

The impact of Chinese Foreign Direct Investment on economic growth of Peru: a short and long run analysis

Nadia Urriola Canchari*

María Osterloh Mejía**

Xiangzheng Deng***

Abstract

Since 2000, the Peruvian economic policy presented a positive impact on the economic growth thanks to Foreign Direct Investment (FDI) increase and the inclusion of foreign markets in the local economy. This study analyzes and quantifies the short and long-run impact of FDI and Foreign Direct Investment from China (FDICH) on economic growth in Peru, using annual time series data from 2001 to 2018 obtained from the Central Bank of Peru and the World Bank. Vector Autoregression (VAR) Model, Augmented Dickey-Fuller test, Johansen Co-integration test, and Granger Causality test were employed for data analysis through the production function. The findings revealed the impact and significance of FDI and FDICH in the short and long-run, which were positive and significant. Moreover, the Co-integration test (for long-run relationship) was positive, and the causality test in the relationship between all variables and the economic growth revealed the directionality of these links.

Keywords: Chinese Foreign direct investment, Peru, Economic growth, Inflation rate, VAR model

Resumen

Desde 2000, la política económica peruana presentó un impacto positivo en el crecimiento económico gracias al aumento de la Inversión Extranjera Directa (IED) y la inclusión de los mercados extranjeros en la economía local. Este estudio analiza y cuantifica el impacto a corto y largo plazo de la IED y la Inversión Extranjera Directa de China (IEDCH) en el crecimiento económico de Perú, utilizando datos de series temporales anuales de 2001 a 2018 obtenidas del Banco Central del Perú y el Banco Mundial. El modelo de autorregresión vectorial (VAR), la prueba de Dickey-Fuller aumentada, la prueba de cointegración de Johansen y la prueba de causalidad Granger se emplearon para el análisis de datos a través de la función de producción. Los resultados revelaron el impacto y la importancia de la IED y la IEDCH a corto y largo plazo, que fueron positivos y significativos. Además, la prueba de cointegración (para una relación a largo plazo) fue positiva, y la prueba de causalidad en la relación entre todas las variables y el crecimiento económico reveló la direccionalidad de estos vínculos.

Palabras clave: Inversión extranjera china, Perú, Crecimiento económico, tasa de inflación, Modelo VAR

* Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Science, Beijing, China. Email: nadiaurriola2@hotmail.com Received: December, 18th 2019; modifications: March, 14th 2020; accepted:

** Researcher at the Center of Asian Studies of San Marcos National University, Lima, Peru.

*** Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Science, Beijing, China.

Introduction

Globalization can be defined as the expansion of the economic activities between nations without any political boundary, with a network of economic, cultural, social and political interconnections (Yeates, 2001; Shahzad, 2006). However, it is still under debate the understanding of its relationship with human welfare. Since globalization covers a wide array of economic activities, including international trade, international migration, and international investment, it makes, from an international point of view, economic growth a measurement of countries' welfare (Susilo, 2018). According to UNCTAD World Investment Report (2012), developing countries are continuously striving for rapid economic growth, promoting foreign investment attraction. Furthermore, new investment policies are characterized by the recognition of investment as a primary driver of economic growth.

Hence, for developing economies, Foreign Direct Investment (FDI) and trade are usually considered catalysts for economic growth (Makki & Somwaru, 2004). FDI is a vehicle of technology transfer from developed to developing countries, stimulating them to improve the human capital force and its institutions. According to Hill (2005), FDI reduces gaps in management, entrepreneurship, and technology through spillovers and other externalities, facilitating the production or marketing of a product in two different forms: Multinational enterprises (MNEs) or Multinational corporations (MNCs). Those corporations usually improve the foreign exchange in the host country, and in a long-run perspective, it may reduce the foreign exchange earnings (Stoner, Freeman, & Gilbert, 2001).

Studies about the impact of FDI on economic growth showed a positive relationship between them, but its degree depends on the level of domestic infrastructure, domestic investment, and macroeconomic stability (Ram & Zhang, 2002; Adegbite & Ayadi, 2011; Ali & Hussain, 2017). Furthermore, the literature showed a debate about the role of FDI on economic growth as well as the importance of economic and institutional development in fostering FDI (Dondeti & Mohanty, 2007). However, there is no consensus between different authors regarding the impact of FDI on economic growth. On one side, Solow (1957) and De Mello (1997), argue that FDI only affects the income level and it does not have an impact on long-run growth, which depends only on population growth and technological advances. So, FDI will have a long-term impact if the technology level improvement remains constant and positive. On the other side, other researchers affirm that FDI can alter economic growth as it increases returns in production through externalities effects, and it is an important human capital and technological transfer mechanism, introducing new management and providing labor training facilities (Farrell, 2008; John, 2016). According to Akinlo (2004) and Louzi & Abadi (2011), FDI contribution in the host country is not relevant on the long term. Countries that promote a policy of export promotion rather than import substitution become stronger as effect of the FDI. Its impact on analyzed countries is higher than the domestic capital investment, demonstrating that FDI is one of the economic driving force (Balasubramanyam, Salisu & Sapsford, 1996; Borensztein, De Gregorio & Lee, 1998).

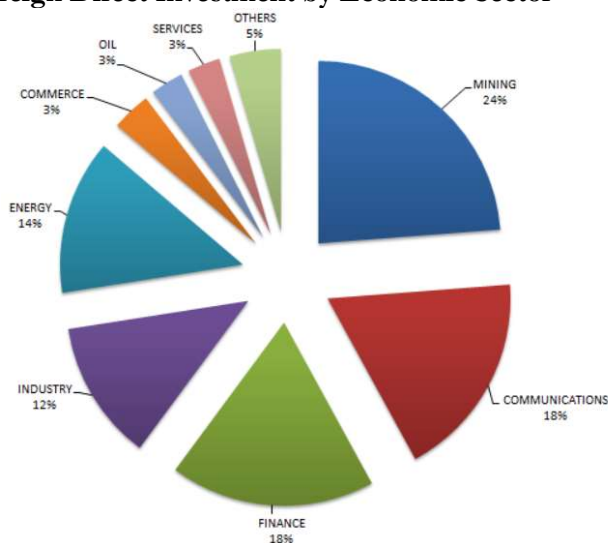
Based on these arguments, industrialized and developing countries have offered incentives to encourage FDI in their economies. Recently, the special merits of FDI and particularly the kinds of incentives offered to foreign firms in practice have begun to be questioned for the consequences in the environment. This debate is fostered by ambiguous empirical evidence, at both the micro and macro levels, regarding FDI generation of positive spillovers for host countries. In the next section, it will be explained the importance of the Chinese investment in Peru.

