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Economic Effects of China's Outward Foreign Direct Investment in South Africa and Nigeria

—— a GTAP-FDI Model Assessment

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Introduction

China's outbound foreign direct investment (OFDI) activities in Sub-Saharan Africa (SSA) has raised much interest in recent years, mainly due to its rapid growth in the past couple of years. According to the latest Chinese official statistics, China's stock of OFDI in SSA amounted to $39.9 billion in 2017, an increase from $11.7 billion from 2010 (China National Statistical Bureau, 2017). Academic sources have tried to identify the reasons behind the increasing amount of Chinese OFDI to SSA. For instance, Dollar (2016) finds that Chinese OFDI to Africa is mainly attracted to countries with large market size and rich in natural resources, and this pattern generally corresponds to the global OFDI pattern into Africa. The author indicates that part of the motivation of increasing Chinese OFDI in Africa is to acquire natural resources (e.g. oil, copper and cobalt, etc) that were important in facilitating China's economic growth, and these deals mainly involve investment from Chinese state-owned enterprises (SOEs). USITC (2017) finds that there is an increasing amount of Chinese investment into SSA's infrastructure sector and by helping SSA countries develop their transport corridor system, China has "increased its access to natural resources needed to boost its own economic growth". Meanwhile, such investment also has been boosted by the Chinese government's efforts to diversify the investment of its large volume of foreign reserves.

Meanwhile, there are some empirical literature available analyzing the pattern and determinants of Chinese OFDI into SSA. Using cross-sector regression analysis, Dollar, Tang and Chen (2018) find that Chinese firms tend to invest in the more skill-intensive sectors in skill-abundant countries, but in capital-intensive sectors in capital-scarce countries. These patterns are mostly observed in politically unstable countries, indicating stronger incentives to maximize profits in tougher environments. Using panel data regressions, Cheung, Haan, Qian and Yu (2012) find that China's outward direct investment (ODI) is found to respond to economic determinants that include the market seeking motive, the risk factor, and the resources seeking motive. It is also affected by the intensity of trade ties and the presence of China's contracted projects. The authors also show that a host country's natural resources have an impact on China's decision on how much to invest in the country rather than on whether to invest in the country or not. However, there are very empirical literature available using computable general equilibrium (CGE) models to analyze the pattern of China's increasing OFDI into SSA, and its impact on output, trade, investment and employment in China and host SSA countries. This paper tries to bridge this gap by analyzing increasing Chinese OFDI activities in two big SSA economies – South Africa and Nigeria, and its impact on output, trade, investment in these two SSA countries. A CGE model incorporates real production, consumption, and international trade and investment data of the economies into a rigorous theoretical framework. The modeling framework allows comparison of different economies in two environments: one in which the base values of policy instruments such as tariffs and investment

restrictions are unchanged, and one in which these measures are changed, or "shocked", to reflect the policies that are being studied (USITC, 2016).

The CGE model framework used in this paper is the Global Trade Analysis Project (GTAP)-FDI model first developed by Lakatos and Fukui (2014), and improved by Tsigas and Yuan (2018). The model incorporates FDI stock and foreign affiliate sales data into the standard GTAP model framework, and allows sector-specific capital to move across borders.

The paper is organized as follows. Section 2 describes the different patterns of Chinese OFDI in South Africa and Nigeria. Section 3 describes the framework of the GTAP-FDI model as well as the data and simulation scenarios. Section 4 presents the simulation results both at the aggregate and sectoral levels. Section 5 concludes.

Chinese OFDI in South Africa and Nigeria

As indicated above, Chinese OFDI stock to SSA increased more than threefold from 2010 to 2017. Meanwhile, in recent years, China's stock of OFDI in SSA was concentrated in a few markets — in 2017, for example, the top recipient markets for China's OFDI were South Africa, the Democratic Republic of Congo(DRC), Zambia, Nigeria, Angola and Ethiopia, jointly accounting for 53.6 percent of total Chinese OFDI stock in SSA (table 1).

