as product exhaustion.

3.3 Situation 1: China Hires High-skilled Workers from the Host Country

Now the model will be used to demonstrate a situation in which the Chinese firm enters the host country with capital to set up production and both high and low-skilled workers are sourced from the host country. High-skilled workers have already been trained to work at a high level. It is useful to differentiate between domestic, referring to the host country, and foreign, referring to China. Only capital and expertise, captured by A, total factor productivity, enter the host country. China will produce according to the following function for one period, employing the three inputs to produce an output.

$$Y^* = A^* H_d^{\alpha+\beta} L_d^{\alpha-\beta} K^{(1-2\alpha)}$$

Where Y^*refers to output produced by China and $A^* > 1$ is the level of total factor productivity when the project is run by the Chinese firm. Maximizing profit with a specific value of A^* does not change the quantities of inputs derived above. However, Y^* increases proportionately with A^*.

If the project is expropriated by the host country immediately after capital is installed but prior to production, output is the following:

$$Y^E = A^E H_d^{\alpha+\beta} L_d^{\alpha-\beta} K^{(1-2\alpha)}$$

where Y^E is the expropriated output produced by the host country, and $A^E = 1$ is total productivity when the project is run by the host country. With putty-clay technology the inputs are fixed at the same level as before expropriation. Because $A^E < A^*$, expropriated output is lower.

Expropriated output can be reflected as a function of A^* as it is the only difference between the functions when input levels are predetermined:

$$Y^E = \frac{Y^*}{A^*}$$

3.3.1 Payoff Structure

Below the payoffs to both the Chinese foreign investor and the host country are assessed. The benefits will again be considered in aggregate with all payoffs to any group within a country counted as net benefits to that country. This pertains to the domestic labour supply—any wages they receive count as a benefit for the host country. Again it is assumed that if expropriation occurs, it does so after all capital is installed by China.

If the host does not expropriate, the payoffs accrued are:

Chinese firm:

$$\prod = Y^* - w_H H_d - w_L L_d - rK = 0$$

Host country:

$$\prod = w_H H_d + w_L L_d - w_H^{OC} H_d - w_L^{OC} L_d > 0$$

As the Chinese firm pays the marginal products to all inputs, it does not make an explicit profit. The implicit profit to China is $(r - r_{OC})K$, the difference between marginal product of capital and the lower rate it would receive back in China, which justifies the firm's entry. The host receives the wages to high and low-skilled labour. The opportunity costs to labour are also included, but the foreign firm's wages are assumed to be higher.

If the host expropriates, payoffs to itself and China are:

Chinese firm:

$$\prod = - rK$$

Host country:

$$\prod = Y^E - w_H^{OC} H_d - w_L^{OC} L_d$$

As expropriation occurs after all capital is installed by the firm, its payoff is the loss of the cost of the capital. As the firm loses control of the project, it receives no output nor pays any wages. The host country, not having to pay for capital, receives all output less the wages paid to high and low-skilled workers. As wages also count as a benefit for the host country, their effect on the host's payoff is neutral. However, the opportunity costs are still present in the expression above.

The host, being purely motivated by maximizing its share of output, faces a decision to expropriate after all capital has been installed by China. It will expropriate if there is a higher payoff from doing so. It is assumed that if the payoff is equal, the host country will expropriate as it prefers to have control over the operation rather than not. If the following condition is satisfied, the host country will expropriate:

$$Payoff\ to\ host\ if\ expropriation \geq payoff\ to\ host\ if\ no\ expropriation$$

$$Expropriated\ output\ less\ the\ opportunity\ costs\ to\ labour$$

$$\geq Wages\ earned\ if\ no\ expropriation\ less\ the\ opportunity\ costs\ to\ labour$$

$$Y^E - w_H^{OC} H_d - w_L^{OC} L_d \geq w_H H_d + w_L L_d - w_H^{OC} H_d - w_L^{OC} L_d$$