The importance of Chinese investment in Peru and its perspective

It could be said that Peru is a big recipient of Chinese foreign investment in Latin America because the Peruvian open environment for FDI. For which China can find an environment where they do not feel, for example, discriminated thanks to a long history of China – Peru relationship. Peru has the largest Chinese community in Latin America because it was the first country to establish diplomatic relations with the Qing Empire in 1874 and the third country that established diplomatic relation with the People’s Republic of China in 1971.

As shown in Figure 1, FDI in Peru is mainly concentrated on mining. This may be a consequence of the country’s economic structure, Peru is a rich country in mineral resources like copper, iron ore, gold, etc., which is reflected in its export basket, including 70% of mining products. In 2018, Peru received 6,488 million dollars of FDI, 5.4% less than in 2017 due to the fall of commodities prices that has been happening since 2014, especially of copper, gold and oil (ECLAC, 2019).

Figure 1: Stock of Foreign Direct Investment by Economic Sector



Source: PROINVERSION, 2018

Regarding Chinese investment in Peru, it has been historically concentrated on sectors such as mining, oil and gas, and fishing (Zanabria & Aquino, 2015). China used to be the major mining investor, until last year when it was replaced by the United Kingdom. Chinese investment began in 1992 when Shougang Corporation bought, in 122 million dollars, Marcona mine from Hierro Peru, a public company. This was the mayor investment after 1990s economic reforms, which opened Peru’s economy and begun the privatization process of public companies. In 1994 the Chinese company CNPC bought several oil blocks in the north of Peru. To date, the biggest investment done by a foreign company in Peru was in 2014 by the Chinese company MMG Ltd. that paid around 7 billion dollars for the copper project Las Bambas (Zanabria & Aquino, 2015).

Most of Chinese investments are brownfield, and done by state owned companies. It is known that China is the world biggest buyer of many primary goods and wants to control their production, having influenced international commodities prices. It should be said that some Chinese companies have had problems with their labor unions but especially with the local communities where they operate (Sanborn

& Chonn, 2016). Due to these reasons, some projects by Chinese companies are currently paralyzed. For example, the project Rio Blanco, a copper mine, that up to now it has not been initiated because of the strong opposition of the local community.

Chinese investment in the mining sector in Peru allows its companies to control 24.3% of the production of copper (thanks to Toromocho and Las Bambas mines) and 100% of iron production (Marcona mine). In the oil sector, Chinese companies SAPET and CNPC controls 35% of oil production and in the fisheries sector two Chinese companies control 25% of fishmeal production (Osterloh, 2019). Since 2016, China started to diversify its investment with projects in infrastructure, telecommunication and hydroelectric projects as it can be seen in Annex 1.

China and Peru signed a Memorandum of Understanding (MOU) under the Belt and Road Initiative in April 2019. As it is known this Chinese initiative is mainly focused on infrastructure investment projects, so it is expected that investment from China on this sector will increase. So far, the most ambitious infrastructure project to be built by Chinese capitals will be the Port of Chancay, to be located in Lima and which will cost 3 billion dollars (Osterloh, 2019). On the electric sector, the Chinese company Yangtze Power Co. recently bought Luz del Sur, a power distribution company for 3.5 billion dollars. They pointed out that Peru is its main strategic market in South America (El Peruano Official Daily, 2019).

Becoming part of the BRI could diversify Chinese FDI to Peru, as has been shown in other South American economies. As it is known, China is already investing in the agricultural sector in Chile, and they signed the Five-Year Plan to Improve the Level of Agricultural Cooperation (2017-21) during the first edition of the Belt and Road Forum. Argentina signed an Agricultural Cooperation Strategic Action Plan. However, Peru just joined the initiative in April 2019 during the second edition of the Forum, and they have not subscribed any kind of agreement. For this reason it is important to highlight that Peru should take advantage of being part of the Belt and Road Initiative, as this could allow more Chinese investment in other sectors, and not necessarily in the extractive one (Osterloh, 2019).

Thanks to the investments in mining and oil, and because China is a big buyer of Peru minerals like copper, zinc, iron and lead, China has become the biggest export destination of Peru and in 2018 its share was of 28% of the total. 97% of Peruvian exports to China are minerals, oil and gas, and fishery goods.

Also, it should be mentioned that Peru and China have an FTA in force since 2010. Thanks to this, exports of so-called agroindustry goods to China, like mangoes, grapes, berries and avocado are increasing. For example, in 2019, Peru became the biggest supplier of avocados and berries to China (Trademap, 2020). Because of this, it is expected that the investment in this sector will increase as it happened in Chile. Currently, Peru and China are upgrading their FTA to include sectors like e-commerce and services, which could result in the promotion of these kind of investment, taking into consideration the global champion characteristics of Chinese firms such as JD.com, Taobao or, in taxi hailing, Didi.

It is not known exactly how much capital Chinese companies have invested in Peru since there are no official figures, but according to an speech given by the Chinese ambassador in Peru, Liang Yu (during his presentation ceremony on December 18 of 2019, until that date, the stock of Chinese investment in Peru was of 30 billion dollars.

In this study, our objective is to investigate the influence of Chinese FDI on Peru's economic growth of Peru, which becomes a relevant topic due to the increasing interest in bilateral relations and the supposed

positive impact this FDI has had on the Peruvian economy. We also examine the impact of overall FDI, and we compare which has a higher impact on human welfare in both short-run and long-run analysis. There is evidence, for the long-run dimension, of a correlation between the Chinese FDI and Peru's economic growth. In addition, as second objective, we examine the causal relationship between economic growth and FDI from China in the short-run. For this objective, we include the Governmental Capital Formation (which includes the acquisition of assets and raw material for the good's production from Peruvian enterprises), Inflation Rate, and Government Consumption. As mentioned in the introduction, although several studies have outlined the relationship between FDI and economic growth, their causal dynamics is an empirical question worthy of further investigation. Nevertheless, there are no studies that analyzed the empirical relationship between total FDI, FDI from China, gross capital formation, inflation rate, government consumption and economic growth in Peru. According to the econometric results, conclusions are drawn regarding the impact of FDI from China on Peru.

