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The Impact of Bilateral Trade Between China and The Philippines on Trade and Economic Growth: A Simultaneity Approach

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Abstract: ***This study investigated the effect of a bilateral agreement between the Philippines and China, which commenced last 1992 on Philippine export trade to China, and examined the impact of the export of the Philippines to China on the economic growth of the Philippines. The paper used a combination of the instrumental variable method and dummy variable to investigate the simultaneity relationship between the dummy variable of a bilateral agreement between the Philippines and China and the export trade of the Philippines to China and its simultaneous ties to the country's economic growth.***

Keywords: Polytechnic University of the Philippines, Master of Science in Economics, Bilateral Trade, Trade, Philippine Exports, Trade Industry.

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1. Introduction

China plays a vital role in the Philippines' trade performance. In 2019, China was the country's top trading partner, export market destination, and source of imported goods (Board of Investment, 2024). In March 2024, the Philippines imported US$4.5 billion of commodities and exported US$1.5 billion. Refined petroleum ($423m), large coated flat-rolled iron ($241m), coated flat-rolled iron ($223m), rubber footwear ($112m), and other small iron pipes ($104M) were the top imports of the country from China (Organization of Exporting Countries, 2024).

Due to the enhanced economic and trade agreements between the Philippines and China, the relations between these countries have improved dramatically over the last decade resulting from empowering the ASEAN-China cooperation.

The trade between the Philippines and China can be complementary in the world market more than competition, as the world export data suggests. Since President Ferdinand Marcos Jr. has taken a step away from being pro-China to strengthen relations with the United States, the relationship between China and the country has soured. This can be viewed as a far-reaching trade effect in the country (Reuter, 2024). With this, this study investigates the economic impact of a trade agreement between China and the Philippines. Trade dynamics have always been of central interest in the Philippines, thus making the country a rich topic to investigate. Among other things, the Philippines has a long-standing appreciation for trade policy.

Assessments of these policies drew particular attention to the dynamics of trade with the country's European partners, namely its member countries and the European Free Trade Association. One reason that has sparked researchers' interest in trade issues is the economic situation in the country. As a lower-middle-income nation, many view the country as a laggard regarding exports and trade discussions. In the global arena, the Philippines is classified as an export-dependent country, with exports constituting 26% to 33% of the country's GDP.

A key motivation for this paper was, therefore, the need to undertake a more profound and comprehensive study of the impact of trade on the Philippine economy. This paper seeks to explore the dynamics of trade policy. The

study focused on the impacts literature and examined trade policy's effects on commodity structures and exports. Much of the work reviewed utilized the framework of Dummy variables to assess differences in export trade volume before and after the implementation of bilateral agreements in the Philippines and China. Little or no work that we are aware of has adopted the features of a combination of the Instrumental variable method and dummy variable to examine changes in product structures and the directions of export flows. This paper will explore the viability of undertaking gains from exchanges with the Philippines. In the Philippine case, the country has a Free Trade Agreement with the European Free Trade Association, over 70% with the Japan-Philippines Economic Partnership Agreement. The years of the Preferential Trade Agreement with Australia, its fifth commodity partner, which is the subject of this paper, have witnessed a Generalized System of Preferences scheme-based access to their market.

2. Theoretical Framework

Trade theory has a long tradition. Four theories are salient for understanding global trade. These are mercantilism, absolute advantage, comparative advantage, and imperfect competition. What are the policy implications of these theories? Mercantilists believed that countries could increase power and wealth by exporting as much as possible to other countries. Under the mercantilist doctrine, economic policy was centrally concerned with the trade balance between nations. The trade balance was treated as an indicator of national strength and prosperity. The Philippine Development Plan advocates an export-oriented, mercantilist-based development strategy in the Philippines.

Policymakers in the Philippines showed how to practice the 21st-century common trade policy theory conflict from the mercantilist Philippines. Absolute advantage defines trade benefits at the national level due to the difference in productivity. As productivity increases, so does the rate of return associated with the export of goods. These real effects are expected to slow or stop exports as countries move up to high-tech, high-productivity industries—comparative advantage theory couples country development to production. Comparative advantage trade allows specialization in the most productive sector, which may or may not be world-leading, and thus offers both social and economic prosperity. Developing countries see trade as a means to diversify economic activities and to reduce dependence on a few export goods. Trade liberalization, in this case, is a two-way flow of benefits between countries, creating mutuality. Researchers suggest several economic theories that reflect natural empirical patterns. Essentially, they state that the volume of trade is positively related to a country's level of development. Development indicators include income, education, health increases, and technological changes in producing and distributing goods and services. Related literature investigates the impact of trade liberalization between countries. However, the argument can suggest that gains or losses are not significant since little trade is happening. These theories show that trade conditions and policies are part of structural economic development and increased prosperity of nation-states. As we argue, it is crucial to verify them through empirical models of applied economics. No economist would suggest that a nation should increase specialization in individual products without understanding the broader policy implications. Trade leads to a wider context. We argue that an economic approach involving the reasoning power of applied economics is as important as the development goals of captains of industry and policymakers.