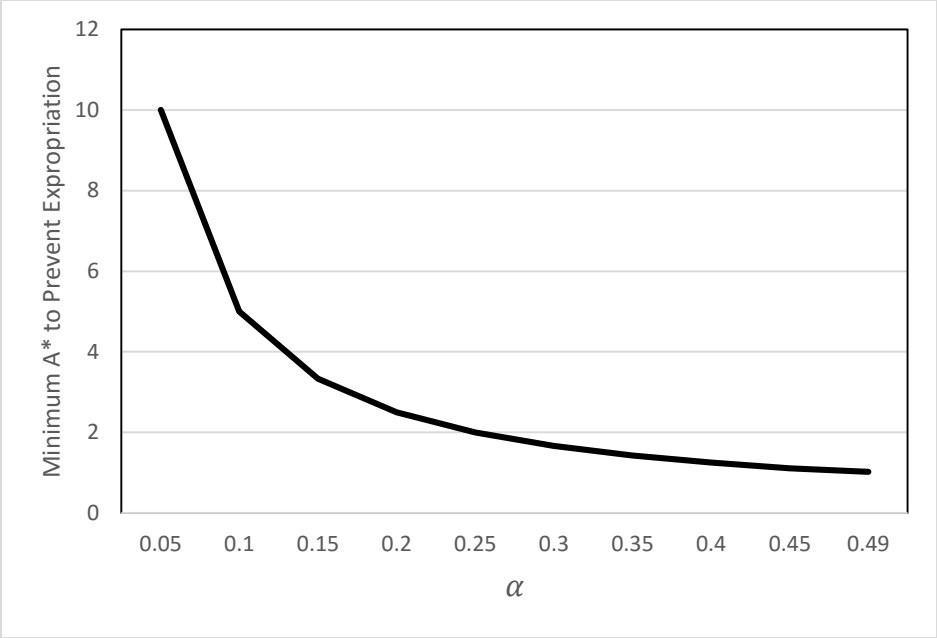
$$Y^E \geq w_H H_d + w_L L_d$$

$$Y^E \geq (\alpha + \beta) Y^* + (\alpha - \beta) Y^*$$

$$\frac{Y^*}{A^*} \geq 2\alpha Y^*$$

$$A^* \leq \frac{1}{2\alpha}$$

The condition boils down to the relationship between the level of total factor productivity under Chinese control to the inverse of the exogenously determined share of output that accrues to labour. If the difference in total factor productivity between the Chinese firm and that of the project under the host's control is low enough, the host will expropriate as it receives a higher payoff for doing so. It is important to note that the condition is independent of scale. As $\alpha < 0.5$ then $\frac{1}{2\alpha} > 1$. Thus there is always a positive range over which expropriation would occur, $1 < A^* < \frac{1}{2\alpha}$.



By plotting $\frac{1}{(2\alpha)}$ the graph above shows the relationship between α and the minimum value of A^* above which the Chinese firm would need to attain to ensure the host country does not expropriate. It is assumed that variations in α are exogenous and vary by project and industry. However, it is insightful to look at this relationship to stress the importance of A^*. Clearly, the smaller α is, the much higher A^* needs to be. As α gets smaller, the shares paid to high and low-skilled labour decrease while the share of output paid to capital increases. If the host does not expropriate, it only receives the wages to high and low-skilled labour. If α is low enough, this payoff decreases more than the payoff if the host expropriates, which is output adjusted down for the change from $A^*$to A. If China trains high-skilled domestic labour, the only tool at their disposal to prevent expropriation is A^* and if it has any discretion it will maximize it to be as efficient as possible and on the production possibility frontier.

3.4 Situation 2: China Hires High-skilled Workers from China

As before China agrees to a contract with the host country specifying wages and the rate paid to capital. Now, however, the firm employs high-skilled workers from China instead of the host country. The workers from China are assumed to always remit their wages back to China. (If purchases are made domestically by such workers, they are assumed to be at cost and hence not a benefit to the domestic economy). The cost to transport Chinese inputs into the host country is assumed to be covered in the wage paid to Chinese workers. Low-skilled workers still come from the host country and China still supplies the capital.

