Decision Science Letters 11 (2022) 379–390

Contents lists available at GrowingScience

Decision Science Letters

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Peru-China international trade and its effect on inclusive economic growth in Peru 2000-2019

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C H R O N I C L E

Article history:
Received May 20, 2022
Received in revised format:
June 20, 2022
Accepted August 27 2022
Available online
August 27, 2022

Keywords:
International Trade
Inclusive Economic Growth
Inclusion
Ordinary Least Square Model

A B S T R A C T

From 2000 to 2019, trade between the People's Republic of China and the Republic of Peru grew at an average annual rate of 22%, however, income and wealth inequality in Peru remained the same. The aim of this study is to understand the effect of trade between Peru and China on the inclusive economic growth of Peru from 2000 to 2019. The method used was the correlation of variables, and a linear regression between Peru and China trade and several indicators of inclusive economic growth in the Peruvian economy was performed using the Ordinary Least Squares model. The results suggest that there is sufficient statistical evidence to support that inclusive economic growth may depend on increased trade between Peru and China; the study show that if trade growth between Peru and China fluctuates by $1 million per year, labor income will increase by $10.3 per capita in the Economically Active Population (EAP). Moreover, for every 1% increase in trade between Peru and China, GDP per capita increases by 0.1057% and labor productivity increases by 0.0681740%. The variables poverty, vulnerable employment, GINI index and life expectancy at birth were not significant factors.

1. Introduction

China's rapid growth and positioning as an economic power have been some of the most studied phenomena in recent years. Between 1990 and 2010, China averaged 10% annual gross domestic product growth (World Bank, 2021). While China is an avid consumer of natural resources and its demand has had a significant impact on primary product markets, the country has also become a large global factory and its manufactured exports compete in all markets of the world. Like other Latin American countries, Peru has felt the positive and negative effects of China's growth on the evolution of the Peruvian economy, whether in exports of primary products to China, imports of capital and consumer goods, and Chinese direct investment focused mainly on the mining sector. According to the Ministry of Foreign Trade and Tourism (MINCETUR, 2021) China is Peru's primary trading partner of Peru covering 31.5% of trade of goods. This trade is mainly based on the export of minerals and fishery goods and the import of machinery, vehicles, and equipment. According to data from the National Superintendence of Tax Administration (known as the SUNAT, its Spanish acronym), between 2000 and 2005 the main product exported from Peru to China was Fishmeal. From 2006 to 2019 the primary exports were copper minerals and their concentrates. The FOB value of this product in 2019 US$ 8,354 million US dollars (SUNAT, 2020).

Regarding imports, in the year 2000 the main products imported from China were coke and semi-coke of coal. From 2001 to 2005 the primary imports were transmission equipment for radio broadcasting, as well as image and sound recording and reproducing equipment. From 2006 to 2019 the main products imported to Peru were mobile phones; the CIF value of this product in 2019 was US$ 849 million. According to the official data from SUNAT, trade between Peru and China has

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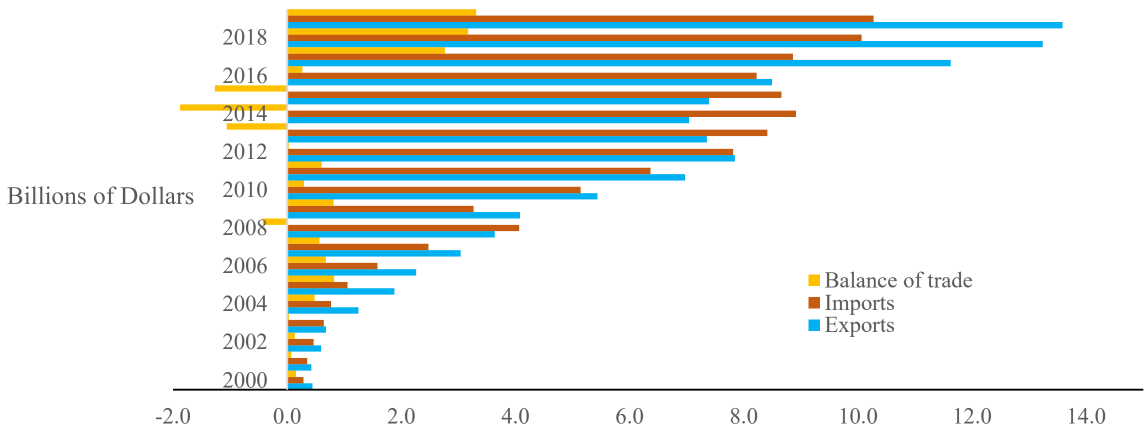
doi: 10.5267/dsl.2022.8.003

shown an average growth of 22% between 2000 and 2019; in 2019, Peru exported US$13.584 billion dollars to China and imported US$10.273 billion dollars from China, as seen in Fig. 1.



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Balance of trade	0.16	0.07	0.13	0.03	0.48	0.82	0.68	0.57	-0.4	0.81	0.30	0.61	0.03	-1.0	-1.8	-1.2	0.27	2.77	3.17	3.31
Imports	0.29	0.35	0.46	0.65	0.77	1.06	1.58	2.47	4.07	3.27	5.14	6.37	7.82	8.41	8.92	8.66	8.23	8.86	10.0	10.2
Exports	0.44	0.43	0.60	0.68	1.25	1.88	2.26	3.04	3.64	4.08	5.44	6.97	7.84	7.35	7.04	7.39	8.49	11.6	13.2	13.5

Fig. 1. Balance of Trade Peru - China 2000 - 2019 (USD Billions)
Note. Adapted from SUNAT (2020). Statistics and Studies. Exports and Imports.