The rest of the paper is organized as follows. The second section reviews the methodological framework and data descriptive analysis. Empirical results are reported in section three. Section four summarizes the findings and, finally some concluding remarks are presented.

Methodology

Research Design and data sources

This research was based on the use of secondary data to determine the effect of Chinese FDI on the economic growth of Peru, both in the short and long-run terms. For the analytical test, we used econometrical tools to model the annual time series data as well as the production function regression. For this purpose, we used annual time series data that covered the period between 2001-2018. As it was mentioned in the introduction, since 2001 the Chinese Investment in Peru became higher than the previous decade. Data included in our model are Gross Domestic Product per Capita (GDPPK), Foreign Direct Investment (FDI), Foreign Direct Investment from China (FDICH), Government Capital Formation (GKF), Inflation Rate (CPI), and Government Consumption (GC). The data for this research was obtained from secondary resources, mainly from the Central Bank of Peru and from the World Bank Indicators. Table 1 presents the variables descriptive summary.

Table 1: Descriptive data summary (2001 – 2018)

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis
GDPPK	4635.00	4651.49	6947.26	1941.48	1895.16	-0.17	1.42
FDI	5720000000.00	6460000000.00	13600000000.00	1140000000.00	3350000000.00	0.43	2.83
FDICH	174000000.00	157000000.00	226000000.00	132000000.00	39800000.00	0.28	1.30
GKF	30800000000.00	33300000000.00	51400000000.00	9450000000.00	15900000000.00	-0.16	1.39
INF.RATE	2.95	2.39	7.66	0.11	2.24	0.83	2.54
GOV.CONSUMP.	16400000000.00	14700000000.00	30100000000.00	6100000000.00	8380000000.00	0.24	1.57

Source: Researchers' compilation using Stata 13.0

Model specification and estimation procedures

The model is based on endogenous growth theory, developed by Balasubramanyam, Salisu & Sapsfor (1996) and Borensztein, de Gregorio & Lee (1998), and derived from a production function, in which productivity depends on FDI, domestic investment, and Government Consumption. FDI contributes directly and indirectly, as it is shown in the following specification:

$$\text{GDPPK}_t = f(\text{FDI}_t, \text{FDICH}_t, \text{GKF}_t, \text{CPI}_t, \text{GC}_t) \quad (1)$$

To discard the differences in variables measurement, having the same unit of values for all variables, we applied the natural logarithm on both sides of the equation 1. Another reason to use natural logarithm is that the growth of every series becomes the same as the derivative of its log with respect to time.

$$\frac{d(\ln Y_t)}{dt} = \frac{d(\ln Y_t)}{dY_t} \times \frac{Y_t}{dt} = \frac{Y_t}{Y_t} \quad (2)$$

Thereby, equation (1) becomes:

$$\text{LGDPK}_t = \beta_0 + \beta_1 \text{LFDI}_t + \beta_2 \text{LFDICH}_t + \beta_3 \text{LGKF}_t + \beta_4 \text{LCPI}_t + \beta_5 \text{LGC}_t + e_t \quad (3)$$

Equation (3) represents the production function model for the econometric estimation with coefficients $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$ and β_5 representing the returns of scale of each determinant towards Gross Domestic Product per Capita in the time t . Finally, e_t represents the error term. In this case, for the short-run analysis, we used the Vector Autoregression (VAR) Model, Unit Root Test and the Granger Causality Test, which allows to prove the existence of a relationship between the studied variables; and for the long-run analysis, a Co-integration Test was applied.

Unit root test

The Vector Autoregression (VAR) Model can be done when the variables are stationary at a level I (0), and or integrated of order one, I (1). A variable is considered as stationary if it has a constant mean, variance, and autocovariance at any measured point. If the data is a non-stationary time series, it may become stationary after differencing a number of times that can be also explained as a series integrated at the order I (n), it becomes stationary after differencing “n” times. We use the Augmented Dickey-Fuller (ADF) test, which was formulated by Dickey & Fuller (1979, 1981), in which a series will be stationary if the ADF test statistic is greater than the critical value. The following regression represents the general ADF Test form:

$$\Delta Y_t = \alpha_0 + \alpha_1 * Y_{t-1} + \Sigma \alpha * \Delta Y_t + e_t; \text{ it includes only the drift} \quad (4)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 * Y_{t-1} + \Sigma \alpha * \Delta Y_t + \delta_t + e_t; \text{ it includes the drift and linear time trend} \quad (5)$$

Where:

Y = time series of specified variable

t = time trend

Δ = first differencing operator $\Delta Y_{t-1} = Y_t - Y_{t-1}$

α_0 = constant term

N = optimum lags' number

e_t = random error term

Johansen co-integration test

As one of the objectives is to analyze the long-term relationship between the variables, we perform a co-integration test. The test was developed by Johansen and Juselius in 1990. Johansen (1995) states that the long-term relationship will occur when the co-integration among the variables happens with the same order of integration. The test is based on two methods of likelihood ratio test statistic (Pearsan et al., 1999); the Maximal Eigenvalue Test and the Trace Statistic Test, in which the null hypothesis is the non-existence of co-integration between the variables, which will be rejected when the test statistic is higher than the critical value.

Pairwise Granger causality test

One of our main objectives is to analyze the significant relationship between the studied variables (FDI, FDICH, GKF, CPI, GC) with the Gross Domestic Product per Capita, for which we performed the Granger Causality Test. The independent variable is considered as a Granger-cause variable of Y if the y_t (the variable Y in the current period) is conditional on the past values of the variable X ($x_{t-1}, x_{t-2}, x_{t-1} \dots x_0$). Regarding our study, we considered the following principal hypotheses to respond:

For the case of LGDPPK (Logarithm of Gross Domestic Product per Capita) and the LFDI (Logarithm of Foreign Direct Investment):

- i. LGDPPK does not Granger Cause LFDI
- ii. LFDI does not Granger Cause LGDPPK

For the case of LGDPPK and the LFDICH (Logarithm of Foreign Direct Investment from China):

- i. LGDPPK does not Granger Cause LFDICH
- ii. LFDICH does not Granger Cause LGDPPK