China will produce according to the following function for one period, employing the three inputs to produce an output.

$$Y^* = A^{**} H_f^{\alpha+\beta} L_d^{\alpha-\beta} K^{(1-2\alpha)}$$

where Y^*refers to output produced by China and $A^{**} \geq A^* > 1$ reflects the total factor productivity when the project is under Chinese control and the high-skilled labour force is Chinese, as H_f refers to high-skilled Chinese labour. This total factor productivity may be higher than when domestic high-skilled workers are used as the domestic high-skilled workers may not know the specific practices and procedures that pertain to the project being under Chinese management. This will involve costly learning which effectively results in lower total factor productivity. Thus, total factor productivity A^{**} may be higher when high-skilled Chinese workers are employed. It is assumed that high-skilled Chinese workers have a degree of commitment to the firm and to the project when it is under Chinese control. Therefore, if the project is expropriated, it is likely that some high-skilled workers will flee the host country.

If the project is expropriated by the host country immediately after capital is installed but prior to production, output is the following:

$$Y^E = A^E(\lambda H)_f^{\alpha+\beta} L_d^{\alpha-\beta} K^{(1-2\alpha)}$$

where $1 > \lambda > 0$ is the proportion of high-skilled Chinese workers that remain as workers on the project after the project is expropriated. Thus, 1 - λ is the proportion that return to China after the project when it is expropriated. There is therefore a decrease in output, in addition to the decrease caused by the drop in technology as $A^E < A^{**}$.

Assuming that A^E =1, expropriated output can be expressed as a function of A^{**} and λ:

$$Y^E = \frac{\lambda^{\alpha+\beta} Y^*}{A^{**}}$$

Here we are assuming the inputs *H*, *L* and *K* abide by the putty-clay assumption. Of course, as there are fewer Chinese workers, λH, the expropriated output is lower for this reason in addition to $A^{**} > A^E$ =1.

3.4.1 Payoff Structure

Again the payoffs to the Chinese firm and the host country are assessed. Chinese labour receives its opportunity cost which implicitly accounts for their alternative employment in China. If the host does not expropriate, the payoffs accrued are:

Chinese firm:

$$\prod = Y^* - w_H^{OC} H_d - w_L L_d - rK$$

Host country:

$$\prod = w_L L_d - w_L^{OC} L_d$$

China receives all output less the wages paid to labour and the rate paid to capital. Only their opportunity cost is seen. The host now only receives the wages paid to low-skilled labour less the opportunity cost.

If the host expropriates, payoffs to itself and China are:

Chinese firm:

$$\prod = w_H \lambda H_f - w_H^{OC} \lambda H_f - rK$$

Host country:

$$\prod = Y^E - w_H \lambda H_f - w_L^{OC} L_d$$

After expropriation, there is a proportion of the high-skilled Chinese labour force that stays and continues to work as part of the project, but for the host country. As Chinese wages are assumed to always be remitted back to China, this counts as a benefit to China. Their net payoff is the sum of the remitted wages, less the high-skilled workers' opportunity cost, less the cost of capital. If it was assumed that no wages are remitted, their payoff becomes only the cost of capital like in the high-skilled domestic worker case. The host country, not having to pay for capital, receives all output less the wages paid to high and low-skilled workers. As the remaining high-skilled workers remit their wages, they do not count as a benefit for the host country and are strictly a cost. This analysis makes most sense when the pecuniary reward for staying is higher than the opportunity cost $w_H > w_H^{OC}$. I assume this condition is met. This is arguably reasonable for two reasons. First, the opportunity cost in China might be quite low as there is a large and perhaps excess supply of high skilled labour in China. Second, the fact that only a fraction of the Chinese workers stay, means that their marginal product will higher.