The modern political-economy theory (Rodriguez-Clair, 2005) of trade policy emphasizes three crucial aspects of the trade model in small-country government, which are as follows: (a) The degree of capital mobility is a key determinant of the extent of trade liberalization. With imperfect capital mobility, trade liberalization does not generate losses for import-competing lobbies, so these lobbies will resist trade liberalization; (b) Politics affects the trade liberalization. The government is keen on the trade agreement, and trade liberalization would materialize. This assumes that politics directly determine trade agreements, and (c) Trade agreements usually specify tariff ceilings rather than the exact tariff rates. With tariff ceilings, the government retains the option of setting tariffs below their maximum levels, and it will further result in mitigating over-investment.

The theory also emphasizes that trade liberalization tends to be less deep, and the parameter region for which the optimal agreement entails free trade is more minor. Countries exporting a large chunk of their output are more likely to grow faster than others (Michealy,1977; Feder, 1982; Marin, 1992; Thornton, 1996). The export growth influences the economy as a whole. International trade increases the number of specialized inputs, thereby increasing growth rates as economies (Halpman, 1991; Riviera-Batiz and Romer,1990).

This study used a combination of difference and instrument variable method to determine the impact of bilateral trade between the Philippine and China in terms of export trade as well as national income.

$$Log\ X = \beta_0 + \beta_1 D \quad \text{Equation 1}$$

$$LNY_t = a_0 + a_1 Log\ X \quad \text{Equation 2}$$

At the first stage, the D refers to the dummy variable of implementation of trade agreement between Philippines and China, while Log X refers to the percentage change in the export trade between Philippines and China. Meanwhile, Yt refer to the national income of the Philippine as represented by the Real Gross Domestic Product growth.

It is assumed that the Trade agreement between the Philippines and China results to higher growth of exports of the Philippines, while the exports of the Philippines to China significantly affects the natural logarithm of Philippines income as represented by GDP.

3. Research Methodology

3.1 Research Design

This study was quantitative in nature and used both univariate and multivariate analyses of quantitative research design. Its design has the sole purpose of describing characteristics and behavior of a given variable using frequency distributions and averages (Babbie, 2011).

On the other hand, the gravity model of trade was implemented to assess the impact of the bilateral trade between the Philippines and China.

3.2 Sources of Data

This study utilized secondary data from different agencies and international institutions and organizations, and government offices such as National Economic Development Authority, Philippine Statistical Authority and World Bank where the needed data are readily available or to be requested if needed. The data were collected during the years 2000-2022.

This study collected the documentary data of Real National Income of China and the Philippines (in US Dollars), Expenditure of China and the Philippines (in US Dollars), World Real Gross Domestic Product (In US Dollars), and Trade Cost (In US Dollar) from World Bank, International Monetary Funds and Philippine Statistical Authority.

3.3 Statistical Treatment

The Regression Models

This study used combination of difference and instrument variable method to determine the impact of Bilateral Trade Between the Philippine and China in terms of Export Trade as well as National Income.

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The Regression Models

This was employed to find out the simultaneous relationship between the effect of the bilateral trade between the Philippines and China the Instrumental Variable Model was utilized.

Test for Instrument Validity

The instrument to be used should be tested on the validity of the instrument where it must pass the criterion of

good instrument: instrument is exogenous and instrument is relevant. The two conditions for a valid instrument are vital for instrument variables (IVs) regression. The F-test and Hausman Test were used to test if the instruments were valid. If the F-statistic is greater than 10, the variable is exogenous, which means that the error is not dependent on the instrument.

To test whether Y2 is uncorrelated with E1, the equation was estimated by ordinary least square (OLS). Hausman suggested comparing directly the OLS and two-stage least squares (TSLS) estimates to determine if the differences were statistically significant. Let the regression equation be

$$Y_1 = \beta_0 + \beta_1 Y_2 + \beta_2 X_1 + \beta_3 X_2 + \varepsilon_1$$

where X1 and X2 are exogenous and Y2 is suspected to be endogenous. If the OLS and TSLS estimates differ significantly, it is concluded that Y2 must be exogenous.

If the instrument satisfies the conditions of instrument relevance and exogeneity, then the coefficient β1 can be estimated using an IV estimator called two-stage least squares.

Test of Overidentification

In addition to the requirement that instrumental variables be correlated with the endogenous regressors, the instruments must be uncorrelated with the structural error term. The Sargan Test of Overidentifying Restrictions was applied to check the instruments' validity in the simultaneous equation model. Suppose the model is overidentified, meaning the number of additional instruments exceeds the number of endogenous regressors. In that case, one can test whether the instruments are uncorrelated with the error term. If the model was just identified, one cannot perform a test of overidentifying restrictions. The Chi-square value can test the null hypothesis that the instruments are valid and correctly excluded from the function. If the Chi-square test gives us a significant p-value, the study will reject the null hypothesis and conclude that the instruments are invalid. Otherwise, the study does not reject the null hypothesis.

