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Analysis of the Economic Impact of ECFA on Taiwan Based on Event Analysis Method

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Abstract:

On August 7, 2010, the leaders of the SEF and ARATS signed the economic cooperation framework agreement (ECFA). Two sides of the Taiwan Straits have obtained the preliminary framework arrangement for the negotiation of free trade agreements between the two economies. However, in recent years, public opinion has often criticized ECFA and questioned its implementation effect. This paper response to this query by quoting the gravity model and proposing the relative contribution rate index of GDP growth, theoretically explains that the increase of exports to the mainland can bring possible excess growth for the export-oriented economy of Taiwan (The Taiwan referred to in this article refers to the Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu under WTO regulations). After that, this paper selects the nominal GDP, employment rate and foreign trade volume data of the basket of nine Asia Pacific region developed countries in 13 years before and after the implementation of ECFA, and uses OLS estimation and optimized event analysis method to model. The results show that: (1) There is a strong correlation between the changes of economic indicators of Taiwan and the major developed economies in the Asia Pacific from 1997 to 2010, and there may be similar economic growth patterns. (2) After the signing of the ECFA node, Taiwan's economy showed the characteristics of cumulative excess return measured by three indicators: nominal GDP, employment rate and foreign trade volume. In particular, the cumulative excess return measured by GDP is significant. (3) After the signing of the ECFA during the reign of Ma Ying-jeou, Taiwan's economy's excess cumulative return was stable and significant, while this cumulative return suffered losses during the reign of Tsai Ing-wen. (4) After entering the long-term, the deficiencies of the event analysis method under the influence of disturbance events have gradually become prominent

Keywords: ECFA, Regional economic integration, Taiwan economy, Cross-Strait Relations of Taiwan and Mainland China

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1. Introduction

In June 2010, leaders of ARATS and SEF signed the Economic Cooperation Framework Agreement(ECFA).

Since the implementation of ECFA, the scale of cross-Taiwan Straits trade in goods has continued to expand and industrial cooperation has become closer through tariff reduction and removal of non-tariff trade barriers. Under the promotion of ECFA, Taiwan products have enhanced their market competitiveness through tariff reduction, and at the same time promoted the balanced development of Taiwan industries, which has brought tangible benefits to Taiwan enterprises. This has not only lowered the export cost of Taiwan products and improved their competitiveness, but also increased the profits and market share of Taiwan enterprises and the return of Taiwanese investment, reducing the risk of geopolitical conflicts. However, ECFA is also facing many challenges at present. In recent years, with the tension between the two sides of the Taiwan Straits, the separatist forces on the island continue to discredit ECFA, and the Taiwan authorities implement trade protection and fail to fully fulfill the obligations stated in ECFA for a long time, the mainland side has cancelled some illegal tariff concessions for imported products from Taiwan in accordance with regulations. The effectiveness of ECFA is facing the risk of shrinking. For example, in December 2023, the Customs Tariff Commission of The State Council of China issued the announcement of suspending the tariff concessions of some ECFA products. [3]In this context, by using new research methods and data samples to explore the impact of ECFA implementation on Taiwan's economy and cross-Straits relations so far and its phased characteristics, it is helpful to clarify the false statements made by the DPP authorities and provide reference for the cross-Straits integrated development pilot zone and the construction of FTAs worldwide.

2. Literature Review

Most scholars of China focus on the impact of ECFA signing on cross-Taiwan Strait economic exchanges. Numerous scholars' research shows that the signing of the ECFA agreement has a promoting effect on the economy and trade of the Chinese Mainland and Taiwan : Wei Hao, Cheng Zheng (2010) [4] and others elaborated the ECFA from four aspects, including political cooperation, normalization of cross-strait economic relations, institutionalization of economic cooperation, and bring new opportunities for cross-strait economic development.By constructing the DID model, Huang, Siyuan, Lu and Siqi (2024) [5] found that the implementation of the "early harvest list" had a positive impact on the overall industrial output value of Taiwan and making the output value of the advantageous industries in Taiwan increase at an above-average level. Guan Zhongmin (2024) [2] calculated the sum of benefits of each chapter by multiplying ATE and the number of early harvest clauses in each chapter, and proved that ECFA early harvest list brought tangible benefits to Taiwan's import and export.