Peru has registered continuous and stable GDP growth over the last 30 years; since 2014 this annual growth has ranged between 2% and 3% (World Bank, 2022). However, there has been no similar improvement in terms of inclusiveness. In 2002 the Gini index was 0.54, and by 2020 it had fallen to only 0.46 (CEPAL, 2021). Figures 2 and 3 show the evolution of trade between Peru and China and the distribution of income and wealth for the top 1%, top 10% and the bottom 50% of Peruvian society from 2000 to 2019, respectively. These figures illustrate that, despite an increase in trade with China, the distribution of income and wealth in Peru has not improved. Income and wealth are mainly concentrated in the 1% and 10% of the population with higher incomes (Top 1% and Top 10%), which places them in a much better position than the 50% of the population with lower incomes (Bottom 50%).

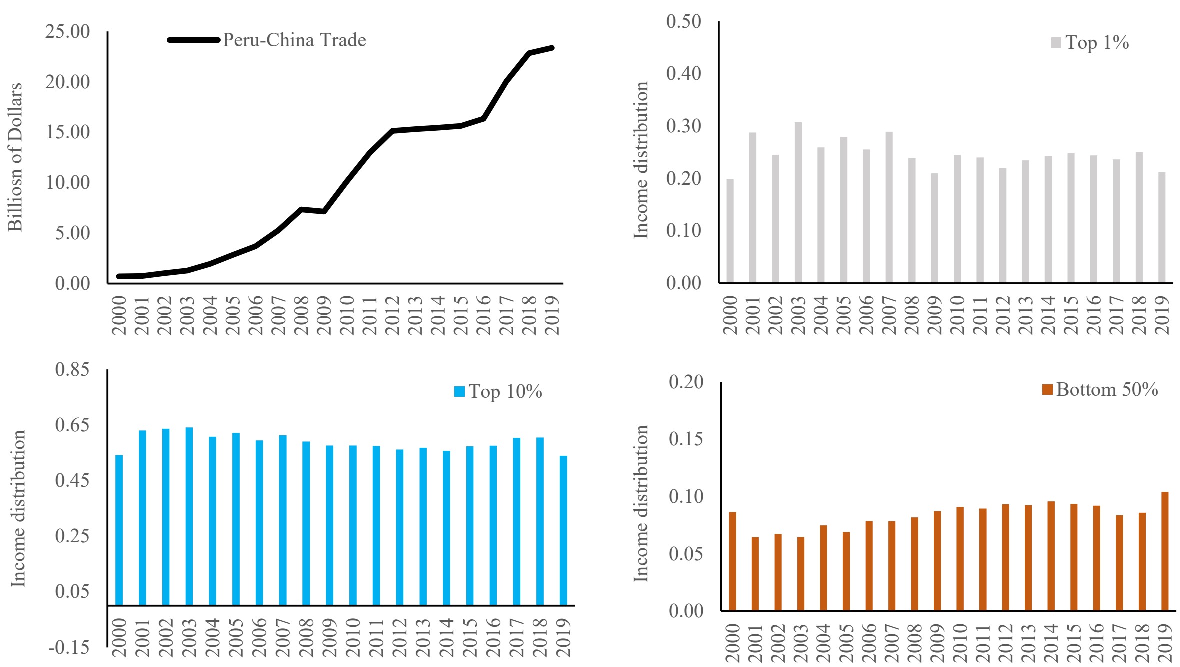


Fig. 2. Income Distribution and Peru – China Trade 2000-2019
Note. Author's elaboration with World Bank (2020) data and The World Inequality Database (2020)

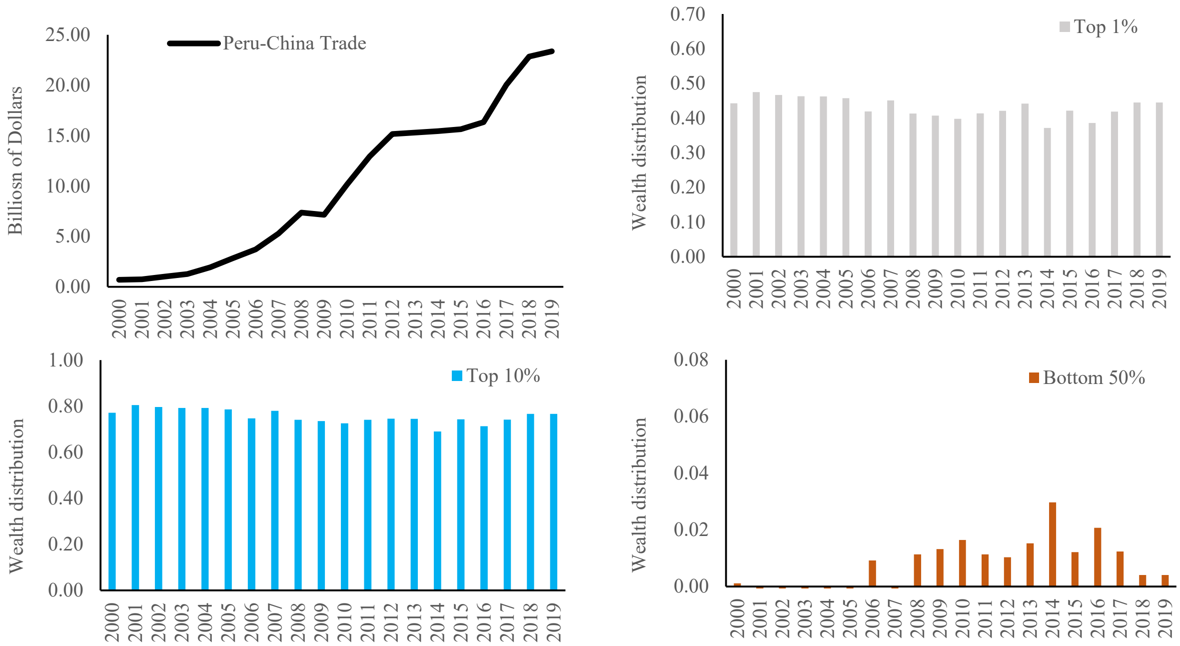


Fig. 3. Wealth Distribution and Peru – China Trade 2000-2019
Note. Author's elaboration with World Bank (2020) data and The World Inequality Database (2020).