For the case of LGDPPK and the LGKF (Logarithm of Government Capital Formation):

- i. LGDPPK does not Granger Cause LGKF
- ii. LGKF does not Granger Cause LGDPPK

For the case of LGDPPK and the LCPI (Logarithm of Inflation Rate):

- i. LGDPPK does not Granger Cause LCPI
- ii. LCPI does not Granger Cause LGDPPK

For the case of LGDPPK and the LGKF (Logarithm of Government Consumption):

- i. LGDPPK does not Granger Cause LGC
- ii. LGC does not Granger Cause LGDPPK

Vector Autoregression (VAR) Model

The vector Autoregression is frequently used for analyzing the dynamic impact of independent variables on the dependent, in the short-run term. The VAR Model approach treats each endogenous variable in the system as a function of lagged values. This model is also a dynamic system of equations, which is represented as follows:

$$Y_t = \alpha + \sum \alpha_i \Delta Y_{t-1} + e_t \quad (6)$$

When this equation is extended, it will be:

$$Y_t = \alpha + \alpha_1 * Y_{t-1} + \alpha_2 * Y_{t-2} + \alpha_3 * Y_{t-3} + \dots + \alpha_k * Y_{t-k} + e_t \quad (7)$$

Where:

- Y_t = vector of endogenous variables at time t
- α_i ($i=1, 2, \dots, k$) = (n x n) coefficient matrices that describe the relationship between endogenous and exogenous variables
- e_t = vector of residuals or random disturbances

The above equation will change with the inclusion of the lag operator (L), and it will be represented by the following equation:

$$Y_t = \alpha * (L) * Y_{t-1} + e_t \quad (8)$$

Where:

- Y_t = vector of endogenous variables at time t
- $\alpha * (L)$ = matrix of coefficients
- e_t = vector of residuals or random disturbances

Results and Discussion

Following the previous description of the econometric models and test, this section presents the results of our estimations.

Unit root test results

The Augmented Dickey-Fuller test was performed on all variables (LGDPPK, LFDI, LFDICH, LGKF, LCPI, and LGC). The results are represented in Table 2, which confirm the stationary test of the variables at the level form I (0) for the LGDPPK, LFDI, LGKF, LCPI, and at the level form I (1) for LGC. The null hypothesis of non-stationary was rejected since the P-value was significant at 5% and 10%. So, we can conclude that the analyzed variables did not have a unit root at levels, and it supported the econometric model of the equation (3).

Table 2: Unit root test for order of integration of variables (ADF)

Variables			Critical values (1%)	Critical values (5%)	Critical values (10%)
LGDPPK	At level	-1.801	-2.602	-1.753	-1.341
	First difference	-1.939	-2.650	-1.771	-1.350
LFDI	At level	-2.112	-2.602	-1.753	-1.341
	First difference	-1.463	-2.650	-1.771	-1.350
LFDICH	At level	-0.619	-2.602	-1.753	-1.341
	First difference	-0.581	-2.650	-1.771	-1.350
LGKF	At level	-1.366	-2.602	-1.753	-1.341
	First difference	-1.599	-2.650	-1.771	-1.350
L(INF.RATE)	At level	-2.824	-2.602	-1.753	-1.341
	First difference	-6.590	-2.650	-1.771	-1.350
L (GOV.CONSUMP.)	At level	-0.918	-2.602	-1.753	-1.341
	First difference	-2.030	-2.650	-1.771	-1.350

Source: Researchers' compilation using Stata 13.0

Co-integration test

Table 3 presents the result of the Johansen Co-integration Test in the Trace Statistic and the Maximum Eigen Test statistics. Both revealed that there was a co-integrating equation for the long-run term. This was because of the null hypothesis of the co-integration rank ($r=0$), which implies the no existence of correlation in the long-run term, the max-eigenvalue was greater than the 5% at the critical value rejecting the null hypothesis. The same happened with the trace statistics, which also indicated the rejection of the null hypothesis. The evidence of co-integration in the study indicated that the alternative hypothesis, about the long-run term relationship, is accepted. It showed that the independent variables were long-run determinants of the growth of the population's standard life in Peru.

Table 3: Johansen Co-integration Trace and Maximum Eigenvalue Test

Hypothesized No. of CE(S)	Trace Test			Maximum Eigen Test		
	Trace Statistic	0.05 Critical Value	0.01 Critical Value	Max Statistic	0.05 Critical Value	0.01 Critical Value
None	98.43	94.15	103.18	31.88	39.37	45.1
At most 1	66.54**	68.52	76.07	24.51	33.46	38.77
At most 2	42.04	47.21	54.46	17.29	27.07	32.24
At most 3	24.74	29.68	35.65	14.19	20.97	25.52
At most 4	10.5491	15.41	20.04	7.66	14.07	18.63

** is at 5%

Source: Researchers' compilation from Stata 13.0

The same long-run relationship and importance between agricultural exports and economic growth (primarily) were found in studies made in East Asia and Latin America (Zhang, 2001; Srivastava & Talwar, 2020). Furthermore, Osei et al. (2019) indicated that FDI has an impact on the long-run growth through various economic sectors.

Granger causality test results

As stated in our objectives, in order to analyze the causal relationship between the LFDI and the LGDPPK, and between LFDICH and the LGDPPK for Peru, we used a Granger causality test. Nevertheless, and expanding the analysis, we also review the causal relationship between the LGKF and the LGDPPK, the LCPI and the LGDPPK, and between the LGC and the LGDPPK. Table 4 presents the value of the Test. We considered as threshold, to accept the null hypothesis of no causality existence, the probability value of 5%, and it was rejected if the P statistic was higher than 5%.