If Chinese high-skilled workers are employed, it faces a different decision to expropriate, but will nonetheless expropriate if there is a higher payoff from doing so. In the calculations below, Chinese workers that stay are assumed to be paid their marginal product. If the condition below is satisfied, the host will expropriate:

$$Payoff\ to\ host\ if\ expropriation \geq payoff\ to\ host\ if\ no\ expropriation$$

$$Expropriated\ output\ less\ the\ remitted\ wages\ less\ the\ opporunity\ cost\ of\ low-skilled\ labour \geq Low-skilled\ wages\ less\ the\ opportunity\ cost\ if\ no\ expropriation$$

$$Y^E - w_H \lambda H_f - w_L^{OC} L_d \geq w_L L_d - w_L^{OC} L_d$$

$$Y^E - w_H \lambda H_f \geq w_L L_d$$

$$Y^E - \lambda(\alpha+\beta) Y^E \geq (\alpha-\beta) Y^*$$

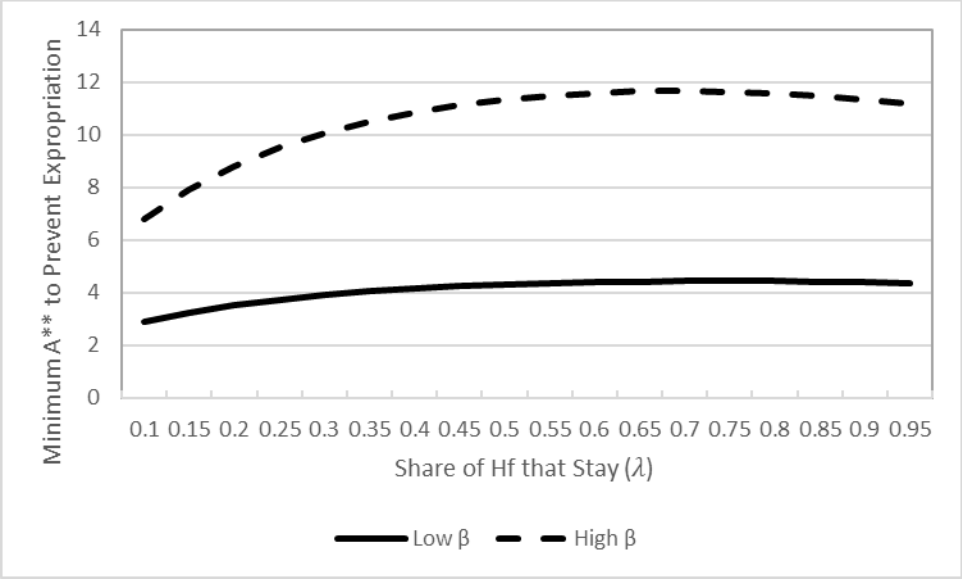
$$\frac{\lambda^{\alpha+\beta} Y^*}{A^{**}} - \lambda(\alpha+\beta)\frac{\lambda^{\alpha+\beta} Y^*}{A^{**}} \geq (\alpha-\beta) Y^*$$

$$\lambda^{\alpha+\beta} - \lambda(\alpha+\beta)\lambda^{\alpha+\beta} \geq A^{**}(\alpha-\beta)$$

$$A^{**} \leq \frac{\lambda^{\alpha+\beta} - \lambda(\alpha+\beta)\lambda^{\alpha+\beta}}{(\alpha-\beta)}$$

$$A^{**} \leq \frac{\lambda^{\alpha+\beta}(1-\lambda(\alpha+\beta))}{(\alpha-\beta)}$$

This result states that if the level of technology is below the value described by the above equation, then the host will expropriate. China is best off with the highest feasible A^{**} so that it is on the production possibility frontier. This only increases their payoff but decreases the threshold for expropriation. The threshold is lower when the proportion that stay, λ, is smaller. If λ is sufficiently small then the threshold value (right hand side of the condition) is less than 1 and expropriation is ruled out. Faced with the threat of expropriation, China has an incentive make it easier for Chinese workers to leave in the event of expropriation.



$\alpha = 0.25; 0.1 \leq \lambda \leq 0.95; \beta = 0.1, 0.2$

The above graph plots $A^{**} \leq \frac{\lambda^{\alpha+\beta}(1-\lambda(\alpha+\beta))}{(\alpha-\beta)}$ given two different constant values of β. It shows the relationship between the value of the minimum total factor productivity (A^{**}) to prevent expropriation and the share of the high-skilled foreign labour force that stay as part of the project after expropriation (λ) increases. If A^{**} falls below the line, the host expropriates. As is seen, the minimum level of A^{**} China would need to attain to prevent expropriation increases as λ increases. If a large proportion of the high-skilled Chinese labour force leaves after expropriation, subsequent output that accrues to the host is severely reduced. This is a significant deterrent to expropriation as the consequent payoff for the host is smaller. As such, the amount by which China would need raise A^{**} is lower. China has a motivation to make λ as small as possible by maximizing the number of workers that leave the project. The curves dip down slightly just as λ approaches one as the benefit from not expropriating increases more relative to the benefit from expropriating for very high levels of λ.