Increasing the income of the poorest sectors of society--especially in developing countries--requires economic growth and fair distribution of resources (PNUD, 2020). Inclusive economic growth is defined as a "mass economic progress that is financially and environmentally sustainable and participatory through job creation, social protection and public infrastructure development" (Mitra & Das, 2018, p. 3). This term was first introduced in 2000 by Kakwani & Pernia (2000) who describes inclusive economic growth as growth that allows poor people to participate actively and benefit from economic activity, ensuring that all people have access to the minimum basic needs. However, the benefits of economic growth are not always distributed equally in society (Jalles & De Mello, 2019). According to CEPAL (2019), Latin America is the most unequal region in the world due to the great income inequality in their societies, which represents an obstacle to social welfare and development. Over the years, different authors have proposed a wide variety of theories on economic growth, inclusive economic growth, and trade. Regarding economic growth, Samuelson & Nordhaus (2009) mention that living standards in households have undergone drastic changes in recent decades with respect to the variety, quality and quantity of goods and services available to them—what they call "the human face of economic growth" (p. 501). Moreover, they claim that, in the long run, economic growth is the most important factor for the success of nations, and consequently is always the objective of policies. On the other hand, Prebisch (1970) argues that in Latin America, achieving growth requires international cooperation; developed countries—even being small and relying on domestic savings—can grow without having to rely on foreign capital because their progress is not subject to a regular inflow of international funds. The same applies to foreign trade since developing countries are also dependent on developed countries, but developed countries prevent changes in foreign trade policy from affecting their growth. In view of this, Prebisch proposes that the countries of the region gradually change their dependence, but they should not wait to reach the stage of developed countries.

Regarding International Trade, Krugman et al. (2012) mention that this allows two countries to benefit even if one is more productive than the other, and it allows specialization in the production of certain products. Heckscher - Ohlin's factors are explained through their model, which is considered one of the most important on the theory of international trade. Along these lines, according to Huang et al. (2022) the influence of international trade on income inequality depends on different factors, such as the stage of development of the country in question, they illustrate this argument with the Heckscher-Ohlin standard model (HO), which anticipates that trade decreases inequality in emerging countries but increases it in developed ones; finally, these authors state that in countries with medium and high income, there is evidence that international trade reduces income inequality in both, middle as well as in high-income countries, but that in low-income countries it is statistically insignificant for inequality. In addition, Krugman et al. (2012) mentions that trade improves the relationship between the scale of production and the variety of a nation's goods, and in addition, that the integration of international markets impacts in the same way as the growth of a market in a single country. However, in relation to Inclusive Economic Growth, Deaton (2005) notes that according to information from national accounts and the World Bank, poverty reduction around the globe was minimal in reference to the average growth of each country. In the same line, Piketty and Saez (2006) point out that only taxes were considered as an indicator to evaluate the distribution of income, resulting in a homogeneous data among countries for decades; just considering the tax aspect of the income assessment resulted in distortions and false data. Sen (2000) links social exclusion with capacity deprivation. This is because many exclusion problems are mainly due to poor inclusion criteria and low participation rates, rather than being seen as an exclusion problem. Regarding income and wealth inequality, Stiglitz (2016) argues that inequality has increased, and that excessive economic inequality tends to generate weak economic growth; he adds that wealth and income inequality increase in crisis situations, where the rich get richer in the short term.

Banerjee & Duflo (2003) demonstrated that there is an inverted U-shaped association between expected growth and changes in inequality, meaning that changes in inequality are associated with lower growth in the following period. This supports the hypothesis of Kuznets (1955), also known as "Kuznets Curve", that charts the nonlinear relationship between income inequality and per capita income. Where per capita income increases, income inequality will also increase; however, after reaching a certain level of income, inequality decreases. From the perspective of Topuz (2022), the complexity of the association of income inequality with economic growth is that the effects may change depending on the income levels of each country. The World Bank (2008) mentions that the benefits of rapid growth are widely distributed and not equally, as urban dwellers generally earn more. CEPAL (2018) considers the Gini index as a tool to measure inequality in income distribution. For its part, the International Monetary Fund (FMI, 2017) suggests policies for inclusive growth in the face of growing inequality heavily influenced by technological changes. The IMF also proposes a series of variables such as trade, productivity, gender equality and debt management as key to essential inclusive development globally. In addition, the World Economic Forum (WEF, 2017) argues that inclusive economic growth goes far beyond a strategy to expand economic opportunities and prosperity. It proposes three dimensions for measuring inclusive economic growth: (i) Growth and Development, which considers as indicators GDP per capita, life expectancy at birth, labor productivity and vulnerable employment rate; (ii) Inclusion, which considers average income per household, poverty rate, GINI income and GINI wealth, and (iii) Intergenerational Equity and Sustainability, which considers public debt, adjusted net savings, dependency ratio and carbon intensity of GDP (WEF, 2018).

In the Peruvian context, Varona-Castillo & Gonzales-Castillo (2021) mention that the increase in tax revenues, investment in human capital, innovation and technology, among others, influence the growth of income distribution. Since the tax system in Peru is known to be insufficient and unequal, the authors recommend deepening the tax reform with policies against tax avoidance, evasion, or exoneration; in this way, higher income would be obtained to prioritize investment in human capital. For their part, Bazán et al. (2014) argue that one of the purposes of public policy is social inclusion; however, science, technology and innovation have recently been identified as factors that help reduce exclusion. Despite this, Peru's national innovation system lacks the necessary conditions to make an important impact on inclusive development. The authors argue that to design policies that aim at an inclusive development process, where all citizens can meet their needs and lead a decent life, it is necessary to identify places in which innovation has a definitive role. Traditional and endogenous growth theories reinforce the benefits of trade generated by a distribution optimization of resources, greater incentives to develop Technology, and greater economies of scale (Kang et al., 2017). In this regard, the studies of Redmond & Nasir (2020) and Adeleye et al. (2021) found out that international trade has a positive effect on economic growth. Lederman (2013) and Kang et al. (2017) found out that international trade has positive effects on inclusive growth. In contrast, Ratnayake (2019) concluded that an enlargement of trade and investment would not produce greater inclusive development, but instead that it is necessary to apply complementary policies and an opening of the economies of each country.