Table 4: Pairwise Granger Causality Test

Null hypothesis	F-statistic	Prob.
LFDI does not Granger Cause LGDPPK	55.28	0.00
LGDPPK does not Granger Cause LFDI	45.22	0.00
LFDICH does not Granger Cause LGDPPK	8.11	0.02
LGDPPK does not Granger Cause LFDICH	1.04	0.59
LGKF does not Granger Cause LGDPPK	18.80	0.00
LGDPPK does not Granger Cause LGKF	7.48	0.02
LCPI does not Granger Cause LGDPPK	25.80	0.00
LGDPPK does not Granger Cause LCPI	1.25	0.54
LGC does not Granger Cause LGDPPK	233.87	0.00
LGDPPK does not Granger Cause LGC	24.39	0.00

Source: Researchers' compilation using Stata 13.0

For the cases of the LFDI and the LGDPPK, it was demonstrated that there is no causal relationship. The same result are obtained for the LGKF and the LGDPPK, and for the LGC and the LGDPPK. A

different result is shown for the cases of LFDICH and the LGDPPK, and LCPI and the LGDPPK, where a unidirectional causal relationship is observed. These results are consistent with previous studies made for countries from Asia and Latin America. For instance, Zhang (2001) estimated the unidirectional relationship between FDI and economic growth for Malaysia. This may be explained as FDI is a key for R&D, which plays an important role in the productivity, competitiveness, and value with the implementation of the innovation management systems (Leite et al., 2018; Sultanuzzaman et al., 2018; Hung & Huong, 2019; Kalai & Zghidi, 2019; Laffineur & Gazaniol, 2019; Oliveira et al., 2019)

Vector Autoregression Model

Table 5 presents the result of the Vector Autoregression (VAR), which revealed the impact of the dependent variables (LFDI, LFDICH, LGKF, LCPI, and LGC) on the independent variable (LGDPPK) in the short-run. First, we highlight that the R² value (99.80%), and probability of F-statistic, indicate that this functional form has a significant fit for Peru's GDPPK. Second, the Breusch-Godfrey Correlation LM Test was used to test the existence of autocorrelation. In this particular case, the value was 0.47 which does not allows us to reject the null hypothesis. Hence, the estimated model is free from autocorrelation. In the case of testing the existence of residuals normality, the Jarque-Bera test was used. It has as a null hypothesis that the residuals are normally distributed. In this case, the result 0.28, implies the no rejection of the null hypothesis and it showed the normal distribution of the residuals.

Table 5: VAR Regression

Variable	Coefficient	Std. Error	t-Statistic	P-value
D(LGDP-1)	0.34	0.12	2.98	0.00
D(LGDP-2)	-2.67	0.09	-3.04	0.00
D(LFDI)	0.04	0.02	2.23	0.03
D(LFDICH)	0.17	0.12	1.36	0.18
D(GKF)	0.37	0.05	7.71	0.00
D(INF.RATE)	0.04	0.01	2.95	0.00
D (GOV.CONSUMP.)	0.24	0.09	2.73	0.01
Constant	-10.90	1.76	-6.20	0.00
R-squared	0.998000			
Prob (F-statistics)	0.000000			
Breusch-Godfrey LM Test	0.473580			
Jarque-Bera (Prob)	0.283840			

Source: Researchers' compilation using Stata 13.0

According to the results, and focusing on the impact of FDI and FDICH on economic growth, we could observe in the model that when FDI grows in 1%, GDP increases by 0.04%; and when FDICH has an increase of 1%, GDP increases by 0.17%. Hence, it shows that the impact of the FDICH is bigger than the impact of the Total FDI in Peru. These kind of results are consistent with the literature, in particular results obtained by Oyatoye et al. (2011) and Alabi (2019) for African countries, which are similar to Peru on the natural resources' endowment. Nevertheless, Ayadi (2007) and Okonkwo et al. (2019), found that FDI impact on Nigeria is not significant, which is explained by the limited infrastructure development in the country. Therefore, human capital development and investment seems important to benefit from technological spillovers associated with FDI.

Regarding the control variables, LGKF had a positive and significant impact on Peru's economic growth, as an increase by 1% is associated with a rise of 0.37% on economic growth. The same results were shown for the United States of America (Makki & Somwaru, 2004), Central and Eastern European countries (Hlavacek & Bal-Domanska, 2016), Nigeria (Alabi, 2019; Babalola et al., 2019), and Tunisia (Bouchoucha & Bakari, 2019). For the case of CPI, it also showed a positive and significant effect on the economic growth of Peru, with an increase of 1% in inflation rate, economic growth increases by 0.04%. Similar studies made in Pakistan (Zaman, 2006; Awan, 2010) and emerging markets (Cai et al., 2019)

found the same results, which meant that a change in the price index over a period of time will encourage foreign investors (Froyen & Waud, 1983; Khan & Sobia, 2019). As for GC, an increase of 1% represents an increase of 0.24% of economic growth. This result was also obtained by Kombui & Kotey (2019), who explained that government expenditure has a positive effect on future benefits through transfer payments, investments, and good and services consumption. Finally, the lagged-economic growth (LGDP-1) had a positive impact, which made the current economic growth to increase by 0.34%.

Conclusions

The primary objective of the study was to make an empirical analysis of the impact of the FDICH on the economic growth of Peru, in the short- and long-run using a time series data from 2001 to 2018. For the economic analysis, the ADF test was used to determine the data stationary, showing that all variables achieved stationary at the level I (0) and at I (1). This supported the use of a Vector Autoregression Model for the short-run analysis. This analysis indicated both a positive relationship between the FDICH and the economic growth of Peru, and a higher impact than Total FDI on Peru. The Co-integration Test result indicated the existence of a long-run relationship between the studied variables for Peru. Moreover, the Granger Causality test revealed a unidirectional causality relationship between the FDICH and the economic growth of Peru. The study included GCF, IR and GC as explanatory variables. The results showed that they had a positive and significant impact on the economic growth of Peru. In light of the findings, Peruvian government should consider the inclusion of the country on the Belt and Road Initiative to increase the foreign investment, especially from China, through a major diversification and benefit from the Chinese interest in our economy.