Test of Endogeneity

The Durbin-Wu-Hausman test was used to test the model's endogeneity. The test's null hypothesis is that the independent variables are exogenous. The rejection of the null hypothesis indicates the presence of endogeneity. Whether one is estimating the intuitive gravity model or its theoretical counterpart, there is a need to pay a particular attention to the problem of endogeneity, particularly when policy variables are included in the model. The reason is that policies are often determined to some extent by the level of a country's integration in international markets: more open economies have an incentive to implement more liberal policies, for example, which creates a circular causal chain between policies and trade. From an econometric point of view, the endogeneity of an explanatory variable violates the first OLS assumption by making a correlation between that variable and the error term.

Test of Correlation

This was used to measure the correlation between variables, the Pearson Correlation Coefficient was employed. The formula is:

$$r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}}$$

The value of r close to unity in magnitude implies a good correlation or linear association between X and Y, whereas values near zero indicate little or no correlation.

Test of Significance of the Parameter Estimates

To test for the statistical significant of each regression coefficient, the t-ratio was used. If the computed t value exceeds the critical t-value at the chosen level of significance, reject the null hypothesis; otherwise, accept it.

$$t = \frac{\hat{\beta}}{se\,(\hat{\beta}_1)}$$

where:

t = Value of statistic
$(\hat{\beta}_1)$ = Standard error of the estimate
$\hat{\beta}$ = Estimated slope coefficient

Test for the Overall Significance of the Model:

F – test. To test for the significance of the coefficients collectively, that is, testing the hypothesis of no relationship between Y and X, the F-statistic was employed. The formula is:

$$F_{k-1,n-k} = \frac{R^2-(k-1)}{\frac{1-R^2}{n-k}}$$

If the F-computed value exceeds the F-critical value, reject the null hypothesis; otherwise, accept it.

4. Results and Discussions

4.1 Behavior of Philippine and China Exports

Several products dominate Philippine exports. Philippine high-demand exports to China in 2019 by sector show that the traditional export products, electronic products, land products, and mineral products or ores still have a more held share of Chinese markets, which have emerged due to production networks involving investors in both countries. Given these investment networks, exports and re-exports between FDI-owned related and arm's length trade are processed, assembled, and then sent to the final market.

Table 1: The Philippine Exports to China and Bilateral Trade

Year	Philippines Exports to China (Export Value Index, 2015 = 100)	Export Growth Rate	Year of Implementation of Bilateral Trade (1 for years implemented
1987	9.24	2.223542	0
1988	11.42	2.435366	0
1989	12.64	2.536866	0
1990	13.21	2.580974	0
1991	14.32	2.661657	0
1992	15.86	2.7638	1
1993	18.11	2.896464	1
1994	21.65	3.075006	1
1995	29.75	3.392829	1
1996	34.69	3.546451	1
1997	42.30	3.744787	1
1998	50.00	3.912023	1
1999	62.18	4.130033	1
2000	64.73	4.170225	1
2001	54.65	4.000949	1
2002	59.85	4.091841	1
2003	61.59	4.1205	1
2004	67.45	4.211387	1
2005	70.13	4.25035	1
2006	80.59	4.389375	1
2007	85.79	4.451902	1
2008	83.43	4.424008	1
2009	65.34	4.179605	1
2010	87.54	4.472096	1
2011	82.11	4.40806	1
2012	88.56	4.48368	1
2013	96.38	4.568299	1
2014	105.57	4.659374	1
2015	100.00	4.60517	1
2016	95.73	4.561532	1
2017	116.80	4.760463	1
2018	114.72	4.742495	1
2019	119.56	4.783818	1
2020	108.59	4.687579	1
2021	126.84	4.842927	1