The present study considers it necessary to take into account the indicators of the first two dimensions proposed by the WEF for inclusive economic growth. Thus, using the method of Ordinary Least Squares, we seek to identify the effect of international trade between Peru and China on inclusive economic growth. In this context, the following hypotheses are proposed:

H_1. There is a positive effect of international trade between Peru and China on labor income.
H_2. There is a positive effect of international trade between Peru and China on poverty.
H_3. There is a positive effect of international trade between Peru and China on the Gini index.
H_4. There is a positive effect of international trade between Peru and China on GDP per capita.
H_5. There is a positive effect of international trade between Peru and China on labor productivity.
H_6. There is a positive effect of international trade between Peru and China on employment.
H_7. There is a positive effect of international trade between Peru and China on life expectancy at birth.

2. Methodology

The research work for this study utilizes a quantitative approach, with a nonexperimental design, of longitudinal cut. The study period includes 20 years, from 2000 to 2019, considering annual data. The analysis unit is made up of the monetary value of primary goods exported from Peru to China in the period 2000 -2019; the level of monetary imports of the main goods imported from China; inclusive economic growth of the Peruvian economy with its different dimensions and indicators. The data collection technique used is Documentary Analysis, since the collection, selection, and analysis of data was carried out from secondary sources. The statistical analysis technique applied in the study is a multiple linear regression, considering eight indicators of inclusiveness: (i) labor income, (ii) poverty ratio, (iii) GINI income, (iv) GINI wealth, (v) GDP per capita, (vi) labor productivity, (vii) vulnerable employment rates, and (viii) life expectancy at birth. The analysis is carried out using data from Peru between 2000 and 2019. The independent and dependent variables are presented in Table

1. In addition, Appendix A shows the summary data table for the application of the econometric model for the "independent and dependent variables".

Table 1
Description and code of Variables

Code	Description of Variables
CPC	Peru – China Trade
CCPC	Peru – China Trade growth
DCPC	Peru – China Trade difference
EVN	Life expectancy at birth
CEVN	Life expectancy at birth growth
CGINI	Gini indicator growth
POB	Poverty
CPOB	Poverty growth
TE	Rate of vulnerable employment
CTE	Rate of vulnerable employment growth
PL	Labor productivity
CPL	Labor productivity growth
PIBP	Gross Domestic Product per capita
CPIBP	Gross Domestic Product per capita growth
ING	Labor income
DING	Labor income difference
MCO	Method of ordinary least squares
CEVN(-1)	Growth in life expectancy at birth t-1
AR(1)	First order autoregressive

Note. Author's elaboration.

This study uses the Ordinary Least Squares (OLS) method to perform linear regressions between Peru-China trade data and Peru's social inclusion indicators. The principle of least squares is based on the population regression function (PRF), as detailed below.

$$Y_i = \beta_1 + \beta_2 X_i + u_i \tag{1}$$

However, this PRF, being not directly observable, is calculated from the following sample regression function (SRF), where $\hat{\beta}_1 + \hat{\beta}_2$ are known as the least squares estimators derived from this principle:

$$Y_i = \hat{\beta}_1 + \hat{\beta}_2 X_i + \hat{u}_i \tag{2}$$

The statistical properties of the OLS are based on the seven assumptions raised in the classical linear regression model (CLRM) and "are endorsed by the famous Gauss-Markov theorem" (p. 69).

The variables have been treated in order to meet the assumptions of the regression model by the method of Ordinary Least Squares (OLS); in addition, for the tests of unit root it was determined that they had tendency and intercept, making an estimate of each variable with its trend and intercept.

3. Results

The regressions were made by applying the OLS method, since it is the best model to fit the data used and the purposes of the present investigation. In addition, it is important to clarify that the objective of the investigation is not to obtain the determinants of each dependent variable, but the effect that CPC has on these; the result of R^2 and R^2 adjusted are not relevant to the investigation, since CPC is insufficient as a variable to explain each dependent variable decisively. It is therefore clear that the estimated models are not correctly specified.

As previously seen, regression must consider variables in the first differences of both income and trade between Peru and China, since in this condition they do not have a unitary root.

Table 2
Regression of DING and DCPC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DCPC	0.0000103	0.00000316	3.276215	0.0042

Note. Author's elaboration using Eviews 10 software.

Regarding the labor income (ING) variable, the regression in Table 2 shows that the DCPC variable is significant because it has a p value less than 0.05, and has a positive coefficient of 0.0000103, which indicates that it has a positive effect with the DING variable. The model has an R-squared of 0.03 which is relatively low, this is because the purpose of the model generated for the present research is not to find the determinants that explain the DING variable, but rather to determine the impact that trade between Peru and China has on this variable. Through the Jarque-Bera test, the estimated residuals have a normal distribution (p-value greater than 5%), with a p-value = 0.1114, so the results of the estimation using the OLS method are robust.

Table 3

Heteroscedasticity test

Heteroskedasticity Test White			
F-statistic	0.132934	Prob. F(1,17)	0.7199
Obs*R-squared	0.147420	Prob. Chi-Square (1)	0.7010
Scaled explained SS	0.267464	Prob. Chi-Square (1)	0.6050

Note. Author's elaboration using Eviews 10 software.