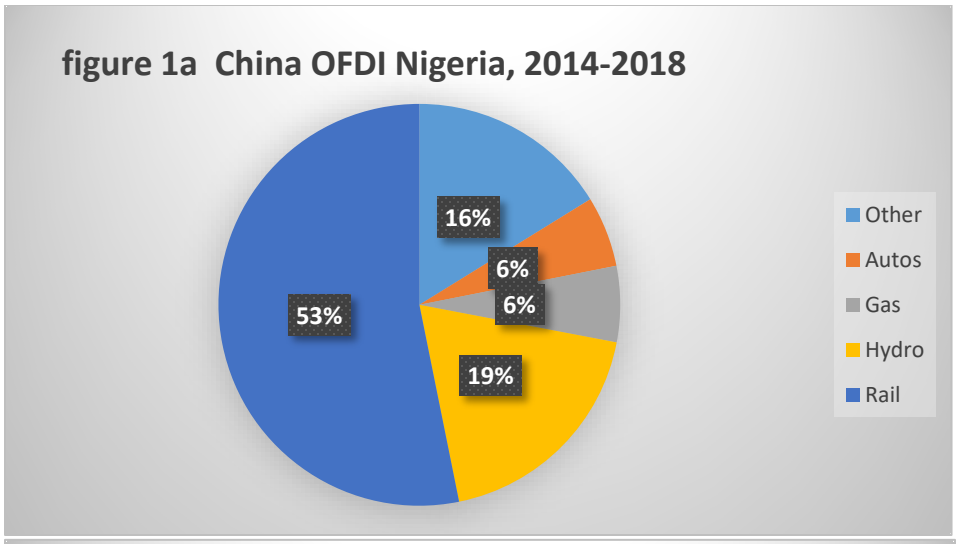
Table 1 Chinese outward FDI position in SSA, top destinations, 2010-2017

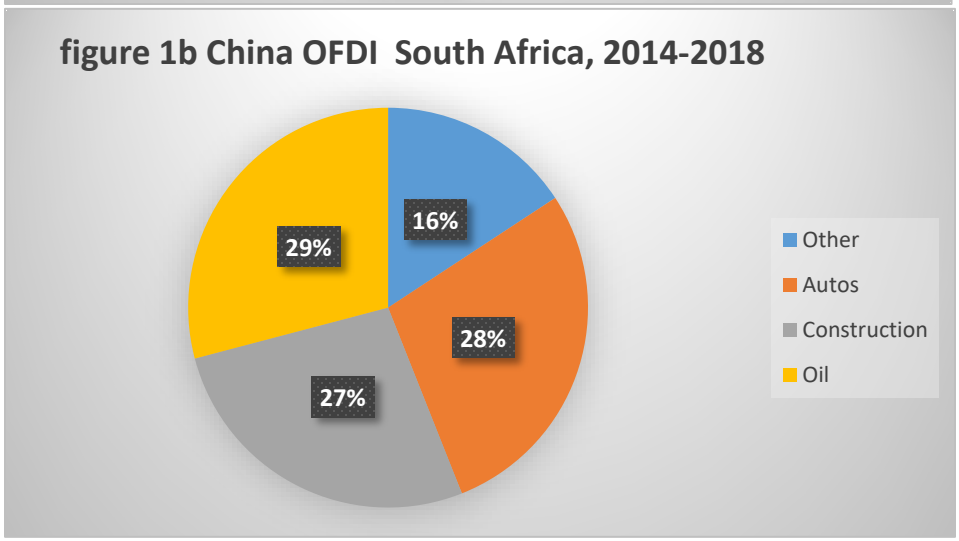
	2010	2011	2012	2013	2014	2015	2016	2017
				Million $				
Total SSA	11678	14618	19799	23952	29003	31217	36046	39928
South Africa	4153	4060	4775	4400	5954	4723	6501	7473
DRC	631	709	970	1092	2169	3239	3515	3884
Zambia	944	1200	1998	2164	2272	2338	2687	2963
Nigeria	1211	1416	1950	2146	2323	2377	2542	2861
Angola	352	401	1245	1635	1214	1268	1633	2260
Ethiopia	368	427	607	772	915	1130	2001	1976

Source: China National Statistical Bureau, 2017 Statistical Bulletin of China's Outward Foreign Direct Investment, 2018. Total Chinese FDI stock in SSA are not provided by China National Statistical Bureau. Total SSA position were calculated by subtracting positions in North African countries (Morocco, Algeria, Tunisia, Egypt and Libya) from total Chinese OFDI stock in Africa.

Among the top recipients of Chinese OFDI in SSA, the patterns of Chinese OFDI differ considerably. Figure 1 compares the sectoral composition of Chinese OFDI in South Africa and Nigeria using transaction-level data from the American Enterprise Institute (AEI), which offers more sector-level details on Chinese OFDI compared to data from Chinese official statistics from China's National Statistical Bureau: in more advanced economies such as South Africa, Chinese OFDI have been more diversified across sectors, while Chinese OFDI was primarily concentrated in the infrastructure sectors in Nigeria.