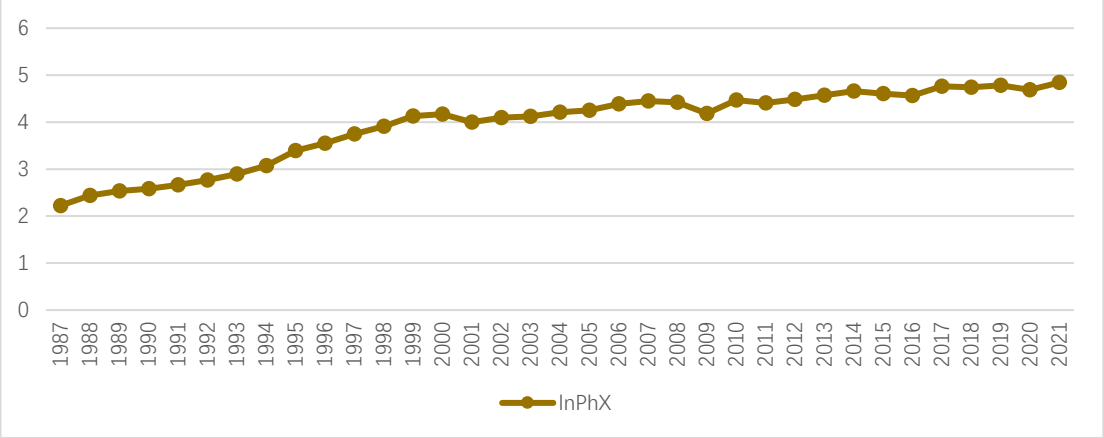

Figure 1: The Philippine Export from 1987 to 2021

Figure 1 reflects that after the implementation of the China- Philippine Bilateral Investment Treaty in 1992, an agreement between the government the People's Republic of China and the Philippines concerning encouragement and reciprocal protection of investments. It is claimed that the export trade of the Philippines significantly increased immediately after the said treaties. From 15.86 million US dollars in value of exports to China to 18.11 million US dollars, there is an increase of 10.78 percent.

The average shares of electronic products from 2009 to 2019 reaches a dominant value of 44.4 percent. However, although the share decreases by about 1.0 percent from 2018 to 2019, it showed significant contrast when recording an increase of about 137 percent from 2009 to 2018, despite the three-year consecutive declines from 2015 to 2017 by about 27.7 percent, 75.3 percent, and 29.9 percent, respectively. The drop in export shares was primarily caused by the downturn in some electronic products' shares, particularly electric apparatus and parts, emanating from a decrease in hard disk exports by about 11 percent and electronic parts by about 1.5 percent in 2019.

Similarly, the massive decline in electronic parts accounts for 303 percent was due to decreased shares of x-ray, aircraft, and delivery systems by about 288 percent. On the other hand, the decline of X-ray shares result from a decrease in exports to China of about 18 percent of digital X-rays. It has been explained that the spillover effect caused the contraction of shares of X-ray, aircraft, and delivery systems. The shares of semiconductor devices, transistors, and insulating gears, despite the marginal decreases of 0.9 and 0.3 percent, were not significantly altered by either a decline in export prices or the effect of the global trade war.

Early Filipinos interacted with China through a barter system during pre-colonization and traded goods such as silk, porcelain, gold, and other commodities. The blowing of pyrotechnic products, an ancient Chinese technological involvement in the country, dates back to the 13th and 17th centuries. In 1570, the Spaniards acquired silk, porcelain, and gold from the Chinese and sold them in and around Manila. By this time, settlements in Cebu, Manila, Vigan Luzon, and others were explicitly established as trading centers.

The Manila-Acapulco Galleon Trade flourished in the later years due to continued Mexican demand for labor, silk, pepper, and porcelain received from China by way of the Philippines. The same products also passed through Manila on their way to China. While the General Regulations for the Indies issued in 1784 formally restricted trade with China through Acapulco and to a few Chinese ports, illicit trade flourished until the first half of the 19th century. In April 1851, regulations arrived in Manila forbidding the Galleon Trade and official tariff schedules, causing the subsequent devaluation of the Manila Galleon. China closed to the Spanish, having only one port, which took ginseng and furs from Russia until the mid-19th century.

Despite trade barriers, large amounts of silver from Mexico found their way to China to buy luxury goods for wealthy Europeans and ginseng for poor people, masked as barter trade in which China imported much more than it exported. However, as China's import demand increased, its silver control decreased over the years. In 1898, two years after the treaty's signing, the United States and Spain developed a new tariff schedule, putting a zero tariff on American goods sold to the Philippines and a very low tariff on goods sold to Americans from the Philippines. These policy effects resulted in a substantial increase in U.S.-Philippine trade and a significant decline in Philippine-China trade. As an inseparable part of its direct reversal to loss and implementation of a policy, the government has actively sought to balance the budget to restore and maintain economic stability. Channels of

export can be resumed on a principle and trade opening priority phase to make provisions for better import profits for a new fertilizer train to be scheduled to sail.

In 2022, China exported $53.6B to the Philippines. The main products exported from China to the Philippines were Refined Petroleum ($2.44B), Integrated Circuits ($1.53B), and Broadcasting Equipment ($1.3B). During the last five years, China's exports to the Philippines have increased at an annualized rate of 12.9%, from $29.2B in 2017 to $53.6B in 2022.

In 2017, the Philippines exported $15.3B to China. The main products exported from the Philippines to China were Integrated Circuits ($5.83B), Office Machine Parts ($1.33B), and Nickel Ore ($1.2B). During the last five years, the Philippines' exports to China have increased at an annualized rate of 4.09%, from $12.6B in 2022 to $15.3B in 2017.