Table 3 illustrates the probability that the null hypothesis is accepted (Ho: Homoscedasticity) for the heteroskedasticity White test is greater than 5% (71.99%), which implies that it is accepted as the null hypothesis of homoscedasticity. In this sense, the parameters of the estimate are consistent, efficient, and unbiased.

Additionally, this estimate does not have autocorrelation or serial correlation of the residues, this can also be verified with the Breush-Godfrey serial correlation test, where the probability of accepting the serial noncorrelation between residues and the explanatory variable is greater than 5% at any level.

The regression of the Gini indicator that was performed for the present research used the growth of GINI (CGINI) and the growth of CPC (CCPC).

Table 4

Regression of CGINI and CCPC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CCPC	-0.038620	0.020466	-1.887050	0.0754

Note. Author's elaboration using Eviews 10 software.

The regression in Table 4 shows that the CCPC variable is not significant since it has a p value greater than 5%. Through the Jarque-Bera test, the estimated residuals have a normal distribution (p-value greater than 5%), with a p-value = 0.3473, so the results of the estimation using the OLS method are robust.

Table 5

Heteroscedasticity test

Heteroskedasticity Test White			
F-statistic	2.281704	Prob. F(1,17)	0.1493
Obs*R-squared	2.248369	Prob. Chi-Square (1)	0.1338
Scaled explained SS	2.443701	Prob. Chi-Square (1)	0.1180

Note. Author's elaboration using Eviews 10 software.

Table 5 illustrates that the probability that the null hypothesis is accepted (Ho: Homoscedasticity) for the heteroskedasticity White test is greater than 5% (14.93%), which implies that it is accepted as the null hypothesis of homoscedasticity. In this sense, the parameters of the estimate are consistent, efficient, and unbiased. In addition, this estimate does not have autocorrelation or serial correlation of the residues. This can also be verified with the Breush-Godfrey serial correlation test, where the probability of accepting the serial noncorrelation between residues and the explanatory variable is greater than 5%, at any level. The regression for the PIBP variable, which was performed for the present research, used the growth of PIBP (CPIPB) and the growth of CPC (CCPC), as dependent and independent variables, respectively.

Table 6

Regression of CPIBP and CCPC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CCPC	0.105673	0.025189	4.195152	0.0006
C	0.014786	0.007018	2.106861	0.0503

Note. Author's elaboration using Eviews 10 software.

The regression in Table 6 shows that the CCPC variable is significant because it has a p value less than 0.05. It has a positive coefficient of 0.105673, which indicates that it has a positive effect with the CPIBP variable. Through the Jarque-Bera test, the estimated residuals have a normal distribution (p-value greater than 5%), with a p-value = 0.7119, so the results of the estimation using the OLS method are robust.

Table 7

Heteroscedasticity test

Heteroskedasticity Test White			
F-statistic	0.351559	Prob. F(2,16)	0.7089
Obs×R-squared	0.799806	Prob. Chi-Square (2)	0.6704
Scaled explained SS	0.344667	Prob. Chi-Square (2)	0.8417

Note. Author's elaboration using Eviews 10 software.

Table 7 shows that the probability of accepting the null hypothesis (Ho: Homoscedasticity) for the heteroskedasticity White test is greater than 5% (70.89%), which implies that we accept the null hypothesis of homoscedasticity. In this sense, the parameters of the estimate are consistent, efficient, and unbiased. In addition, this estimate does not have autocorrelation or serial correlation of the residues. This can also be verified with the Breush-Godfrey serial correlation test, where the probability of accepting the serial correlation between residues and the explanatory variable is greater than 5% at any level.

The regression for the PL variable, which was performed for the present research, used the growth of PL (CPL) and the growth of CPC (CCPC) as dependent and independent variables, respectively.

Table 8
Regression of CPL and CCPC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CCPC	0.068174	0.028005	2.434357	0.0262
C	0.015621	0.007802	2.002067	0.0615

Note. Author's elaboration using Eviews 10 software.

The regression in Table 8 shows that the CCPC variable is significant because it has a p value less than 0.05, and a positive coefficient of 0.068174, which indicates that it has a positive effect on the CPL variable. Through the Jarque-Bera test, the estimated residuals have a normal distribution (p-value greater than 5%), with a p-value = 0.3676, so the results of the estimation using the OLS method are robust.

Table 9
Heteroscedasticity test

Heteroskedasticity Test White			
F-statistic	0.378682	Prob. F(1,17)	0.5465
Obs×R-squared	0.414010	Prob. Chi-Square (1)	0.5199
Scaled explained SS	0.336906	Prob. Chi-Square (1)	0.5616

Note. Author's elaboration using Eviews 10 software.

In addition, Table 9 illustrates that the probability that the null hypothesis is accepted (Ho: Homoscedasticity) for the heteroskedasticity White test is greater than 5% (54.65%), which implies that it is accepted as the null hypothesis of homoscedasticity. In this sense, the parameters of the estimate are consistent, efficient, and unbiased.

In addition, this estimate does not have autocorrelation or serial correlation of the residues. This can also be verified with the Breush-Godfrey serial correlation test where the probability of accepting the serial correlation between residues and the explanatory variable is greater than 5% at any level.

The regression for the TE variable, which was performed for the present research, used the growth of TE (CTE) and the growth of CPC (CCPC) as dependent and independent variables, respectively.

Table 10
Regression of CTE and CCPC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CCPC	-0.020514	0.014278	-1.436797	0.1679

Note. Author's elaboration using Eviews 10 software.

The regression in Table 10 shows that the CCPC variable is not significant to explain CTE because it has a p value greater than 0.05. The regression for the EVN variable, which was performed for the present research, used the growth of EVN (CEVN) and the growth of CPC (CCPC) as dependent and independent variables, respectively.