However, some scholars believe that ECFA has certain limitations or negative effects. Huang Jianzhong and Yuan Shan (2011) [6] argued that after ECFA was implemented, Beijing did not completely change the conservative liberalization process of service trade before, and Taiwan only made some modifications to its WTO commitments. The cross-strait cooperation under ECFA is more focused on trade in goods, and the opening sectors of the early harvest plan are limited, and the degree of commitment is not high. The two sides also failed to reach innovative commitments on cross-border delivery and overseas consumption; In business, they have only stayed in the form of joint ventures. Lu, Chieh Ju (2019) [7] compared the quantitative identity data of Taiwan people before and after ECFA implementation by using social identity theory and intergroup contact theory, and found that ECFA did not significantly reduce the identity of Taiwan people.

The main overseas literatures like Heo, Uk; Cho, Wondeuk (2012) [8] found that ECFA will affect South Korea's market share in China due to the competition between South Korea and Taiwan in the Chinese market. Wonwoo, Shin (2019) [10] compared various aspects of the ECFA and Kaesong Industrial Park (GIC) negotiation cases to draw inspiration for the development of inter-Korean economic agreements.

3. Research Path

3.1 The Transmission of Chinese Mainland's Trade Impact on Taiwan under the Trade Gravity Model

The trade gravity model has various forms. This paper quotes Jan Tinbergen's formal variation of the gravity model: $X_{ij} = K\frac{(Y_i)^a (Y_j)^b}{(1+eD_{ij})^f}$, in the equation, X_{ij} is the total export from country i to country j, $Y_i and Y_j$ is the GDP of country i and country j, D_{ij} is the distance between country $iandj$, $Kande$ is the constant, $aandb$ is the parameter. The formula shows that the size of the total exports to countries or the size of the trade volume between countries is proportional to the total national income of countries, and is inversely proportional to the distance between two countries. Statistics of the geographical distance between the world's major economies and the Chinese Mainland region into the model show that Tai-

wan has the largest theoretical export volume (EX) to the Chinese Mainland, and the mainland China market has the largest external influence on Taiwan's exports, which is consistent with the actual situation of Taiwan's foreign trade.

3.2 Contribution path of ECFA to Taiwan's economic development

According to the classical theory of economics, in the long-term equilibrium state of an open economy, the total domestic output is equal to the total domestic income is equal to the sum of private consumption (C), investment (I), government purchase (G) and net export (NX) : $Y_1 = Y_2 = C + I + G + NX$., where net export is equal to export value (EX) minus import value (IM) : $NX = EX - IM$, in theory, there is a positive correlation between net export and economic development indicators.

From the traditional perspective of international economy and trade, the development of cross-Straits trade can be divided into two parts. First, under the background of economic development in various regions in the era of economic globalization, the natural increase of the supply and demand of each economy including the two sides of the Taiwan Straits reaches a higher equilibrium state, that is, the natural growth part; The other is the reduction of trade barriers such as the reduction of tariffs and the optimization of the principle of origin between the two sides of the Taiwan Straits, which brings excess growth to the cross-strait economic and trade development through the trade creation effect and the trade transfer effect. These two motivations may lead to excess growth in Taiwan after the signing of ECFA nodes compared with the fitting situation without the signing of ECFA in the same period.

4. Empirical analysis of the impact of ECFA on Taiwan's economy based on the event study method

4.1 Data Explanation

$R_{taiwan,it} / R_{yatai,it}$: The actual rate of change in time t of the i direction of concern for the Taiwan/Asia Pacific sample area (According to international practice, the service industry output value of developed economies should usually account for 70% of GDP. The Asia-Pacific sample region selected in this article refers to the United States, Canada, Japan, South Korea, Hong Kong, Singapore, Australia, and New Zealand).