Table 2: Philippine Top Export to China in 2023 and 2022

2023		2022	
Export Commodity Group	**Quantity**	**Export Commodity Group**	**Quantity**
Components/Devices (Semiconductors)	5,092,776,787	Components/Devices (Semiconductors)	4,834,301,175.00
Other Mineral Products	1,620,609,489	Other Mineral Products	1,853,731,951.00
Cathodes & Sections Of Cathodes, Of Refined Copper	886,414,295	Cathodes & Sections Of Cathodes, Of Refined Copper	824,921,552.00
Copper Concentrates	412,080,967	Electronic Data Processing	584,006,319.00
Electronic Data Processing	406,628,032	Other Manufactures	385,507,721.00
Other Manufactures	392,935,213	Bananas (Fresh)	359,689,117.00
Bananas (Fresh)	359,762,276	Chemicals	324,490,499.00
Chemicals	235,687,400	Coconut Oil	201,832,777.00
Machinery & Transport Equipment	182,246,222	Machinery & Transport Equipment	200,611,706.00
Pineapple And Pineapple Products	170,802,561	Pineapple And Pineapple Products	154,400,194.00
Fish, Fresh Or Preserved Of Which: Shrimps & Prawn	110,078,790	Others	140,147,455.00
Others	103,552,762	Fish, Fresh Or Preserved Of Which: Shrimps & Prawn	98,771,496.00
Ignition Wiring Sets	79,699,066	Metal Components	79,329,587.00
Processed Tropical Fruits	73,336,268	Copper Concentrates	70,713,137.00
Coconut Oil	67,090,872	Ignition Wiring Sets	67,453,817.00
Electronic Eqpt. & Parts	63,181,582	Control And Instrumentation	64,063,077.00
Metal Components	56,553,668	Processed Tropical Fruits	61,659,401.00
Textile Yarns/Fabrics	55,454,945	Electronic Eqpt. & Parts	61,372,200.00
Lumber	54,086,650	Communication/Radar	57,838,058.00
Telecommunication	53,206,750	Misc. Manufactured Articles, N.E.S.	50,451,476.00

In 2022, the Philippine’s top export trade to China includes: Components/Devices (Semiconductors) (4,834,301,175), Other Mineral Products (1,853,731,951), Cathodes & Sections Of Cathodes, Of Refined Copper (824,921,552), Electronic Data Processing (584,006,319), Other Manufactures (385,507,721), Bananas (Fresh) (359,689,117), Chemicals (324,490,499), Coconut Oil (201,832,777), Machinery & Transport Equipment (200,611,706), Pineapple And Pineapple Products (154,400,194).

Table 3: Philippine Top Import to China in 2023 and 2022

2023		2022	
Export Commodity Group	**Quantity**	**Export Commodity Group**	**Quantity**
Iron And Steel	4,566,634,961	Iron And Steel	4,054,366,707
Mineral Fuels, Lubricants And Related Materials	4,231,362,178	Mineral Fuels, Lubricants And Related Materials	2,467,129,337
Non-Metallic Mineral Manufactures	1,771,627,016	Non-Metallic Mineral Manufactures	2,042,179,191
Miscellaneous Manufactured Articles	1,512,690,420	Miscellaneous Manufactured Articles	1,483,486,577
Fertilizers, Manufactured	1,114,961,531	Fertilizers, Manufactured	981,439,112
Metal Products	989,582,531	Organic And Inorganic Chemical	969,077,699
Organic And Inorganic Chemical	869,928,817	Metal Products	942,611,493
Transport Equipment	777,534,623	Transport Equipment	742,065,021
Plastics In Primary And Non-Primary Forms	630,160,909	Paper And Paper Products	640,361,466
Fruits And Vegetables	625,992,133	Plastics In Primary And Non-Primary Forms	629,218,500
Industrial Machinery And Equipment	620,233,814	Industrial Machinery And Equipment	562,702,935
Paper And Paper Products	620,096,171	Other Manufactured Goods	550,755,400
Other Manufactured Goods	537,965,431	Fruits And Vegetables	550,034,209
Other Crude Materials, Inedible	478,175,871	Textile Yarn, Fabrics, Made-Up Articles And Related Products	526,877,650

Textile Yarn, Fabrics, Made-Up Articles And Related Products	458,304,205	Other Food & Live Animals	421,695,817
Other Food & Live Animals	451,641,676	Other Crude Materials, Inedible	395,165,880
Chemical Materials And Products, N.E.S.	391,185,824	Chemical Materials And Products, N.E.S.	367,053,247
Rubber Manufacture	242,716,303	Fish & Fish Preparations	215,504,208
Fish & Fish Preparations	191,671,374	Rubber Manufacture	193,708,686
Others	162,234,544	Telecommunication Eqpt. & Elect. Mach.	170,354,959

