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ARTICLE

# Analysis of the Influence of Cross-strait Policy on Pineapple Trade

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**Abstract**

In order to prevent the risk of plant epidemic at the source, the General Administration of Customs of mainland China decided to prohibit the import of pineapples from Taiwan starting from March 1, 2021. Leveraging data from the 2020 mainland China and Taiwan Agricultural Statistical Report, we constructed a model to analyze the impact of mainland China's trade policy changes on the pineapple market in Taiwan. The results of the analysis indicate that the policy change will have a severe impact on Taiwan's pineapple market and will significantly affect producers' investment confidence. Achieving market equilibrium and overall efficiency in the pineapple market would be challenging, given the targeted nature of this policy change. Comparatively, the fruit industry, including pineapples, exhibits the weakest durability in risk management against such targeted policy changes, when compared to other agricultural products. Import policies from large unified market economies have a decisive impact on small exporting regions.

**Keywords:** Mainland China; Taiwan; pineapple market; trade policy

## 1. Introduction

On February 26, 2021, Ma Xiaoguang, the representative of the Taiwan Affairs Office in the People's Republic of China, responded to an inquiry stating that mainland customs had detected and intercepted quarantine pests in pineapples imported from Taiwan since 2020. The introduction of these harmful organisms poses a serious threat to mainland China's agricultural production and ecological security. "To prevent the potential risk of plant epidemics at the source, the General Administration of Customs has decided to enforce a prohibition on pineapple imports from Taiwan to the mainland starting from March 1st, 2021. [1]



1. The Central People's Government of the People's Republic of China. (2021). Taiwan Affairs Office of the State Council of China: The mainland China's suspension of pineapple imports from Taiwan

It is well known that mainland China and Taiwan have evolved into two distinct economic entities due to historical reasons. Once the aforementioned policy is implemented, Taiwan will be significantly affected. The substantial accumulation of pineapples will cause great turmoil in Taiwan's pineapple market. Orders for pineapples from other countries and areas cannot effectively solve the surplus of pineapples in Taiwan. The consumption in the local Taiwanese market also does not offer substantial relief for the excess supply. However, so far, the impact on mainland China is relatively minor. Pineapples that were originally imported from Taiwan are being replaced by domestic products from provinces such as Hainan and Yunnan, which are capable of marketing their own products independently. We will take China's policy on Taiwanese pineapples as a case study to explore the impact of policy changes on trade between different economic entities and the dependency of small export regions on a unified larger market.

## 2. Methodology and data

Based on the data presented in the tables, it is evident that Taiwan's export products are heavily reliant on the mainland China market. However, Taiwanese pineapples constitute only 20% of the total imported pineapples in mainland China. So, if mainland China stops importing Taiwanese pineapples, it will have a significant impact on Taiwan's overall market.

*Table 1 Query of agricultural statistics, 2020*

| Year | Taiwan pineapple price ($/each) | Taiwan pineapple production (ton) | The proportion of Taiwan pineapple exported to the mainland（%） | Mainland China pineapple price（$/lb） |
|---|---|---|---|---|
| 2018 | 0.94 | 432,084 | 97.03 | 0.2-0.3 |
| 2019 | 0.94 | 431,084 | 97.26 | 0.36-0.46 |
| 2020 | 1.01 | Taiwan's cumulative | 91.31 | 0.6 |
| 2020-Jan-21 | 0.73 | pineapple weights | 95.27 | 0.5-0.6 |
| 2020-Feb-21 | 0.77 | 430,000 tons | 94.54 | 0.5-0.6 |

*Source: "Agriculture Commission of the Executive Yuan", Taiwan Province. (2011). Agricultural statistics query. Agricultural inquire advance. Retrieved 16 March, 2021, from https://agrstat.coa.gov.tw/sdweb/public/inquiry/InquireAdvance.aspx*

Next, we will analyze and describe the implications of this policy change on both sides and explore possible future changes through the graphs below.