Also shown on the graph is the same function plotted with a high and a low β. By increasing the differential in shares of output between high and low-skilled labour, the curve

shifts up and becomes steeper. Explained another way, as wage and productivity inequality between high-skilled Chinese labour and low-skilled domestic labour increases, expropriation is much more likely for given levels of total factor productivity and proportions of high-skilled labour that remain. This is because if the host does not expropriate, it only receives the wage to low-skilled domestic labour, which decreases if β increases. If it expropriates, it receives output less the wage to the fraction of high-skilled labour that remain. Although the wage to high-skilled labour also increases as β increases and this counts as a cost to the host, the value of β is lessened by the presence of λ so the cost is less than the benefit. As well, for a given λ, the minimum A^{**} that China needs to attain increases.

If for some reason β increases, China has an incentive to both increase $A^{**}$and decrease λ. By increasing the level of total factor productivity if productivity and wage inequality increase, the entire project becomes more difficult for the host to expropriate. However, it is also in China's interest to ensure wage inequality between high and low-skilled labour does not get high enough that it incents expropriation.

3.5 Comparing Expropriation Thresholds

For the discussion below, it will be assumed for simplicity that $A^{**} = A^{*}$. Then the expropriation thresholds for hiring Chinese workers or domestic workers involves the following comparison.

$$\frac{1}{2\alpha} \; vs \; \frac{\lambda^{\alpha+\beta}(1-\lambda(\alpha+\beta))}{(\alpha-\beta)}$$

If λ is sufficiently small, then it is better to hire Chinese workers. On the other hand, if λ is sufficiently large, the threshold for expropriation is lower when hiring domestic workers. This is because for $\lambda = 1$, the project faces a higher threshold with Chinese workers.

$$\frac{1}{2\alpha} < \frac{(1-\alpha-\beta)}{(\alpha-\beta)}$$

3.6 Decreasing Expropriation Risk through A^*, λ and β

As has been inferred, China has preferences with regard to several aspects of the function as a means of reducing the risk that the host country will expropriate. If China employs high-skilled domestic labour, they prefer A^*, total factor productivity, to be high to decrease the risk of expropriation. If high-skilled foreign labour is used, China prefers $A^{**}$to be high, λ, the share of high-skilled foreign workers that stay, to be low and β, the skill differential, to be low. Although β is present in the case where high-skilled domestic workers are used, as all workers are domestic and the full values of H and L are present in both payoff situations, it is not a consideration for China as the host receives all wages.

If it is assumed that A^* captures aspects of the firm's operation and management, then there is an incentive to maximize it. As such, China prefers to set up the firm's operation in a way that is unfamiliar to the host country and to domestic workers as a means ensuring it is high. In doing so, the host country perceives expropriation to be more burdensome than it would be if a domestic producer were to be expropriated. This could involve language, as Chinese is not heavily spoken in Africa. For example, instructions on operating complicated machinery could be written in only Chinese, making it difficult for the host country to operate after expropriation. This could also involve output increases from not having to take time to translate. As well, information held and used by management about the project's operations, status and goals could also be kept all in Chinese. In this case it would be in China's interest that the local workers do not learn Chinese. More generally, the project's high-level processes and style of operations

could be conducted in different enough ways from those in the host country that resuming post-expropriation operations is prohibitively difficult.