$GDP_{yatai,t}$: Aggregate nominal GDP of Asia-Pacific sample region at time t (Unit: $1,000,000)

$GDP_{taiwan,t}$: Nominal GDP of Taiwan, Mainland China at time t (Unit: $1,000,000)

$EN_{yatai,t}$: Total number of people employed in year t in sample areas of the Asia-Pacific region (unit: thousand)

$EN_{taiwan,t}$: Total number of employed persons in Year t of Taiwan(unit: thousand)

$P_{yatai,t}$: Total population of the Asia-Pacific sample area in year t (unit: thousand)

$P_{taiwan,t}$: Total population of Taiwan in year t (unit: thousand)

$TV_{yatai,t}$: Total import and export trade of the sample Asia-Pacific region in time t (unit: $1,000,000)

$TV_{taiwan,t}$: Total import and export trade of Taiwan, China in time t (unit: $1,000,000)

(The raw data for this section of statistical indicators are all from the CEIC Global Economic Database. The data has been adjusted quarterly (SA) and annual data has been used to eliminate the influence of seasonal cyclical factors)

4.2 Correlation analysis

The economic data of the Asia-Pacific sample region and Taiwan region from 1997 to 2009 were regression fitted:

(1) The first direction of concern: nominal GDP

$$GDP_{yatai,t} = GDP_{Australia,t} + GDP_{Koreaen,t} + GDP_{Japan,t} + GDP_{America,t} + GDP_{HK,t} + GDP_{Singapore,t} + GDP_{Canada,t} + GDP_{New,t} \quad (1)$$

; $t = 1997,\ldots,2023$

$$R_{taiwan,1t} = \frac{GDP_{taiwan,t} - GDP_{taiwan,t-1}}{GDP_{taiwan,t-1}} \; ; \; t = 1998,\ldots,2009 \quad (2)$$

$$R_{yatai,1t} = \frac{GDP_{yatai,t} - GDP_{yatai,t-1}}{GDP_{yatai,t-1}} \; ; \; t = 1998,\ldots,2009 \quad (3)$$

Table 1 Descriptive statistics of main variables

Variables	Number of observations	Average	Standard Deviation	Minimum	Maximum
$GDP_{taiwan,t}$	13	343413.2	46486.45	279374.4	416470.2
$GDP_{yatai,t}$	13	$1.92e^7$	3290213	$1.49e^7$	$2.41e^7$

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$R_{taiwan,1t}$	12	0388801	0660351	-.0938851	0938661
$R_{yatai,1t}$	12	0236808	038374	-.0196832	0872639

(2) Second focus: Employment Rate ER (Employment Rate)

$$EN_{yatai,t} = EN_{Australia,t} + EN_{Koreaen,t} + EN_{Japan,t} + EN_{America,t} + EN_{HK,t} + EN_{Singapore,t} + EN_{Canada,t} + EN_{New,t}; t = 1997,\ldots,2009 \quad (4)$$

$$P_{yatai,t} = P_{Australia,t} + P_{Koreaen,t} + P_{Japan,t} + P_{America,t} + P_{HK,t} + P_{Singapore,t} + P_{Canada,t} + P_{New,t}; t = 1997,\ldots,2009 \quad (5)$$

$$ER_{yatai,t} = \frac{EN_{yatai,t}}{P_{yatai,t}}; ER_{taiwan,t} = \frac{EN_{tawian,t}}{P_{taiwan,t}}; t = 1997,\ldots,2009 \quad (6)$$

$$R_{taiwan,2t} = \frac{ER_{taiwan,t} - ER_{taiwan,t-1}}{ER_{taiwan,t-1}}; R_{yatai,2t} = \frac{ER_{yatai,t} - ER_{yatai,t-1}}{ER_{yatai,t-1}}; t = 1998,\ldots,2009 \quad (7)$$