Figure 1:





Source: AEI, China Global Investment Tracker

According to transaction-level FDI data from the AEI, from 2014 to 2018, Chinese firms in different industries have committed to invest $30.7 billion in Nigeria. As can be seen from figure 1a above, more than 50 percent of the aforementioned Chinese OFDI went to the rail sector from 2014 to 2018. In 2010, the Nigerian government developed the National Integrated Infrastructure Master Plan (NIIMP), which is a 30-year roadmap aiming at building world-class infrastructure (China-Africa Trade Research Center, 2018). Nigeria plans to invest $127 billion in infrastructure from 2014 to 2019. However, from 2014 to 2018, the allocated funding from the Nigerian government for infrastructure projects totaled only $11.5 billion, less than 10 percent of the planned amount (Usman 2013; China-Africa Trade Research Center, 2018). This big infrastructure funding gap creates opportunities for Chinese capital to enter Nigeria's infrastructure sector. For example, China Civil Engineering Construction Company (CCECC), a Chinese SOE and a subsidiary of China Railway Construction Corporation, has invested in multiple rail projects across Nigeria, including the inner-city light rail projects in Abuja and Lagos and a new coastal railway connecting Lagos to Calabar (Chen, 2018). According to the project-level data from AEI, CCECC signed contracts with the Nigerian government committing to invest in six railway projects in Nigeria from 2014 to 2018, with a total value amounted to $16.4 billion (AEI, 2018).

China has also begun to channel investment into Nigeria's renewable energy sector (figure 1a). In 2017, the Nigerian government awarded a contract of $5.8 billion to build a hydropower station for electricity generation to the state-owned China Civil Engineering Construction Corporation (EIU, 2017; figure 1a). The project is scheduled to complete in six years, and is aimed to narrow the huge energy deficit that is one of the major obstacles to Nigeria's industrialization (EIU, 2017).

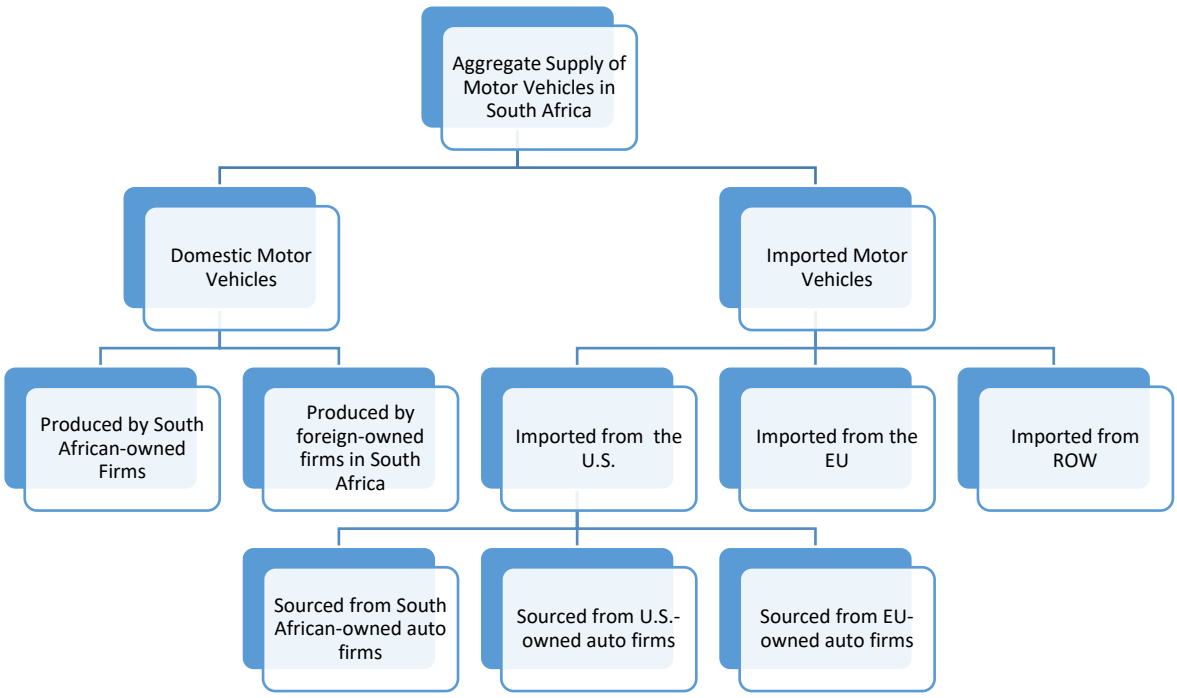
In South Africa, by comparison, Chinese OFDI has been more diversified and has targeted not only natural resources but also the autos and construction sectors (figure 1b). According to transaction-level FDI data from the AEI, from 2014 to 2018, Chinese firms have committed to invest $4.6 billion South Africa and the committed OFDI spread across a couple different industries (AEI, 2018). In 2017, for example, China Minsheng Investment channeled $1.2 billion of Greenfield investment to build affordable housing in South Africa. In 2016, Beijing Automotive Group committed to invest a total of $1.3 billion in a vehicle assembly plant in South Africa.