The amount of high-skilled foreign workers that stay and continue to be employed after expropriation, λ, is another tool that China can use to reduce the risk of expropriation. By keeping λ as low as possible, China increases its chances that its operation will not be expropriated. In practice, reducing λ could be seen by limiting the extent to which the Chinese high-skilled workers integrate into the host country. By limiting their exposure to the local people and culture, there is a lower chance the Chinese workers form social ties that would prevent them from returning to China after expropriation occurs. This could be done through management that limits social integration of its workers with strict and long working hours and also by housing workers in barracks on the production site that is segregated far from the locals. There could also be financial incentives for Chinese workers to stay. If the work visa arrangements offered by the host after expropriation are desirable enough, Chinese workers may stay as part of the operation. Whether or not there is employment back in China for the high-skilled workers will also have an impact on their choice to stay. It will be up to China to monitor this and intervene by guaranteeing employment back in China prior to the start of the project if doing so will reduce expropriation risk sufficiently to warrant the effort.

Additionally, China has an incentive to decrease β, the skill differential in order to decrease the risk of expropriation. While α is determined by the sector the firm operates in as it reflects the share of labour relative to capital, it is exogenous. However for current purposes, β could be variable as it only relates high and low-skilled labour within the sector. The higher β is, the more likely expropriation occurs for given levels of $A^*$and λ. This is primarily because low-skilled domestic workers' wages decrease as β increases, reflected by the decline in their skill

level relative to high-skilled workers. In practice this means that China should not let the difference in productivity levels of high and low-skilled workers to get so high that expropriation occurs. China needs to ensure low-skilled workers are trained adequately. As well, minimizing turnover of low-skilled workers would put downward pressure on β as an increasing amount of knowledge about the operation would be earned through prolonged experience. From the host's perspective, the lower β is, the more training domestic low-skilled workers have received for a given skill level of high-skilled foreign workers and the higher their wages are. This is a benefit for the host and they are therefore less likely to expropriate. However, China must be wary of the tradeoff between $A^*$and β. The training the low-skilled workers receive must be such that it does not materially decrease A^*, the level of total factor productivity. If the value of A^* resides at the management level of the operation, such as management techniques or strategy, training low-skilled workers will likely not decrease A^*. The low-skilled workers also may not require training that involves being able to understand Chinese. It could be given through a Chinese translator or by learning by observing others. Nevertheless, the relation between A^* and β should not be ignored by China.

3.7 China's Labour Input Preferences

Assuming China is motivated by payoff and having control over more variables to reduce expropriation risk, China prefers to use high-skilled foreign labour over high-skilled domestic labour whether or not expropriation occurs. Output accrued to China is higher if high-skilled Chinese labour is used in either case where the host decides to expropriate or not expropriate. This is primarily because China receives high-skilled wages. If there is expropriation, China still receives a net benefit equal to the remitted wages of the high-skilled labour that remains, where

China receives no benefit if high-skilled domestic labour is employed. As well, there are more variables China can alter to decrease the risk of expropriation, as shown above. Therefore, given the payoff assumptions, it is in China's best interest to employ high-skilled foreign workers.

As China is less averse to political risk than other investors in Africa, their high usage of high-skilled Chinese labour is a potential explanation as they not only are rewarded with a higher payoff but also have more control over managing the higher risk. This is contingent on whether they can be assured that high-skilled Chinese workers will flee the country after expropriation in sufficient numbers.

4. Probabilistic Expropriation

4.1 China's Choice Between High-skilled Domestic and Foreign Workers

In the situations just explored, it was assumed that the host country is only motivated by profits and did not also consider its international reputation when deciding to expropriate. While there may be extreme cases in reality, this is otherwise an unrealistic assumption given the current state of international affairs. The following section will relax this assumption, and outline an extension of the model based on probabilistic expropriation in previous situations where expropriation was certain. The extension examines China's decision to employ high skilled domestic or foreign workers is this situation where they might not be expropriated if they parameters lie below the expropriation thresholds studied above. The host country is partly payoff driven but also motivated by its international reputation.

However, I assume the host will be more likely to expropriate if China hires high-skilled foreign workers than if it hires local high-skilled workers. This is consistent with the host

government preferring its own people be employed over foreign workers in all situations. There could be cases where the opposite happens, that the host country expropriates even though there is a lower resulting payoff, perhaps only for political reasons. This situation will not be taken up in this model.