### *2.1 policy influence*

Figure 1 illustrates the typical trade pattern of pineapples between mainland China and Taiwan before the policy change. The shipping and handling costs, along with tariffs on pineapple trade between both sides, were almost negligible due to their special historical

is a normal bio-security precaution. The Chinese Government Website. Retrieved 16 March, 2021, from https://www.gov.cn/xinwen/2021-02/26/content_5589004.htm

*Table 2 Main import areas and proportion of pineapples in mainland China,2020*

| Pineapple import areas in mainland China | Proportion（%） |
|---|---|
| Philippines | 74.7 |
| Taiwan | 20 |
| Thailand | 5.2 |

*Source: "Agriculture Commission of the Executive Yuan", Taiwan Province.(2011). Agricultural statistics query. Agricultural trade. Retrieved 16 March, 2021, from https://agrstat.coa.gov.tw/sdweb/public/trade/tradereport.aspx*

Table 3 Taiwan's dependence on the mainland for exports, 2020

| Year | Taiwan Exports Proportion (%) |
|---|---|
| 1999 | 23.7 |
| 2007 | 40.9 |
| 2015 | 39.0 |
| 2020 | 43.8 |

*Source: "Agriculture Commission of the Executive Yuan", Taiwan Province.(2011). Agricultural statistics query. Agricultural trade. Retrieved 16 March, 2021, from https://agrstat.coa.gov.tw/sdweb/public/trade/tradereport.aspx*

relationship.[2] In the absence of cross-Strait trade, the consumer surplus associated with pineapples is denoted by area (a) for mainland China and area (f+g+h) for Taiwan. The producer surplus is measured by (b+e) for mainland China and (j+k) for Taiwan. The total surplus in mainland China is given by (a+b+e), while it is (f+g+h+j+k) for Taiwan.

When cross-Strait trade of agricultural products is established, the consumer surplus in mainland China becomes (a+b+c+d), while the producer surplus becomes (e). The change in consumer surplus is equal to (b+c+d) >0, and the change in producer surplus is equal to (-b) <0. In Taiwan, the consumer surplus is (f), and the producer surplus is (g+h+i+j+k). The change in consumer surplus is (-g-h) < 0, and the change in producer surplus is (g+h+i) > 0.

Figure 2 shows the effect of implementing the policy where mainland China stops importing any kind of pineapples from Taiwan. This policy leads to a significant increase in the supply of pineapples in Taiwan's local market, causing the price of pineapples in Taiwan to decline. [3] Before the policy change, the consumer surplus was equal to area (a), and the producer surplus was equal to area (b+e). Once mainland China stopped importing, the consumer surplus became (a+b+c+d), and the producer surplus became (e+f+g). The changes in consumer surplus were (b+c+d), and in producer surplus were (f+g-b). Consequently, the policy change resulted in an oversupply of pineapples in Taiwan's market, leading to price reduction, reduced production, associated employment, and profit in the pineapple industry.

2. Jiang, Y., and X. Xue. (2015). Building a cross-strait cooperation mechanism for the conservation and management of fishery resources in the South China Sea. Ocean & Coastal Management, 116:318-330.

3. Fulponi, L. and A. Engler. (2013). The Impact of Regional Trade Agreements on Chilean Fruit Exports. OECD Food, Agriculture and Fisheries Papers, No. 64. Retrieved 22 March, 2021, from https://doi.org/10.1787/5k3z0kd43z5f-en.

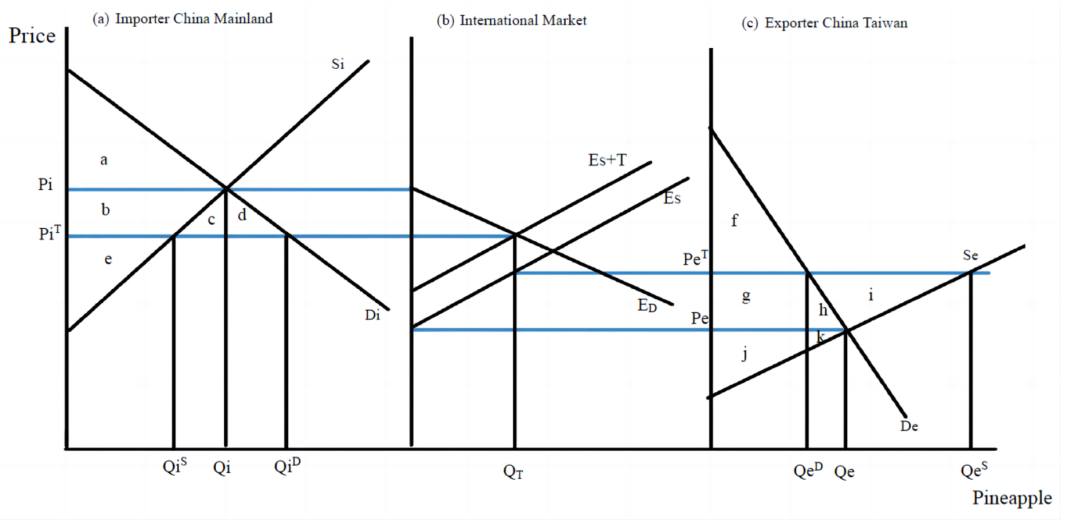


*Figure 1 When the policy didn't exist the normal pineapple trade between mainland and Taiwan*