References

- Adegbite, E. O., & Ayadi, F. S. (2011). The Role of Foreign Direct Investment in Economic Development: A Study of Nigeria. *World Journal of Entrepreneurship, Management and Sustainable Development*, 6, pp. 133 – 147. DOI: 10.1108/20425961201000011
- Akinlo, A. E. (2004). Foreign Direct Investment and Growth in Nigeria: An Empirical Investigation. *Journal of Policy Modeling*, 26, pp. 627 – 639. DOI: 10.1016/j.jpolmod.2004.04.011
- Alabi, K. O. (2019). The Impact of Foreign Direct Investment on Economic Growth: Nigeria Experience. *Open Journal of Applied Sciences*, 9, pp 372 – 385. DOI: 10.4236/ojapps.2019.95031
- Ali, N. & Hussain, H. (2017). Impact of Foreign Direct Investment on the Economic Growth of Pakistan. *American Journal of Economics*, 7, pp. 163 – 170. DOI: 10.5923/j.economics.20170704.01
- Ayadi, F. S. (2007). Foreign direct investment. Retrieve from: <http://www.allbusiness.com>. (accessed on April 4, 2012)
- Awan, M. Z., Khan, B., & Zaman, K. U. (2010). A nexus between Foreign Direct Investment & Pakistan's Economy (Co-Integration & Error Correction Approach). *International Research Journal of Finance and Economics*, 52, pp. 17 – 27.
- Babalola, S. J., Mohd, S., Ehigiamusoe, K. U., & Onikola, H. (2019). Impact of Foreign Direct Investment, Aid and Trade on Economic Growth in Nigeria, *The Journal of Developing Areas*, 53(4), pp. 15 – 32. DOI: 10.1353/jda.2018.0067
- Balasubramanyam, V. N., Salisu, M. A., & Sapsford, D. (1996). Foreign Direct Investment and Growth in EP and IS Countries. *Economic Journal*, 106, pp. 92 – 105. DOI: 10.2307/2234933
- Borensztein, E., De Gregorio, J., & Lee, J. (1998). How Does Foreign Direct Investment Affect Economic Growth. *Journal of International Economics* 45, pp. 115 – 35. DOI: 10.1016/S0022-1996(97)00033-0
- Bouchoucha, N., & Bakari, S. (2019). The Impact of Domestic and Foreign Direct Investment on

- Economic Growth: Fresh Evidence from Tunisia. MPRA Paper 94777, University Library of Munich, Germany.
- Cai, P., Kim, S., & Wu, E. (2019). Foreign direct investments from emerging markets: The push-pull effects of sovereign credit ratings. *International Review of Financial Analysis*. *International Review of Financial Analysis*, 61(C), pp. 110 – 125. DOI: 10.1016/j.irfa.2018.10.006
- CNPC (2014). China Petroleum Corporation. Available at: <http://www.cnpc.com.cn/en/Enla/201407/6071c5f3a3234aa988e1c42ef2ed98e3/files/40c7bffcac4c47658c9ef6c335f66634.pdf> (accessed on March 8, 2019).
- Congress of the Republic of Peru (2002). The privatization process of Hierro Peru. Research committee on economic and financial crimes committed between 1990 and 2001 (In Spanish). First research report. Available at <http://www4.congreso.gob.pe/comisiones/2002/CIDEF/oscuga/InformeHierro.pdf> (Accessed on September, 2019).
- OSINERGMIN (2019). Contract supervision of electricity generation and transmission projects. Available at: http://www.osinergmin.gob.pe/seccion/centro_documental/electricidad/Documentos/Publicaciones/Compendio-Proyectos-GTE-Construccion-febrero-2019.pdf (Accessed on August, 2019).
- De Mello, L. R. (1997). Foreign Direct Investments in Developing Countries and Growth: A Selective Survey. *Journal of Development Studies*, 34, pp. 115 – 35. DOI: 10.1080/00220389708422501
- Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74(366a), pp. 427 - 431. DOI: 10.2307/2286348
- Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: Journal of the Econometric Society*, pp. 1057 - 1072. DOI: 10.2307/1912517
- Dondeti, V. R., & Mohanty, B. B. (2007). Impact of foreign direct investment on the gross domestic product, exports and imports of four Asian countries: A panel data analysis. *Delhi Business Review*, 8(1), 1-21.
- Farrell, R. (2008). *Japanese Investment in the World Economy: A Study of Strategic Themes in the Internationalisation of Japanese Industry*. Edward Elgar, Britain.
- Economic Commission for Latin America and the Caribbean (ECLAC) (2019). *Foreign Direct Investment in Latin America and the Caribbean*. Available at: <https://www.cepal.org/es/publicaciones/44697-la-inversion-extranjera-directa-america-latina-caribe-2019> (Accessed on October, 2019).
- El Peruano Official Daily (2019). Construirán puerto en Chancay con inversión de 3,000 millones de dólares. Available at: <https://elperuano.pe/noticia-construiran-puerto-chancay-inversion-3000-millones-dolares-75033.aspx>
- Froyen, R. T., & Waud, R. N. (1985). Demand Variability, Supply Shocks and the Output-Inflation Tradeoff. *The Review of Economics and Statistics*, 67(1), pp. 9 – 15. DOI: 10.2307/1928429
- Gestion Daily (2018). China Railway won S / 1,240 million project to improve road in Huánuco region. Available at: <https://gestion.pe/economia/china-railway-gano-proyecto-s-1-2400-millones-mejorar-via-region-huanuco-nddc-245619> (Accessed on September, 2019).
- Gestion Daily (2019). Luz del Sur is sold to China Yangtze Power Co. for US \$ 3,590 million. Available at: <https://gestion.pe/economia/empresas/sempra-luz-del-sur-se-vendio-a-china-yangtze-power-co-noticia/> (Accessed on September, 2019).
- Gestion Daily (2019). Odebrecht completed the sale of Chaglla Hydroelectric to a Chinese consortium for US \$ 1,400 million. Available at: <https://gestion.pe/economia/empresas/odebrecht-concreto-venta-hidroelectrica-chaglla-consorcio-chino-us-1-400-millones-265150> (Accessed on August, 2019).
- Hlavacek, P., & Bal-Domanska, B. (2016). *Impact of Foreign Direct Investment on Economic Growth*