If high-skilled domestic workers are employed,

$$P(expropriate) = x$$

$$P(not\ expropriate) = 1 - x$$

where $0 \leq x \leq 1$. If high-skilled foreign workers are employed,

$$P(expropriate) = x + b$$

$$P(not\ expropriate) = 1 - x - b$$

where x is the same in both situations and b is the probability differential when high-skilled foreign workers are used, bounded as $0 \leq b \leq 1 - x$. It is determined at the country level. This means that there is a greater probability that the host country will expropriate if China employs high-skilled foreign labour than if high-skilled domestic labour is used. As mentioned, b is likely to be higher if the host government is particularly nationalistic and protective of the domestic population, and lower if the government is very free-enterprise-oriented and open to international labour mobility. It is assumed that the high-skilled Chinese workers face an opportunity cost in the form of the wage they would receive if they were to find employment elsewhere, shown as $w_H > w_H^{OC}$. If high-skilled domestic workers are employed, there is no opportunity cost of labour for China. If the project is expropriated, the Chinese workers that stay are paid their marginal product. To simplify, $A^* = A^{**}$again so that the expressions can be simplified. If it was to be included as A^{**}, the expected payoff if high-skilled labour from China is used and there was no expropriation would be higher.

The expected payoffs to China are given below.

$$E(payoff\ if\ H_d\ used)$$

$$= P(not\ expropriate) * [total\ payoff\ if\ no\ expropriation\ occurs]$$

$$+ P(expropriate) * [total\ payoff\ if\ expropriation\ occurs]$$

$$= (1-x)\left[Y^* - w_H H_d - w_L L_d - rK\right] + (x)[-rK]$$

$$= (1-x)\left[Y^* - w_H H_d - w_L L_d\right] - rK$$

$$E\left(payoff\ if\ H_f\ used\right)$$

$$= P(not\ expropriate) * [total\ payoff\ if\ no\ expropriation\ occurs]$$

$$+ P(expropriate) * [total\ payoff\ if\ expropriation\ occurs]$$

$$= (1-x-b)\left[Y^* - w_H^{OC} H_f - w_L L_d - rK\right] + (x+b)[w_H \lambda H_f - w_H^{OC} \lambda H_f - rK]$$

$$= (1-x-b)\left[Y^* - w_H^{OC} H_f - w_L L_d\right] + (x+b)[(w_H - w_H^{OC})\lambda H_f] - rK$$

The above expected payoffs are common in that China must invest capital either way and the expected payoffs include its cost in full. However, the payoffs to China when H_f is employed exceed that when $H_d$is used primarily due to the wages for H_f accruing to China rather than to the host country. As a result, China chooses to employ H_f when the probability of expropriation is the same regardless of the source of high-skilled labour, when $b = 0$. When the probability of expropriation is higher when China employs $H_f$over H_d, China's choices change, depending on the magnitude of b.

The following outlines the value of b so that China is indifferent between using high-skilled domestic or foreign labour.

$$E\left(payoff\ if\ H_f\ used\right) = E(payoff\ if\ H_d\ used)$$

$$(1-x-b)\left[Y^* - w_H^{OC} H_f - w_L L_d\right] + (x+b)\left[(w_H - w_H^{OC})\lambda H_f\right] - rK = (1-x)\left[Y^* - w_H H_d - w_L L_d\right] - rK$$

$$(1-x-b)\left[Y^{*}-w_{H}^{OC}H_{f}-w_{L}L_{d}\right]+(x+b)\left[(w_{H}-w_{H}^{OC})\lambda H_{f}\right]=(1-x)\left[Y^{*}-w_{H}H_{d}-w_{L}L_{d}\right]$$

$$(x-1)w_{H}^{OC}H_{f}+(1-x)w_{H}H_{d}+x(w_{H}-w_{H}^{OC})\lambda H_{f}=bY^{*}-bw_{H}^{OC}H_{f}-bw_{L}L_{d}-b(w_{H}-w_{H}^{OC})\lambda H_{f}$$

$$b^{*}=\frac{(x-1)w_{H}^{OC}H_{f}+(1-x)w_{H}H_{d}+x(w_{H}-w_{H}^{OC})\lambda H_{f}}{Y^{*}-w_{H}^{OC}H_{f}-w_{L}L_{d}-(w_{H}-w_{H}^{OC})\lambda H_{f}}$$

This value for b^{*}represents the probability differential threshold when high-skilled foreign workers are used. It equals the relative increase in probability that the host country will expropriate if China employs high-skilled foreign labour, so that China is indifferent between sourcing high-skilled labour domestically or from China.