Table 2 Descriptive statistical results of main variables

Variables	Number of observations	Mean value	Standard Deviation	Minimum	Maximum
$EN_{yatai,t}$	13	254382.3	7955.259	242838.7	266164.6
$EN_{taiwan,t}$	13	9735.769	424.9108	9175.5	10403.08
$P_{yatai,t}$	13	533121.4	15250.68	508809	556529.6
$P_{taiwan,t}$	13	22540.2	432.8584	21742.81	23119.77
$ER_{yatai,t}$	13	4771451	0048919	4662236	4851948
$ER_{taiwan,t}$	13	4317667	0114991	4187426	4515809
$R_{taiwan,2t}$	12	0044089	0109835	-.0173351	018501
$R_{yatai,2t}$	12	-.0018883	0114659	-.0318641	0113024

(3) Third focus: total Trade Value TV (Trade Value)

$$TV_{yatai,t} = TV_{Australia,t} + TV_{Koreaen,t} + TV_{Japan,t} + TV_{America,t} + TV_{HK,t} + TV_{Singapore,t} + TV_{Canada,t} + TV_{New,t}; t = 1997,\ldots,2009 \quad (8)$$

$$R_{taiwan,3t} = \frac{TV_{taiwan,t} - TV_{taiwan,t-1}}{TV_{taiwan,t-1}}; \quad R_{yatai,3t} = \frac{TV_{yatai,t} - TV_{yatai,t-1}}{TV_{yatai,t-1}}; \ t = 1998,\ldots 2009 \quad (9)$$

Table 3 Descriptive statistical results of main variables

Variables	Number of observations	Average	Standard Deviation	Minimum	Maximum
$TV_{yatai,t}$	13	5429458	1616865	3626158	8535241
$TV_{taiwan,t}$	13	329374.1	97978.09	217825.3	501952
$R_{yatai,3t}$	12	0508562	173085	-.2746332	3171194
$R_{taiwan,3t}$	12	0509974	1534573	-.2383051	2613823

Based on the statistical results, we can draw conclusions and make assumptions:

Hypothesis H1: There is a linear correlation between and. $R_{taiwan,1t} R_{yatai,1t}$

Hypothesis H2: There is a linear correlation between and. $R_{taiwan,2t} R_{yatai,2t}$

Hypothesis H3: There is a linear correlation between and. $R_{taiwan,3t} R_{yatai,3t}$

That is, assuming that Taiwan and the Asia-Pacific sample

region showed a correlation in the changes of the three economic indicators of nominal GDP, employment rate and foreign trade volume from 1997 to 2009, the two economies may have similar development patterns.

4.3 Construction of regression model

Based on the above Hypothesis H1, H2 and H3, we can set the variable change measurement model as follows:

$$R_{taiwan,it} = R_{basic,it} + \beta R_{yatai,it};\ t = 1998,\ldots,2009$$
$$\text{Therefore, the regression model is designed as: } R_{taiwan,it} = \alpha_i + \beta_i R_{yatai,it} + \epsilon_{it};\ t = 1998,\ldots,2009 \quad (10)$$

Among them, the explained variable represents the actual change rate of the i concerned direction in Taiwan at time t, and the core explanatory variable represents the actual change rate of the i concerned direction in other developed regions in the Asia-Pacific at time t, representing the random disturbance term, and are regression coefficients, which are used to measure the impact of the i concerned direction in the Asia-Pacific market on the corresponding concerned direction in Taiwan. $R_{taiwan,it} R_{yatai,it} \epsilon_{it} \alpha_i \beta_i \beta_i$ Based on the data from 1997 to 2009, the prediction model of economic indicators in Taiwan about the change of economic indicators in the sample region of the Asia-Pacific was obtained, which was used to fit the economic growth model of Taiwan without the implementation of ECFA after 2010.