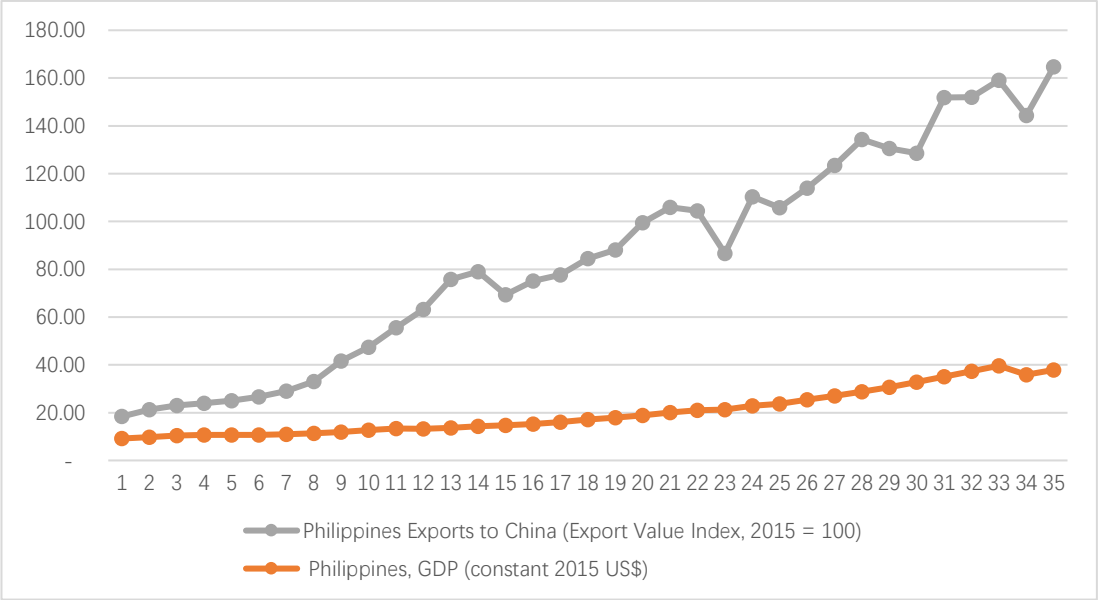

Figure 2: The Philippine Export to China and GDP

Figure 2 illustrates the relationship between the Philippines' exports to China and the country's Gross Domestic Product (GDP) over the observed period. The grey line represents the export value index, with 2015 set as the base year (index = 100), while the orange line tracks the country's GDP in constant 2015 US dollars.

The graph shows that the Philippines' exports to China have experienced a sharp upward trend. Beginning at a base of 20 in the early periods, the export index demonstrates consistent growth, showing a marked increase from period 5 onwards. This upward trajectory accelerates particularly after period 10, with minor fluctuations between 25 and 35. By the end of the graph, exports are nearly 170% higher than the 2015 baseline, highlighting the rapid expansion of trade between the two countries. This rise may be attributable to factors such as strengthening bilateral trade relations, expanding China's demand for key Philippine exports such as electronics and raw materials, or favorable trade policies between the two nations.

In contrast, the Philippines' GDP shows a much more gradual increase. Starting at a value slightly above 20, the GDP growth follows a smooth and steady trajectory throughout the observed period, with minimal fluctuations. Despite the relatively slow growth, GDP continues to rise, reflecting the country's economic resilience and constant expansion. However, the GDP growth rate does not mirror the steep incline seen in exports, suggesting that while trade with China is flourishing, it has not yet significantly outpaced the overall economic growth of the Philippines.

The divergence between the rapid rise in exports and the slower GDP growth indicates that while exports to China are an essential contributor to the Philippine economy, other sectors and international trade relationships may moderate the impact of this specific export growth on the overall economic performance. Additionally, the sharp fluctuations in the export index, especially after period 25, suggest that certain external factors, such as global market conditions, changes in trade policies, or economic slowdowns, may have temporarily impacted trade volumes with China.

The figure highlights the significant upward trend in Philippine exports to China in recent years, with trade volumes nearly tripling since 2015. Despite this, the GDP growth remains relatively moderate, indicating that while exports to China are important, they represent only one facet of the broader Philippine economy. The continued increase in both indicators suggests that economic ties between China and the Philippines will likely play an increasingly pivotal role in the future development of the Philippine economy.

4.2 The China's Growth of the Economy and Import Goods from the Philippines

As reflected in the Figure below, it can be observed that in the advent of the implementation of a trade agreement between the Philippines and China in 1992, there is a significant increase in import products from the Philippines to China. As a result, China's GDP responded positively.