If $b > b^{*}$, China prefers to hire high-skilled domestic workers as hiring foreign workers is prohibitively risky and the expected payoff is less from doing so. If $b < b^{*}$, China will hire high-skilled foreign workers as the higher risk is justified by a higher expected payoff.

Profit and expropriation risk management and control drive China's interest in employing high-skilled foreign workers. However, exogenous, international-reputation-driven risk on the part of the host country prevents high-skilled foreign labour from always being used. There are cases where the host strongly prefers domestic high-skilled workers to be employed and would rather not expropriate, but will if high-skilled foreign workers are used. This is the case when the probability differential exceeds the threshold.

In summary, China prefers to employ Chinese high-skilled foreign workers when it is motivated by payoff and having control over the project to reduce expropriation while the host country is only motivated by payoff. When the model is extended to allow the host country to consider its international reputation while still having a primary motivation for payoff, China may not always employ Chinese high-skilled workers.

4.2 Altering b to Decrease Expropriation Risk through Lump Sum Transfers

Given the above, there is an incentive for China to decrease b, the probability differential for using high-skilled foreign workers as China is motivated by not only payoff but also by having control over expropriation risk. By doing this, expropriation is less likely to occur for a given threshold b^*. This would involve maintaining and improving relationships with the host country government as b is determined at country level. This is conducive to China's relationship-based strategy for engaging in diplomacy with Africa.

An appropriate example for how China attempts to maintain a good relationship with countries in Africa is the announcement in December 2015 of US$60 billion in financial support over three years from China to Africa, discussed earlier. Through this recent lump sum transfer, China hopes to further ameliorate relationships with African countries and help to develop the local economies. A consequence of this could be to decrease the values of b in those countries that benefit. It is in China's favour to decrease potential host countries' preference for high-skilled domestic labour and this could have factored into the motivation behind the lump sum transfer. Lump sum transfers may occur on a project-by-project basis and would work to decrease expropriation risk, but were not taken up in this model.

If the frequency of projects that employ high levels of Chinese labour reaches a critical level, there is a possibility that it would increase political tensions within the country that may increase b. Ensuring political tensions do not get too high could be further motivation behind the trend of lump-sum transfers.

5. Conclusion

Africa is gradually becoming a prominent hub for Chinese foreign direct investment. FDI composition is continually evolving as the expansion of investment in secondary and tertiary sectors has reflected, yet the intricacies of the Chinese strategy in Africa remain. China's lower level of political risk aversion, orientation towards building long-term trade relationships and track record of employing relatively high proportions of Chinese labour have placed them under scrutiny.

Examining the situation of a Chinese firm investing in Africa facing expropriation risk from a theoretical perspective, this model outlining payoffs and conditions to expropriate and provides insight into the motivations behind the trend. Projects do not face expropriation if Chinese productivity is high enough that domestic low skill workers earn high enough wages. China has a preference for employing high-skilled labour from China as they receive a higher payoff and have more variables at their disposal to reduce the risk of expropriation, particularly if Chinese workers leave after expropriation. However, if the host considers its international reputation when deciding to expropriate and assigns higher probability of expropriating on FDI projects that employ foreign labour, there are situations where China chooses to employ domestic high-skilled labour if geopolitical relations are not congenial.

Further research needs to be done to consider the contracting process between Chinese firms and the host country, looking at how the current projects in question were arranged to result in high foreign labour usage. Consideration should be given to lump sum transfers or taxes as other variables in the contractual arrangement. Related analysis should be done to examine the relationship between lump-sum transfers and political relations both within the host country and between the host country and the foreign investor. The implications of high foreign labour usage

in FDI projects on the economic development of host countries should be more closely examined. Doing so would complement possible future research that explores potential policy instruments the host country could implement to change the employment practices of Chinese firms in their favour.

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