Table 11
Regression of CEVN and CCPC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004198	0.001323	3.172108	0.0063
CCPC	-0.000078	0.000223	-0.351421	0.7302

Note. Author's elaboration using Eviews 10 software.

The regression in Table 11 shows that the CCPC variable is not significant to explain CEVN because it has a p value greater than 0.05.

Table 12
Regression of CPOB and CCPC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CCPC	0.129440	0.148759	0.870134	0.3963
C	-0.121715	0.041445	-2.936752	0.0092

Note. Author's elaboration using Eviews 10 software.

The regression in Table 12 shows that the CCPC variable is not significant to explain CPOB because it has a p value greater than 0.05.

As for the proposed hypotheses, Table 13 illustrates that three hypothesis have p <0.05; therefore, the proposed hypotheses H1, H4 and H5 are accepted, and the hypotheses H2, H3, H6 and H7 are rejected, since their p-value>0.05.

Table 13

Results of the hypothesis test of the variables in the model

Hypothesis	T statistic	p-value	Decision
H1: Trade → ING	3.276215	0.0042	Accept H1
H2: Trade → POB	0.870134	0.3963	Reject H2
H3: Trade → CGINI	-1.887050	0.0754	Reject H3
H4: Trade → PIBP	4.195152	0.0006	Accept H4
H5: Trade → PL	2.434357	0.0262	Accept H5
H6: Trade → TE	-1.436797	0.1679	Reject H6
H7: Trade → EVN	-0.351421	0.7302	Reject H7

Note. Author's elaboration using Eviews 10 software.

4. Discussion

This study found that Peru-China trade has a positive effect on labor income, corroborating H1. If Peru-China trade varies positively by USD 1,000,000, then the income from labor will increase by USD 10.3. These results are consistent with those obtained by Vo & Nguyen (2021), who showed that international trade has a significant effect on the per capita income of rural households with a significance of 10%.

In addition, if Peru-China trade growth increases by 1%, GDP per capita growth would increase by 0.1057%, corroborating H4. Studies by Kang et al. (2017) showed that trade is a significant determinant at 1% for GDP per capita. Studies by Nguyen Viet (2014) also showed that trade facilitation increases GDP per capita, since an extra document required for imports and exports is related with a reduction of GDP per capita by an equivalent of 2.9% and 1.5%, respectively.

Furthermore, the additional effect of a 1% increase for Peru-China trade on labor productivity growth is 0.0681740%, corroborating the H5. In this line, the studies of Asada (2020) showed that there is a long-term relationship between labor productivity and international trade with a significance of 1%.

Likewise, it was found that Peru-China trade is not a significant variable to explain the variable growth of the GINI index, rejecting the H3. Along these lines, studies by Kang et al. (2017) showed that trade is not a significant determinant for net Gini index in South Korea. In contrast, the studies of Nguyen Viet (2014) determined that trade facilitation reduces inequality, since an extra document or day required for imports or exports would reduce the Gini index by 0.4 and between 0.22 and 0.25 percentage points, respectively.

In addition, Peru-China trade is not a significant variable to explain the vulnerable employment rate indicator, rejecting the H6. In contrast, the studies of Ratnayake (2019) reflect that the rate of participation in employment is significantly related to the interactions of the participation of intermediate goods in total imports; for example, if the share of intermediate goods in total imports was 22%, the rate of participation in employment would increase slightly, going from 58.42% to 58.55%.

On the other hand, Peru-China trade is not a significant variable to explain the percentage variation in life expectancy at birth, rejecting H7. On the contrary, the studies of Tahir (2020) showed that the opening of trade has a positive and significant impact on the life expectancy of the population of China, since it is significant at 1% and statistically different from zero.

Finally, Peru-China trade is not significant to explain the poverty indicator, rejecting H2. In line with the results obtained, the studies of Fambeu (2021) showed that openness to trade is not a significant variable in determining poverty since both variables are not highly correlated. In contrast, the studies of Nguyen Viet (2014) determined that trade facilitation reduces poverty, since an additional document or day required for imports or exports can be associated with an increase of 0.77 and between 0.49 and 0.47 percentage points in the poverty rate, respectively.

Given the evidence of the regressions made, there is enough statistical evidence to argue that trade between Peru and China can affect inclusive economic growth in Peru. This result is consistent with that found by Khan et al. (2016), who demonstrated that trade has a positive effect, and it is significant at 10 percent on inclusive growth. However, this result differs from the results obtained by Osabohien et al. (2021), finding that trade opening reduces the process of inclusive growth by 1.91%, and those of Adeleye et al. (2021) demonstrating that trade openness is a positive predictor and statistically significant of economic growth, however does not have a significant impact on inclusive growth (The total impact of trade on inclusive growth was determined to be -0.0535).

5. Conclusions

In light of the above econometric analysis, we conclude that the growth of Peru-China trade directly, positively, and significantly influences four of the seven analyzed indicators of inclusive economic growth: Labor Income, Real GDP per capita, and Labor Productivity. On the contrary, the growth of Peru-China trade is not relevant to explain the indicators of the Vulnerable Employment Rate, the Gini index, life expectancy at birth and poverty. Therefore, we conclude that inclusive economic growth is affected by the growth of trade between Peru and China.