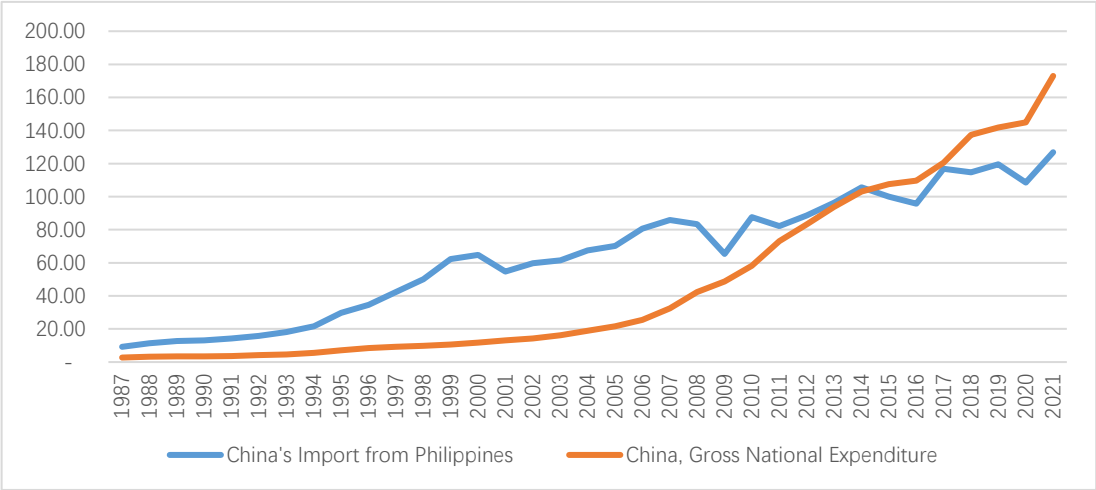

Figure 3: China Import from the Philippines and Gross Domestic Product

4.3 Regression Results

4.3.1 Instrument Validity Test

The first stage of regression is used to validate whether the instrument is valid or not. Based on the findings, the F-test of 48.94 is greater than 10 which means that the chosen instrumental variable is exogenous, which means that the error is not dependent on the instrument.

Table 4: The First Stage Regression

```
First-stage regressions
-----------------------

                                           Number of obs     =         35
                                           F(  1,     32)    =      48.94
                                           Prob > F          =     0.0000
                                           R-squared         =     0.8135
                                           Adj R-squared     =     0.8018
                                           Root MSE          =     0.3531

------------------------------------------------------------------------------
       lnPhX |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    CHIncome |   8.02e-14   1.25e-14     6.43   0.000     5.48e-14    1.06e-13
          dt |   1.275452   .1823265     7.00   0.000     .9040647    1.646839
       _cons |   2.460931   .1579697    15.58   0.000     2.139158    2.782705
------------------------------------------------------------------------------

Instrumental variables (2SLS) regression      Number of obs =         35
                                              Wald chi2(1)  =     126.87
                                              Prob > chi2   =     0.0000
                                              R-squared     =     0.7838
                                              Root MSE      =     .20892

------------------------------------------------------------------------------
      lnPhGDP |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnPhX |   .5641465   .0500863    11.26   0.000      .465979    .6623139
       _cons |   23.70171   .2002856   118.34   0.000     23.30916    24.09426
------------------------------------------------------------------------------
Instrumented:  lnPhX
Instruments:   CHIncome dt
```

Since the computed F-value of 48.94 is greater than 10 then, the chosen instrument is exogenous and valid. This means that the identified instrument can be used as exogenous variable of endogenous variables.

4.3.2 Test of Overidentification

Further, the overidentification test is also employed to determine whether the instrumental variables were correlated with the endogenous regressor. If the model is overidentified, it does mean the instrument is valid, and then we can test whether the instruments are uncorrelated with the error term. If the model is just identified, then one cannot perform a test of overidentifying restrictions.

Table 5: The Sargan Test for Overidentification

Sargan (score) chi2(1)	p = 0.1536
Basmann chi2(1)	p = 0.1683

The statistical results reveal that the p-value of 0.1536 exceed the chosen 5 percent level of significance and therefore conclude that there is a need to reject the null hypothesis that the instrument is valid, thus, use the instrument in estimating the simultaneous relationship between variables.

4.3.3 Test of Endogeneity

To test the endogeneity of the model the Durbin-Wu-Hausman test is used. The null hypothesis of the Durbin-Wu-Hausman test is that the independent variables are exogenous in nature. The rejection of the null hypothesis indicates the presence of endogeneity.

Tests of endogeneity
Ho: variables are exogenous

Durbin (score) chi2(1) = 1.67877 (p = 0.1951)
Wu-Hausman F(1,32) = 1.56523 (p = 0.2200)

The statistical result revealed that this study does not reject the null hypothesis the independent variables are exogenous in nature

```
Instrumental variables (2SLS) regression          Number of obs =      35
                                                  Wald chi2(1)  =   39.88
                                                  Prob > chi2   =  0.0000
                                                  R-squared     =  0.7553
                                                  Root MSE      =  .22228
```

lnPhGDP	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnPhX	.4012631	.0635381	6.32	0.000	.2767307	.5257954
_cons	24.34284	.2529023	96.25	0.000	23.84716	24.83852

```
Instrumented:  lnPhX
Instruments:   dt
```

4.4 Correlation Result

The correlation matrix shown in the table below indicates that there is a strong positive relationship between the dummy variable for the implementation of the Bilateral agreement between the Philippines and China in 1992 and the percentage change in export trade to China. The result also shows that this relationship is evidently significant since the p-value of 0.00 is less than the 5 percent level of significance.