Model and Simulation Scenarios

The GTAP-FDI Model

The GTAP-FDI model is a CGE model which incorporates FDI stock and FAS data. It is a comparative static, multi–regional and multi–sector CGE model which differentiates between domestic and foreign-owned firms both on the demand and supply side (Lakatos and Fukui, 2014). The major difference between the GTAP-FDI and the standard GTAP model is that the former incorporates an additional level of nesting representing the region of ownership. Figure 1 sketches production linkages in the GTAP-FDI model using South Africa's transportation equipment sector as an example. In the first stage, aggregate supply of motor vehicles in South Africa consists of domestically produced and imported motor vehicles. In the second stage, South Africa's domestically produced motor vehicles are the aggregate produced by South African-owned firms or foreign-owned firms in South Africa. Expenditures on imported motor vehicles are allocated across different sources, and finally allocated across ownership categories to various multinational companies in economies exporting motor vehicles to South Africa.

Figure 2 Illustrative Production Linkages in the GTAP_FDI Model: Domestic Production and Imports



This model has also been extended to treat the labor force as an endogenous variable. Under this assumption, the labor supply elasticity is greater than zero, which implies that the labor supply will expand in response to a rise in real wages, and contract if wages fall.[1] Another important update to this model is that it allows sector-specific capital to move across borders, which therefore accounts for the linkages between trade and FDI in the model (Tsigas and Yuan, 2018).

Simulation Scenarios

The simulation used GTAP version 10 database, with a baseline of 2014. One hundred forty-one regions of the original GTAP database were aggregated into 10 regions, namely, China, Japan, Korea, USA, EU-28, North Africa, South Africa, Nigeria, Rest of SSA, Rest of the World. This paper maintains the 57 GTAP sectors as in the original GTAP model. The FDI stock and FAS data is incorporated into the model, with Chinese OFDI stock to South Africa and Nigeria updated to 2014.

As was indicated above, from 2014 to 2018, Chinese firms have committed to invest $4.6 billion South Africa, spreading across different sectors. Table 2 presents the sectoral level data on the increase of Chinese OFDI stock in South Africa from 2014 to 2018:

[1] This paper uses 0.4 for labor supply elasticities for developed economies, and 0.44 for developing countries (see USITC(2016)).

Table 2 Chinese OFDI in South Africa, 2014-2018	
in million dollars	
Autos	1290
Construction Services	1230
Refined Petroleum Products	1330
Non-Ferrous Metals	230
Renewable Energy for Electricity Generation	380
Coal	110
Total	**4570**

Source: Transaction-level FDI data from AEI

This paper induces an increase in the returns of Chinese capital in South Africa so that Chinese capital stock in South Africa's motor vehicles and parts; construction services; production of refined petroleum products, non-ferrous metals and electricity generation sectors increases by the aforementioned amount in table 2.

Simulation Results

The simulation results indicate that with an inflow of Chinese OFDI into different sectors in South Africa, South Africa's real GDP increases by 0.2 percent. Overall output in South Africa increases by $982 million. Among them, output in South Africa's motor vehicles and parts sector increases by 0.6 percent ($207 million), and output in South Africa's construction services sector increases by 1.2 percent ($445 million). In the meantime, output produced by Chinese foreign affiliates in South Africa's motor vehicle sectors increases by 25.4 percent while output produced by Chinese foreign affiliates in South Africa's construction services sectors increases by 37.0 percent. The reason why increasing Chinese OFDI is having a relatively small impact on the South Africa economy is because Chinese OFDI composes a relatively small share of South Africa's total capital stock.

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