References

Adeleye, B. N., Adedoyin, F., & Nathaniel, S. (2021). The criticality of ICT-trade nexus on economic and inclusive growth. *Information Technology for Development*, *27*(2), 293–313. https://doi.org/10.1080/02681102.2020.1840323

Asada, H. (2020). Effects of Foreign Direct Investment and Trade on Labor Productivity Growth in Vietnam. *Journal of Risk and Financial Management*, *13*(9), 204. https://doi.org/10.3390/jrfm13090204

Banerjee, A. v, & Duflo, E. (2003). Inequality and Growth: What Can the Data Say? *Journal of Economic Growth*, *8*(3), 267–299. https://doi.org/10.1023/A:1026205114860

Bazán, M., Sagasti, F., & Cárdenas, R. (2014). National system of innovation for inclusive development: achievements and challenges in Peru. In G. Dutrénit & J. Sutz (Eds.), *National Innovation Systems, Social Inclusion and Development* (pp. 169–198). Edward Elgar Publishing. http://franciscosagasti.com/site/wp-content/uploads/2014/12/TTTT-SISTEMAS-DE-INNOVACI%C3%93N-en-AL.pdf

Comisión Económica para América Latina y el Caribe (CEPAL). (2018). *La ineficiencia de la desigualdad: 2018*. Naciones Unidas. https://www.cepal.org/es/publicaciones/43442-la-ineficiencia-la-desigualdad

Comisión Económica para América Latina y el Caribe (CEPAL). (2019). *Panorama social de América Latina: 2019*. Naciones Unidas. https://www.cepal.org/es/publicaciones/44969-panorama-social-america-latina-2019

Comisión Económica para América Latina y el Caribe (CEPAL). (2021). *Panorama Social de América Latina: 2020*. Naciones Unidas. https://www.cepal.org/es/publicaciones/47718-panorama-social-america-latina-2021#:~:text=pdfepubmobi-,Descripci%C3%B3n,gasto%20social%20en%20la%20regi%C3%B3n.

Deaton, A. (2005). Measuring poverty in a growing world (or measuring growth in a poor world). *The Review of Economics and Statistics*, *LXXXVII*(1). http://www.jstor.org/stable/40042916

Fambeu, A. H. (2021). Poverty reduction in sub-Saharan Africa: The mixed roles of democracy and trade openness. *Journal of International Trade and Economic Development*, *30*(8), 1244–1262. https://doi.org/10.1080/09638199.2021.1946128

Fondo Monetario Internacional (FMI). (2017). *Informe Anual del FMI 2017: Promover el crecimiento inclusivo*. www.imf.org

Huang, K., Yan, W., Sim, N., Guo, Y., & Xie, F. (2022). Can trade explain the rising trends in income inequality? Insights from 40 years of empirical studies. *Economic Modelling*, *107*. https://doi.org/10.1016/j.econmod.2021.105725

Instituto Nacional de Estadística e Informática (INEI). (2020). *Bases de datos*. https://www.inei.gob.pe/bases-de-datos/

Jalles, J. T., & de Mello, L. (2019). Cross-country evidence on the determinants of inclusive growth episodes. *Review of Development Economics*, *23*(4), 1818–1839. https://doi.org/10.1111/rode.12605

Kakwani, N., & Pernia, E. M. (2000). What is Pro-poor Growth? *Asian Development Review*, *18*(1). https://mpra.ub.uni-muenchen.de/104987/

Kang, M., Park, I., & Rhee, D. E. (2017). Korea's growth-driven trade policies: Inclusive or exclusive? *World Economy*, *40*(11), 2475–2490. https://doi.org/10.1111/twec.12556

Khan, A., Khan, G., Safdar, S., Munir, S., & Andleeb, Z. (2016). Measurement and determinants of inclusive growth: A case study of Pakistan (1990-2012). *Pakistan Development Review*, *55*(4), 455–466. https://doi.org/10.30541/v55i4i-iipp.455-466

Krugman, P. R., Obstfeld, M., & Melitz, M. J. (2012). *Economía Internacional: Teoría y Política* (9th ed.): Pearson Educación, S.A.

Kuznets, S. (1955). Economic Growth And Income Inequality. *The American Economic Review*, *XLV*(1).

Lederman, D. (2013). International trade and inclusive growth: A primer. *Indian Growth and Development Review*, *6*(1), 88–112. https://doi.org/10.1108/17538251311329568

Ministerio de Comercio Exterior y Turismo (MINCETUR). (2021). *Reporte del Comercio Bilateral Perú-China 2021, III Trimestre*. https://www.acuerdoscomerciales.gob.pe/estadisticas.html

Mitra, A., & Das, D. (2018). Inclusive Growth: Economics as if People Mattered. *Global Business Review*, *19*(3), 756–770. https://doi.org/10.1177/0972150917713840

Nguyen Viet, C. (2014). The impact of trade facilitation on poverty and inequality: Evidence from low- and middle-income countries. *Journal of International Trade and Economic Development*, *24*(3), 315–340. https://doi.org/10.1080/09638199.2014.898315

Osabohien, R., Iqbal, B. A., Osabuohien, E. S., Khan, M. K., & Nguyen, D. P. (2021). Agricultural trade, foreign direct investment and inclusive growth in developing countries: evidence from West Africa. *Transnational Corporations Review*. https://doi.org/10.1080/19186444.2021.1936986

Piketty, T., & Saez, E. (2006). The Evolution of Top Incomes: A Historical and International Perspective. *American Economic Review*, *96*(2), 200–205. https://doi.org/10.1257/000282806777212116