Further, the correlation between the percentage change in exports to China and the percentage change in gross

domestic product is very strong and positive, as reflected in the correlation coefficient of 0.8901.

Variable	Correlation Coefficient	p-value
LnPhx and dt	0.7564	0.000
LnPhX and Lngdp	0.8901	0.000

Moreover, the relationship between percentage change in exports and percentage change in gross domestic product is significant one since the p-value is 0.000 which is lower than the 5 percent level of significance.

4.5 Regression Results

The result of the regression is presented in Table 3. Based on the table, the Bi- bi-bilateral trade agreement represented by the dummy variable of the implementation of free trade has a significant relationship with the percentage change in exports, evidently reflected in the p-value of 0.000, which is less than the 5 percent level of significance. Moreover, the implementation of a Bi-lateral trade agreement between China and the Philippines resulted in an increase in export trade to China by 1.68 percent

Moreover, the regression result also shows that as the percentage of exports to Chinaina increases by one percent, age, the gross domestic product will increase by 0.40 percent.

The impact of the trade agreement between the Philippines and China is reflected below. Based on a statistical test, the trade agreement resulted in an increase in the import of goods from the Philippines to China by US$61.517, which eventually contributed to the increase in GDO by US$0.84. Thus, it is concluded that the trade agreement is beneficial not only to the Philippines but also to China.

```
Three-stage least-squares regression
------------------------------------------------------------------------------
Equation           Obs  Parms        RMSE    "R-sq"       chi2         P
------------------------------------------------------------------------------
chinagross~e        35      1    28.72629    0.6850      13.87    0.0002
chinasimpo~s        35      1    28.46568    0.3638      20.02    0.0000
------------------------------------------------------------------------------

------------------------------------------------------------------------------
                             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----------------------------+------------------------------------------------
chinagrossnationalexpenditure|
  chinasimportfromphilippines|   .8400496   .2255656     3.72   0.000     .3979493     1.28215
                       _cons |  -6.886044   15.42237    -0.45   0.655    -37.11333    23.34125
-----------------------------+------------------------------------------------
chinasimportfromphilippines  |
                         FTA |     61.517   13.75023     4.47   0.000     34.56705    88.46695
                       _cons |     12.166   12.73024     0.96   0.339    -12.78481    37.11681
------------------------------------------------------------------------------
Endogenous variables:  chinagrossnationalexpenditure
     chinasimportfromphilippines
Exogenous variables:   FTA
------------------------------------------------------------------------------
```

5. Conclusions

Based on the findings generated from the data gathered, the study has come up with the following conclusions:

1) There was an existing linear relationship between the export to China and gross domestic product and the bilateral trade between the Philippines and China

2) The gross domestic product was significantly affected by the exportation of goods to China

3) The bilateral trade between the Philippines and China was significantly affecting the exports of the Philippines to China

4) The trade agreement resulted in a positive impact both in the case of the Philippines and China

6. Recommendations

Based on the findings of the study, the paper recommends the following:

To optimize trade relations between the Philippines and China, it is essential to approach both short-term and long-term strategies while addressing potential challenges. Here are some recommendations:

Diversification of Export Products. Expand Agricultural Exports: The Philippines already exports bananas, pineapples, and coconuts to China, but expanding other high-value crops like avocados, durian, and processed agricultural goods could deepen market penetration.

To increase export revenues, promote more value-added exports like electronics, textiles, or furniture instead of focusing on raw materials.

Strengthen export of services like IT, education, and tourism (especially medical and eco-tourism) as China's middle class grows.

Both countries need to invest in upgrading port infrastructure, supply chains, and digital trade facilitation to support increased trade volumes.

Enhancing its infrastructure and trade capabilities could benefit the Philippines from China's Belt and Road Initiative (BRI).

Strengthen negotiations to reduce tariffs on Philippine goods, mainly agricultural and manufactured products.

The Philippines could explore expanding the ASEAN-China Free Trade Agreement to include more comprehensive terms or negotiating a bilateral FTA to boost trade flow.

Invest in improving the quality standards of agricultural products to meet China's regulatory requirements, reducing delays and rejections in customs.

Use digital platforms for efficient customs processing and enhance compliance with Chinese standards in electronics and pharmaceuticals.

Encourage Chinese investment in manufacturing, energy, and technology. Joint ventures in industrial parks and Special Economic Zones (SEZs) could boost job creation.

While promoting exports, ensure cheaper Chinese imports don't flood local industries. Use anti-dumping measures and other safeguards where necessary to protect local businesses.

Small and medium enterprises (SMEs) should have knowledge, technology, and financing to participate in China's vast e-commerce market.

Facilitate the adoption of digital payment systems to streamline trade and improve financial transactions between businesses from both countries.

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