**Figure 1**

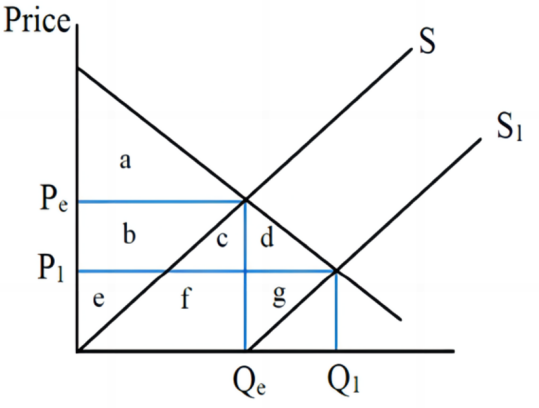


*Figure 2 When the policy is formally implemented, there is no trade between cross-strait*

Facing a plummet in pineapple exports and substantial losses, the Taiwan "government" is likely to seek a solution. Thus, it is reasonable to assume that Taiwan may improve the quality of its pineapples to solve the pest problem and regain the mainland market, while mainland China may increase tariffs to ensure the quality of Taiwanese pineapples. [4]Figure 3 and Figure 4 present these assumptions.

4. Leonidou, L. C., Katsikeas, C. S., Palihawadana, D., & Spyropoulou, S. (2007). An analytical review of the factors stimulating smaller firms to export. International Marketing Review, 24(6), 735–770. Retrieved 22 March, 2021, from https://doi.org/10.1108/02651330710832685

In Figure 3, Pw represents the free trade equilibrium price, where excess demand by mainland China equals excess supply by Taiwan. When mainland China implements a tariff, it will cause an increase in the price of pineapples in the domestic market and a decrease in the price in Taiwan local market. The price in mainland China rises to PcT, and the price in Taiwan falls to PwT.

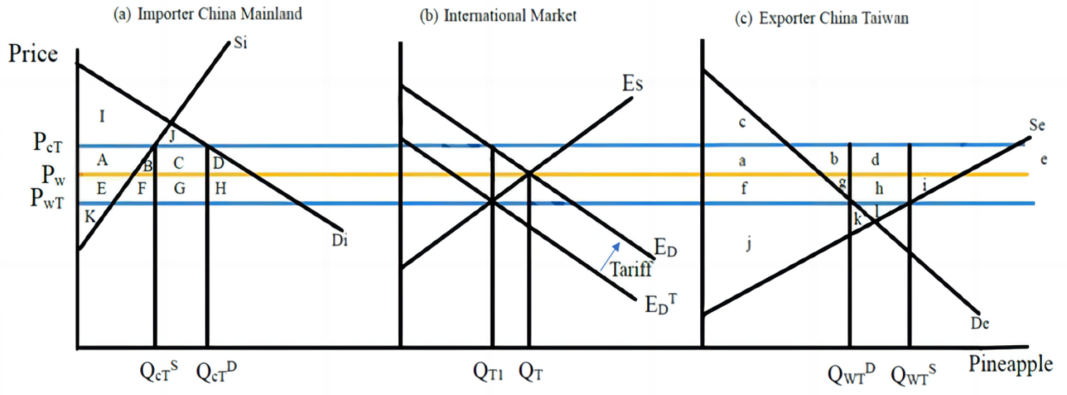


*Figure 3 Mainland China pineapple market reopened to Taiwan with additional tariff.*

No tariff: Consumer surplus in mainland China (importing market) = (I+J+A+B+C+D), producer surplus = (E+K). With the tariff added: Consumer surplus in mainland China = (I+J), producer surplus = (A+E+K). The implementation of the tariff leads to a reduction in consumer surplus of pineapples in mainland China, as shown in Figure 3, with the area reduced by (A+B+C+D). The increase in the domestic price of both imported goods and domestic substitutes results in a decrease in the overall consumer surplus in the market. However, producer surplus in mainland China experiences an increase due to the tariff, as depicted by the area (A) in Figure 3. The rise in pineapple prices in the domestic market enhances producer surplus in the industry, stimulating increased output by existing firms, potentially attracting new firms, generating more employment, and increasing fixed costs from profits. Additionally, the tariff implementation generates revenue for the mainland China government, indicated by the area (C+G).