Prebisch, R. (1970). *Change and Development: Latin America's Great Task*. Inter-American Development Bank.
Programa de las Naciones Unidas para el Desarrollo. (2020). *Informe sobre Desarrollo Humano 2020: La próxima frontera - el desarrollo humano y el antropoceno.* United Nations.
Ratnayake, R. (2019). The Role of Trade in Fostering Inclusive Growth in the Asia-Pacific #. *Thailand and The World Economy*, *37*(2). https://so05.tci-thaijo.org/index.php/TER/article/view/207762
Redmond, T., & Nasir, M. A. (2020). Role of natural resource abundance, international trade and financial development in the economic development of selected countries. *Resources Policy*, *66*. https://doi.org/10.1016/j.resourpol.2020.101591
Samuelson, P. A., & Nordhaus, W. D. (2009). *Economics. Nineteenth Edition* (19th ed.): McGraw-Hill Irwin.
Sen, A. (2000). *Social exclusion: concept, application, and scrutiny*. Office of Environment and Social Development, Asian Development Bank.
Stiglitz. (2016). Inequality and Economic Growth. *The Political Quarterly*, *86*(S1), 134–155. https://doi.org/https://doi.org/10.1111/1467-923X.12237
Superintendencia Nacional de Aduanas y de Administración Tributaria. (SUNAT). (2020). *Estadísticas y Estudios*. https://www.sunat.gob.pe/estadisticasestudios/informa-tributa.html#icomer
Tahir, M. (2020). Trade and life expectancy in China: a cointegration analysis. *China Economic Journal*, 322–338. https://doi.org/10.1080/17538963.2020.1783745
Topuz, S. G. (2022). The Relationship Between Income Inequality and Economic Growth: Are Transmission Channels Effective? *Social Indicators Research*. https://doi.org/10.1007/s11205-022-02882-0
Varona-Castillo, L., & Gonzales-Castillo, J. R. (2021). Economic growth and income distribution in Peru. In *Problemas del Desarrollo* (Vol. 52, Issue 205, pp. 79–107). Universidad Nacional Autonoma de Mexico. https://doi.org/10.22201/iiec.20078951e.2021.205.69636
Vo, T. T., & Nguyen, D. X. (2021). Impact of Trade Liberalization on Household Welfare: An Analysis Using Household Exposure-to-Trade Indices. *Social Indicators Research*, *153*(2), 503–531. https://doi.org/10.1007/s11205-020-02499-1
World Inequality Database. (2020). *Data Indicators from World Inequality Database*. https://wid.world/data/
World Bank. (2008). *The Growth Report: Strategies for Sustained Growth and Inclusive Development*. https://openknowledge.worldbank.org/handle/10986/6507
World Bank. (2020). *World Bank Open Data*. https://datos.bancomundial.org/
World Bank. (2021). *GDP growth (annual %) - China*. https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=CN
World Bank. (2022). *GDP growth (annual %) - Peru*. https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=PE
World Economic Forum (WEF). (2017). *The Inclusive Growth and Development Report 2017*. https://www.weforum.org/reports/the-inclusive-growth-and-development-report-2017/
World Economic Forum (WEF). (2018). *The Inclusive Development Index 2018: Summary and Data Highlights*. https://www.weforum.org/reports/the-inclusive-development-index-2018/

Appendix A

"Independent and dependent variables" summary data table for econometric model application

Independent Variable: International Trade				Dependent Variable: Inclusive Economic Growth						
				Inclusion			Growth and Development			
Year	Export Peru - China	Import Peru - China	International Trade Peru - China	Labor income	Poverty rate	Gini indicator	GDP per capita Peru	Labor productivity	Vulnerable Employment rate	Life expectancy
2000	444,558.49	288,311.50	732,869.99	391.30	16.40	49.10	3,242.58	3,597.49	54.36	71.11
2001	425,031.09	351,850.00	776,881.09	633.80	17.40	51.30	3,221.30	5,648.19	54.62	71.51
2002	597,625.07	464,760.20	1,062,385.27	698.70	15.20	53.60	3,359.16	5,871.14	54.19	71.88
2003	677,880.13	645,082.40	1,322,962.53	716.20	12.00	53.10	3,464.40	5,733.29	56.49	72.24
2004	1,248,459.46	767,825.10	2,016,284.56	668.00	13.60	49.90	3,603.00	5,914.89	55.13	72.58
2005	1,878,534.20	1,058,750.70	2,937,284.90	673.90	15.50	50.40	3,796.20	6,257.42	54.74	72.91
2006	2,260,851.16	1,583,885.10	3,844,736.26	722.80	13.50	50.30	4,047.75	6,451.90	52.95	73.22
2007	3,040,489.43	2,474,058.10	5,514,547.53	810.50	11.10	50.00	4,356.74	6,747.68	51.28	73.53
2008	3,636,028.09	4,065,255.60	7,701,283.69	893.20	9.10	47.50	4,716.20	7,230.15	51.15	73.83
2009	4,078,797.20	3,267,437.70	7,346,234.90	963.90	7.00	47.00	4,729.74	7,159.37	50.97	74.12
2010	5,436,667.20	5,811,955.20	11,248,622.40	986.90	5.50	45.50	5,082.35	7,593.27	51.08	74.41
2011	6,972,639.40	6,364,754.60	13,337,394.00	1,069.00	5.20	44.70	5,360.23	7,968.44	51.41	74.70
2012	7,843,946.10	7,814,505.70	15,658,451.80	1,155.70	4.70	44.40	5,642.58	8,315.44	50.06	74.98
2013	7,354,027.80	8,413,581.90	15,767,609.70	1,184.60	4.30	43.90	5,919.21	8,714.28	49.82	75.26
2014	7,042,587.50	8,914,610.00	15,957,197.50	1,239.90	3.70	43.20	5,996.49	8,856.91	50.57	75.53
2015	7,391,350.20	8,657,806.20	16,049,156.40	1,304.90	3.60	43.40	6,114.23	9,082.85	50.00	75.79
2016	8,492,299.50	8,226,213.00	16,718,512.50	1,370.70	3.50	43.60	6,262.37	9,280.03	50.39	76.04
2017	11,626,652.40	8,861,606.10	20,488,258.50	1,376.80	3.40	43.30	6,314.29	9,333.07	51.14	76.29
2018	13,237,194.20	10,065,325.10	23,302,519.30	1,400.10	2.70	42.40	6,453.08	9,550.62	51.27	76.52
2019	13,584,602.40	10,273,707.90	23,858,310.30	1,443.10	2.20	41.50	6,489.57	9,588.97	51.56	76.74

Note. Data extracted from the World Bank (2020), National Superintendence of Tax Administration (SUNAT, 2020) and the National Institute of Statistics and Informatics (INEI, 2020)