- in Central and Eastern European Countries. *Inzinerine Ekonomika-Engineering Economics*, 27(3), pp. 294 – 303. DOI: 10.5755/j01.ee.27.3.3914
- Hung, T. V., & Huong, L. T. M. (2019). Relationship between economic growth and foreign direct investment: The case of Dong Nai Province, Vietnam. *The EUrASEANa: Journal on Global Socio-Economic Dynamics*, 2(15), pp. 50 -59. DOI: 10.35678/2539-5645.2(15).2019.50-59
- Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration - with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52(2), pp. 169 - 210. DOI: 10.1111/j.1468-0084.1990.mp52002003.x
- Johansen S. (1995). *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*. Oxford University Press. Available at <http://www.oxfordscholarship.com/view/10.1093/0198774508.001.0001/acprof-9780198774501> (accessed on March 8, 2019).
- John, E. I. (2016). Effect of Foreign Direct Investment on Economic Growth in Nigeria. *European Business & Management*, 2, pp. 40-46. DOI: 10.11648/j.ebm.20160202.14
- Kalai, M., & Zghidi, N. (2019). Foreign Direct Investment, Trade, and Economic Growth in MENA Countries: Empirical Analysis Using ARDL Bounds Testing Approach. *Journal of the Knowledge Economy*, 10(1), pp. 397 – 421. DOI: 10.1007/s13132-017-0460-6
- Khan, R. U., & Sobia (2019). Does Macroeconomic factors Impact on Foreign Direct Investment in emerging economies? (Pakistan). *International journal of Engineering, Business and Management*, 3(3), pp. 55 – 64. DOI: 10.22161/ijebm.3.3.1
- Kombui, D. N., & Kotey, R. A. (2019). Foreign Direct Investment in an Emerging Economy: Exploring the Determinants and Causal Linkages. *Academic Journal of Economic Studies*, 5(1), pp. 51 – 62.
- Laffineur, C., & Gazaniol, A. (2019). Foreign direct investment and wage dispersion: Evidence from French employer-employee data. *International Economics* 157, pp. 203 - 226. DOI: 10.1016/j.inteco.2018.12.001
- La República Daily (2018). Huánuco: Chinese will invest 500 million dollars in hydroelectric Available at: <https://larepublica.pe/sociedad/1321553-huanuco-chinos-invertiran-500-millones-dolares-hidroelectrica> (Accessed on September, 2019).
- Leite, A., Klotzle, M., Pinto, A., & Da Silva, A. (2018). Size, value, profitability, and investment: Evidence from emerging markets. *Emerging Markets Review*, Elsevier, 36(C), pp. 45 - 59. DOI: 10.1016/j.ememar.2018.04.006
- Louzi, B. M., & Abadi, A. (2011). The Impact of Foreign Direct Investment on Economic Growth in Jordan. *IJRRAS*, 8, pp. 253-258. DOI: 10.14254/2071-8330.2019/12-3/
- Makki, S. S., & Somwaru, A. (2004). Impact of Foreign Direct Investment and Trade on Economic Growth: Evidence from Developing Countries. *Amer. J. Agr. Econ.*, 86(3), pp. 795 – 801. www.jstor.org/stable/3697825
- Ministry of Energy and Mines of Peru (2018). Mining Annual Bulletin. Available at: [http://www.minem.gob.pe/minem/archivos/file/Mineria/PUBLICACIONES/ANUARIOS/2018/AM2018\(VF\).pdf](http://www.minem.gob.pe/minem/archivos/file/Mineria/PUBLICACIONES/ANUARIOS/2018/AM2018(VF).pdf) (Accessed on September, 2019)
- Ministry of Energy and Mines (2018). Mining Statistical Bulletin. Available at: <https://www.minem.gob.pe/minem/archivos/file/Mineria/PUBLICACIONES/VARIABLES/2018/BEMDIC2018.pdf> (Accessed on August, 2019).
- Ministry of Energy and Mines of Peru (2018). Statistic Report of Hydrocarbons. Available at <http://www.minem.gob.pe/estadistica.php?idSector=5&idEstadistica=13105> (Accessed on September, 2019)
- Ministry of Transport and Communications of Peru (2018). Investment Portfolio of the Multiannual Investment Program 2019 – 2022. Available at: http://portal.mtc.gob.pe/estadisticas/inversiones/cartera/Cartera_Inversiones_PMI_2019-2021_31082019.pdf (Accessed on August, 2019)
- Okonkwo, R. I., Egbunike, F. C., & Udeh, F. N. (2015). Foreign Direct Investment and Economic Growth

- in Nigeria. *Developing Country Studies*, 5(9), pp. 47 – 52. DOI: 10.7176/DCS
- Oliveira, M. F., Gomes da Silva, F., Ferreira, S., Teixeira, M., Damásio, H., Ferreira, A. D., & Gonçalves, J. M. (2019). Innovations in sustainable agriculture: Case study of Lis Valley irrigation district, Portugal. *Sustainability*, 11, p. 331. DOI: 10.3390/su11020331
- Osei O., E. E., Ibrahimy, M., & Sare, Y. A. (2019). Foreign Direct Investment, Sectoral Effects and Economic Growth in Africa. *International Economic Journal*, 33(3), pp. 473 – 492. DOI: 10.1080/10168737.2019.1613440
- Osterloh, M. (2019). ¿Cómo América Latina ha sido incluida en La Iniciativa de la Franja y la Ruta por China?. *Revista Andina de Estudios Políticos*, 9 (1), pp. 8-25. Available at: <http://www.iepa.org.pe/raep/index.php/ojs/article/download/225/188/>
- Osterloh, M. (2019). Recuento de las inversiones chinas en Perú en el sector infraestructura 2016-2019. *Los Gigantes del Asia Blog*. Available at <https://alertaeconomica.com/recuento-de-las-inversiones-chinas-en-peru-en-el-sector-infraestructura-2016-2019/>
- Oyatoye, E. O., Arogundade, K. K., Adebisi, S. O., & Oluwakayode, E. (2011). Foreign direct investment, export and economic growth in Nigeria. *Journal of Humanities and Social Sciences*, 2(1). <http://ir.unilag.edu.ng:8080/xmlui/handle/123456789/2784>
- Pearsan, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, 94, pp. 621 - 634. DOI: 10.1080/01621459.1999.10474156
- PROINVERSION (2018). Foreign Direct Investment Statistics. Available at: <https://www.investinperu.pe/modulos/JER/PlantillaStandard.aspx?are=1&prf=0&jer=6037&sec=17> (Accessed on September, 2019)
- Ram, R., & Zhang, K. H. (2002). Foreign direct investment and economic growth: Evidence from cross-country data for the 1990s. *Economic Development and Cultural Change*, 51(1), pp. 205 – 215. DOI: 10.1086/345453
- Razza, S. A., Shah, N., & Arif, I. (2019). Relationship between FDI and Economic Growth in the Presence of Good Governance System: Evidence from OECD Countries. *Global Business Review*, 5. DOI: 10.1177/0972150919833484
- Ruiz, A. (2002). The privatization process in Peru during the period 1991-2002. *Latin American and Caribbean Institute for Economic and Social Planning of ECLAC. Public Management Series Publications* N° 22. Available at https://repositorio.cepal.org/bitstream/handle/11362/7273/1/S027489_es.pdf (Accessed on September, 2019).
- Sanborn, C., & Chonn V. (2016). Chinese investment in the Peruvian mining industry: Blessing or curse? *China in Latin America: Lessons for south-south cooperation and sustainable development. Discussion Paper 2015-8. Universidad del Pacifico, Boston University.* <https://www.bu.edu/pardeeschool/files/2014/12/Peru2.pdf>
- Shahzad, A. (2006). What is Globalization - Historical Background. *Jadavpur Journal of International Relations*, 10(1), pp. 204 – 212. DOI: 10.1177/0973598406110013
- Srivastava, S., & Talwar, S. (2020). Decrypting The Dependency Relationship Between the Triad of Foreign Direct Investment, Economic Growth And Human Development. *The Journal of Developing Areas*, 54(2), pp. 1 – 14. DOI: 10.1353/jda.2020.0012
- Solow, R. M. (1957). Technical Change and the Aggregate Production. *Review of Economics and Statistics*, 39, pp.312–20. DOI: 10.2307/1926047
- Stoner, J. A. F., Freeman, R. E., & Gilbert, D. R. (2001) *Management*. Pearson, 2 edition: 656 pages. Retrieved from: <https://books.google.com/books?id=-QmRAAAACAAJ>.
- Sultanuzzaman, M. R., Hongzhong, F., Banban, W., Miraj, A. B., & Adnan, K. M. M. (2019). Trade (exports) as an opportunity for Bangladesh: A VECM analysis. *The International Trade Journal* 33(1), pp. 95 - 110. DOI: 10.1080/08853908.2018.1511489
- Susilo, D. (2018). The Impact of Foreign Direct Investment on Economic Growth (a Causal Study in the