4.4 Research model construction

Replace the three indicators of GDP, trade volume and employment rate, and build the model with the same method, taking GDP as an example:

$$\bar{R}_{taiwan,1t} = \alpha_1 + \beta_1 R_{yatai,1t};\ t = 2011,\ldots,2023 \quad (11)$$

$$GDP_{predict,2011} = GDP_{taiwan,2010}\left(\bar{R}_{taiwan,12011} + 1\right) \quad (12)$$

$$GDP_{predict,t} = GDP_{predict,t-1}\left(\bar{R}_{taiwan,1t} + 1\right);\ t = 2012,\ldots,2023 \quad (13)$$

Cumulative return rate (based on regression to calculate the ideal value in the absence of an event) $R_{more,1t}$

$$R_{more,1t} = \frac{GDP_{predict,t} - GDP_{taiwan,2010}}{GDP_{taiwan,2010}};\ t = 2011,\ldots,2023 \quad (14)$$

Cumulative excess rate of return $R_{morecumul,1t}$

$$R_{real,1t} = \frac{GDP_{taiwan,t} - GDP_{taiwan,2010}}{GDP_{taiwan,2010}};\ t = 2011,\ldots,2023 \quad (15)$$

$$R_{morecumul,1t} = R_{real,1t} - R_{more,1t};\ t = 2011,\ldots,2023 \quad (16)$$

$R_{real,1t}$ represents the change rate of Taiwan's GDP after the policy takes place in reality. Replace this part of GDP data with employment rate (ER) and trade volume (TV) data to respectively obtain $R_{real,2t}$ and $R_{real,3t}$.

4.5 Results of empirical analysis

4.5.1 Description of goodness of fit

Table 4 Regression results

	(1)	(2)	(3)
	$R_{taiwan,1t}$	$R_{taiwan,2t}$	$R_{taiwan,3t}$
$R_{yatai,it}$	1.619403***	6694676**	8816449***
	(8.80)	(3.09)	(29.78)
$cons(\alpha_i)$	-.0392818**	0056731**	0061603
	(-3.99)	(2.35)	(1.20)
N	12	12	12
R^2	0.8856	0.4884	0.9889

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4.5.2 Descriptive Statistics

Table 5 *The first focus: Descriptive statistics results of the main variables of GDP*

Variables	Number of observations	Average	Standard Deviation	Minimum	Maximum
$R_i®_{taiwan,1t}$	13	0131763	0520378	-.0602679	1235833
$GDP_{predict,t}$	13	593007.1	117972	467690.4	799394.4
$R_{more,1t}$	13	3275309	2640972	0469916	7895582
$R_{real,1t}$	13	3604311	2323074	0867413	7361966
$R_{morecumul,1t}$	13	0329002	080041	-.081975	2283237

Table 6 Second direction of interest: Descriptive statistical results of the main variables of employment rate (ER)

Variables	Number of observations	Average	Standard Deviation	Minimum	Maximum
$R_i®_{taiwan,2t}$	13	0086427	0109689	-.02286	0222687
$ER_{predict,t}$	13	4783222	0168068	4531183	5063006
$R_{more,2t}$	13	0558092	0370979	0001762	1175664
$R_{real,2t}$	13	0592943	0224925	0178095	086438
$R_{morecumul,2t}$	13	0034851	0163747	-.0311284	021549

Table 7 Third direction of concern: Descriptive statistical results of the main variables of total trade (TV)

variable	Number of observations	Average	Standard Deviation	Minimum	Maximum
$R_i®_{taiwan,3t}$	13	0348937	1178639	-.1516853	3013586
$TV_{predict,t}$	13	638113.4	97978.09	503750.3	909123.5
$R_{more,3t}$	12	1969913	2256615	-.055051	7053598
$R_{real,3t}$	12	205796	2259505	-.0463774	7023101
$R_{morecumul,3t}$	12	0088048	0106078	-.015528	0237293

Draw $R_{morecumul,1t}$ (Figure 5), draw $R_{morecumul,2t}$ (Figure 6), draw $R_{morecumul,3t}$ (Figure 7) a line chart about time t, that is, the statistical results of the excess cumulative growth of Taiwan's nominal GDP, employment rate, and trade volume from 2011 to 2023.

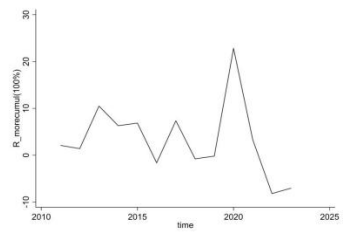

Figure 1.