No tariff: Consumer surplus in Taiwan (exporting market) = (c+a), producer surplus = (f+g+h+i+j+k+l). With the tariff added: Consumer surplus in Taiwan = (c+a+f), producer surplus = (j+k+l). The tariff leads to an increase in consumer surplus of pineapples in Taiwan, as illustrated by the area (f) in the graph. The decrease in Taiwan's local price raises the overall consumer surplus in the market. However, producer surplus in Taiwan experiences a decrease as a result of the tariff, represented by the area (f+g+h+i) in the graph. The decrease in the price of pineapples in their own market diminishes producer surplus in the industry, potentially leading to a decline in output, a reduction in employment, and a decrease in profit or payments to fixed costs.

To assess the overall impact on each area's welfare, we sum up the gains and losses to consumers, producers, and the government. The national welfare of mainland China is [G -

(B + D)], while the national welfare of Taiwan is [- (j +h+i)].

### 2.2 Market Assumptions

In a scenario where the mainland China ends the prohibitive policy against Taiwan and Taiwan fully integrates into the mainland China trade as part of the domestic market, the mainland China government grants subsidies to Taiwan's pineapple exporters. When Taiwan implements an export subsidy, it leads to an increase in the price of pineapples on the local market and a decrease in the price in mainland China. Let's assume that after the subsidy, the price in mainland China falls to Pw1, and the price in Taiwan rises to Pw2. The subsidy rate, in this case, would be S = Pw2 - Pw1.

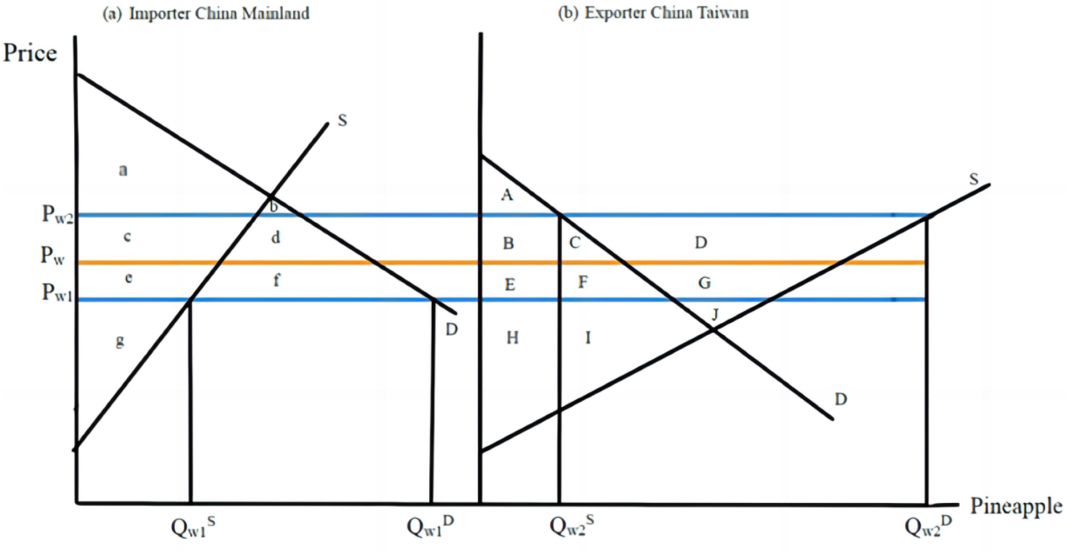


*Figure 4 Taiwan fully returned as part of the China's internal market*

Exporting market (Taiwan):
CS before = A + B + C; CS after = A; Change = -(B + C) (<0);
PS before = E + F + G + H + I + J; PS after = B + C + D + E + F + G + H + I + J; Change = +B + C + D (>0).

The export subsidy results in a decrease in consumer surplus of pineapples in Taiwan. The increase in the local price of pineapples reduces the overall consumer surplus in the market. On the other hand, producer surplus in the exporting area experiences an increase due to the subsidy. The increase in the price of Taiwan's pineapples in their local market raises the producer surplus in the industry. However, the "government" must pay the subsidy to exporters, and these payments come out of the general "government" budget. Therefore, the change in "government" revenue is -(C + D + K + F + G + L).
Importing market (mainland China):
CS before = a + b + c + d; CS after = a + b + c + d + e + f; Change = +e + f (>0);

PS before = e + g; PS after = g; Change = -e (<0).