- United States). BISE: Jurnal Pendidikan Bisnis dan Ekonomi, 4(1), pp. 50 – 63. DOI: 10.20961/bise.v4i1.21422
- UNCTAD (2012). World Investment Report: Towards a New Generation of Investment Policies. Retrieved from unctad.org/en/Publications_Library/wir2012_embargoed_en.pdf
- Yates, N. (2002). Globalization and Social Policy: From Global Neoliberal Hegemony to Global Political Pluralism. *Global Social Policy*, 2(1), pp. 69 – 91. DOI: 10.1177/1468018102002001095
- Zaman, K., Hashim, S., & Awan, Z. (2006). Economic Determinants of Foreign Direct Investment in Pakistan. *Journal of Humanities and Social Sciences*. University of Peshawar, Peshawar.
- Zanabria, L.; Aquino, C. (2015). Las Relaciones entre el Peru y China. La Política Exterior Peruana en el siglo XXI: Agenda y Propuestas. Instituto de Estudios Internacionales de Pontificia Universidad Católica del Perú (IDEI), Konrad Adenauer Stiftung. pp. 87-99.
- Zhang, K. H. (2001). Does Foreign Direct Investment promote economic growth? Evidence from East Asia and Latin America. *Contemporary Economic Policy*, 19(2), pp. 175 – 185. DOI: 10.1111/j.1465-7287.2001.tb00059.x

Annex 1. Main Chinese investments in Peru. 2005 – 2019

Year	Investor	Project	Sector
2005	China National Petroleum Corporation CNPC - SAPET	Lot 111 (Madre de Dios region)	Oil and Gas
2007	Aluminium Corporation of China (CHINALCO)	Toromocho (Junín region)	Mining Copper
	Zijing Mining Group	Rio Blanco (Piura region)	Mining Copper
2008	China Minmetals Corp. and Jiangxi Copper Corp.	El Galeno (Cajamarca region)	Mining Copper, silver, gold, molybdenum
2009	Shougang Corporation	Marcona Expansion (Ica)	Mining Iron
	Nanjinzhao Group	Pampa de Pongo	Mining
2010	Bank of China	China Desk Peru	Finance
	Industrial and Commercial Bank of China (ICBC)		Finance
2011	Baiying Nonferrous Group and Shougang Corporation	Minera Shouxing Peru Tailings Exploitation	Mining
2012	China National Petroleum Corporation CNPC - SAPET	Lot 1AB (45% of shares) (Loreto region)	Oil and Gas
	China National Petroleum Corporation CNPC - SAPET	Lot 8 (27% of shares, Loreto region)	Oil and Gas
	China National Petroleum Corporation CNPC - PetroChina	Lot X (Piura region) Lot 58 (Cusco region)	Oil and Gas
	China National Petroleum Corporation CNPC - PetroChina	Lot 57 (46.16% of shares, Cusco region)	Oil and Gas
	Pacific Andes International Holdings Ltd./ China Fishery Group		Fishing
2014	MMG Ltd	Las Bambas (Apurímac region)	Mining Copper
2016	Hydro Global Peru S.A.C (China Three Gorges Corporation) Energías de Portugal S.A	San Gabán III Hydroelectric Power Plant	Electricity
2017	Hidroviás II Consortium: SINOHYDRO (China) Construcción y Administración S.A. (Perú)	Amazon Waterway	Transport
	GMC Consortium: Yangtze Optical Fiber and Cable Company Limited YOFC (Hong Kong, 51%);	Broadband Installation for Amazonas and Ica regions.	Telecommunications

	GMC Telecom (Peru, 24%); SATEL (Peru, 25%)		
2018	YOFC Consortium (Hong Kong) and Yachay Telecomunicaciones (Perú).	Broadband Installation for La Libertad, Ancash and Arequipa regions.	Telecommunications
	China Railway 20 Bureau Group Corporation	Improvement and conservation of the Huánuco - La Unión - Huallanca road	Transport
2019	China Three Gorges and Energías de Portugal	Chaglla Hydroelectric Power Plant	Electricity
	Cosco Shipping Ports (China, 60% and Volcán Compañía Minera (Perú)	Chancay Port	Logistics infrastructure
	China Yangtze Power Co. (83.6% of shares)	Luz del Sur Electric power distribution company	Electricity

Sources: Author's elaboration based on Sanborn, & Chonn (2016); Ministry of Energy and Mines (2018); Ministry of Transport and Communications (2019); La Republica Daily; Gestion Daily.



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