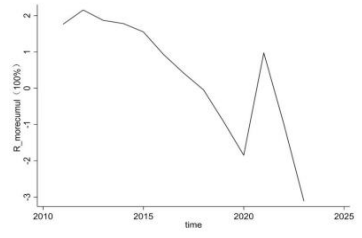

Figure 2.

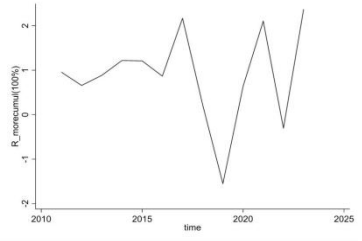

Figure 3.

4.6 Analysis of statistical results

On the whole, during the 5 observation basis points from 2011 to 2015, the end of Ma Ying-jeou's term of office, Taiwan's nominal GDP, employment rate and import and export volume all experienced significant and stable cumulative excess growth, especially the excess cumulative income measured by GDP once reached 10%.

However, during Tsai Ing-wen's first term as the leader of Taiwan (2016 -- 2020), the overall level of cumulative excess growth of the three economic indicators all showed a significant decline.

After 2020, with the expansion of the interval of time series, more events will cause disturbances to Taiwan's economic indicators, and the relative influence of ECFA on Taiwan's economy will inevitably decline. ECFA alone cannot explain the change of excess returns during this period. The addition of major disturbances will increase the volatility and instability of the excess cumulative yield curve. For example, the impact of COVID-19 on the Asia-Pacific economy at the end of 2020 will change the realistic basis of the hypothesis of linear correlation of the OLS model in this paper, and the coefficient and the value of the coefficient will deviate from the reality after 2020. $\alpha_i \beta_i$ The goodness of fit of the post-2020 economic data and the strength of interpretation of the real situation have declined. As a result, the theoretical basis of the event study method for empirical analysis of post-2020 data has been destroyed. In addition, the nominal amount used in this paper is unable to eliminate the interference of inflation and exchange rate changes, and the three excess cumulative returns have experienced large fluctuations after 2020. The event study method has lost its applicability in this time interval.

5. Summary

By comparing the cumulative excess returns generated by ECFA over different periods and indicators, this paper concludes that:

(1) ECFA can drive economic growth of Taiwan by promoting Taiwan's exports to Chinese Mainland.

(2) From 1997 to 2010, the changes of the three indicators of nominal GDP, employment rate and foreign trade volume between Taiwan and the major developed economies in the Asia-Pacific region showed obvious linear correlation, indicating that Taiwan and the major developed economies in the Asia-Pacific region may have similar economic development models.

(3) After the signing of the ECFA framework node, Taiwan's economy presents the characteristics of cumulative excess returns under the three indicators of GDP, employment rate and foreign trade volume, and this excess return is more obvious in GDP.

(4) The effective implementation of ECFA during Ma Ying-jeou's administration will have a positive impact on Taiwan's overall economy, social employment and foreign trade development. This indicates that cross-strait relations were good during the period of Blue Camp's administration, and ECFA showed a strong driving force for Taiwan's economic development at the early stage of its implementation.

(5) During Tsai Ing-wen's first term, there was a contradictory situation that cross-strait economic development brought about natural economic and trade growth, but the cumulative excess returns brought by ECFA for Taiwan's economy declined. This indicates that the backsliding of cross-Straits relations during the DPP's administration led to insufficient guarantee for the implementation of ECFA, coupled with the increase of factors affecting the excess returns over time, the relative influence of ECFA itself on Taiwan's economic development declined, and other cross-Straits economic and trade policies during this period failed to create the excess growth of Taiwan's economy in addition to the natural growth.

(6) The impact of ECFA on Taiwan's economy can be effectively analyzed in the short and medium term under the event study method. However, in the long term, with the increase of disturbing event factors and the decline of the relative influence of the main event itself, the insufficiencies of this analysis method are gradually highlighted, and the analysis of the long-term impact of ECFA on Taiwan's economy becomes more complicated (The short cycle in economics is usually 3-5 years, the medium cycle is usually 8-10 years, and the long cycle is usually over 10 years).

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