The export subsidy results in an increase in consumer surplus of pineapples in mainland China. The decrease in the price of both imported goods and domestic substitutes increases the overall consumer surplus in the market. However, producer surplus in mainland China suffers a decrease as a result of the export subsidy. The decrease in the price of mainland China's pineapples in their domestic market reduces producer surplus in the industry.

There is no direct effect on mainland China's government revenue as a result of the exporter's subsidy. Since Taiwan is fully integrated into mainland China's internal market, Taiwan's export subsidies will be paid by the mainland China. In summary, an export subsidy lowers consumer surplus and raises producer surplus in the exporting area's market. Meanwhile, it raises producer surplus in the export market (Taiwan) and lowers it in the import market (mainland China).

## 3. Research Conclusions

This pineapple trade case provides valuable analytical insights into the trade relationship between mainland China and Taiwan. Following the policy implementation, there was a significant drop in the price of pineapples, leading to a surplus of stocks for Taiwan local market. The impact on pineapple producers in Taiwan was severe, while the market in mainland China remained relatively unaffected. This suggests that the pineapple trade between mainland China and Taiwan is currently dominated more by mainland China, with a single-sided influence. The perishable nature of pineapples, requiring pre-ordering and immediate transportation to consumers, is a common characteristic in the fruit industry. Analyzing pineapples as a classic example in the fruit industry demonstrates how this sector is particularly vulnerable to sudden policy changes. The trade relationships are often shaped by the dominance of an economically larger and unified market over a smaller economy. In this case, the fruit industry's unique characteristics make it highly susceptible to policy shifts, and its ability to manage risks is weaker compared to other agricultural products.

## 4. Discussion

The new policy implemented by mainland China regarding pineapple imports is based on concerns over pineapple pests and diseases, although it may also involve other variables. Since its implementation on March 1, 2021, mainstream media and various investigations have indicated a significant impact on Taiwan's pineapple industry. Reports suggest that approximately 430,000 tons of unsold pineapple inventory have accumulated, leading to substantial resource wastage and significant economic losses in the sector. Based on this analysis and information from mainstream media, it can be inferred that Taiwan will take significant measures to restore the mainland Chinese market and mitigate the incurred losses.

Considering the vast market size of mainland China and the historical preferential policies towards Taiwanese exports, re-engaging in trade with mainland China appears to be the most viable option. Additionally, the high transportation costs and logistical challenges of selling excess pineapples to other countries further support this assumption. In light of this, Taiwan should strategize to eliminate pineapple pests and ensure product quality

while addressing other factors affecting cross-strait trade. This approach aims to promote a win-win situation for both mainland China and Taiwan in their trade relations.

However, it must be acknowledged that these speculations may not be fully conclusive due to the lack of precise information from the Taiwanese "government" and the possibility of other influences on mainland China's policies. Overall, the above analysis and reasonable speculations emphasize Taiwan's strong dependency on the mainland Chinese market in its export trade, highlighting the relatively passive position of a smaller economy in the trading process, with the dominant role of a large unified market as the importing nation in shaping trade dynamics.

## 5. Concluding remarks

In summary, following the policy change, the price of pineapples on the island of Taiwan experienced a significant drop, leading to a surplus of pineapples with a large inventory in the hands of local farmers. However, the mainland China market quickly filled the gap with internal supplies from provinces like Hainan and external supplies from tropical nations such as Vietnam and Thailand. This resulted in significant losses and waste with a substantial unconsumed inventory for Taiwan's farmers. Analyzing the policy, it becomes evident that it did not achieve market equilibrium or total efficiency. To assess whether the policy change was "worthwhile," one must consider both sides of the trade relationship. For China and other large importers, the policy change was likely driven by multiple considerations to restructure their market. Trade is meant to be a mutually beneficial relationship for both importers and exporters. However, in this case, mainland China's pineapple market holds a dominant position as the buyer-market, and the decision to share the market with other exporters is solely determined by China. History has shown that in trade policy, most conditions are concluded with larger nations achieving their desired outcomes. In the current case, without concrete statistics from Beijing, it is challenging to ascertain the severity of the "ecological security" concerns regarding those pineapples. In conclusion, the policy change had significant repercussions on Taiwan's pineapple industry, while the mainland China market quickly adapted to alternative sources. The analysis highlights the impact of trade policies in asymmetric relationships and underscores the influence of larger nations in shaping trade dynamics. The extent of the "worth whileness" of the policy change depends on various factors, and the ecological security concerns remain subject to further investigation.

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