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Methodologies to Measure Market Competition – Note by Chinese Taipei

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More documents related to this discussion can be found at https://www.oecd.org/daf/competition/methodologies-to-measure-market-competition.htm

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Chinese Taipei

1. This paper presents different measures, which have been applied to real-life cases in Chinese Taipei, to assess the level of competition intensity in a market. It also touches on the data required for each measure and relevant practical experiences gained from law enforcement.

1. An outline of methodologies of measuring market competition and their application in practice

1.1. An outline of methodologies to measure market competition

2. The degree of competition in product markets and the market power of individual firms therein are closely associated with each other. Generally, the lower market power individual firms have in a relevant market, the higher degree of competition will be in the market. On the contrary, the higher market power of individual firms in a relevant market suggests that the degree of overall competition in the market is relatively lower. In this regard, measuring the degree of competition in a product market and the market power of a firm in the market are arguably two sides of the same coin, to which similar analytical methods can be applied.

3. In 2014, the Chinese Taipei Fair Trade Commission (CTFTC) collated various tools for economic analysis of competition-related issues, including market definition, monopoly, merger, concerted action, horizontal or vertical restrictions, to inform the CTFTC's staff of relevant economic theories and analytical methods applicable in competition law. Methodologies to measure market competition can be categorized into direct and indirect measurements, which are subject to data required for analysis, such as data on product prices, costs and profits. The methodologies under the two different measurement approaches are as follows:

1.1.1. Direct measurement

a Price-cost margin analysis: For example, the Lerner index, and L-P formula[1].

b Demand and price analysis: For example, residual demand analysis.

c Firm profitability analysis: For example, supra-competitive profits and profit margin analysis.

d Natural experiments

1.1.2. Indirect measurement

a Market share

b Concentration ratio: For example, CR4; the Herfindahl-Hirschman Index (HHI).

[1] Landes and Posner (1981) indicate that in a case where a single large or dominant firm faces competition from fringe firms in the relevant market, fringe firms with a very small market share (and the combined share) are not likely to engage in strategic behavior. This suggests that each of the fringe firms is a price taker in the relevant market.

c Entry analysis

d Buyer power

1.2. Application of methodologies to measure market competition

4. Given data around marginal cost or profit margins is not often readily available, the CTFTC often uses indirect measurements, such as concentration ratios (CR4 and the HHI) to assess the level of competition in a relevant market. With regard to a horizontal merger, the CTFTC defines relevant product markets and then estimates market shares of firms under investigation to calculate the combined market share of the four largest firms (CR4), and the HHI. Similar to the Horizontal guidelines issued by US antitrust agencies, the CTFTC considers the post-merger HHI and the increase between pre-merger and post-merger HHI when measuring market concentration. Based on the level of the post-merger HHI, markets can be classified into three types: 1) low concentration: HHI less than 1500; 2) medium concentration: HHI between 1500 and 2500; and 3) high concentration: HHI higher than 2500.

5. In addition to the indirect measurement, such as market share and market concentration, the CTFTC may make use of the Lerner index and profit margin analysis to evaluate how competitive a relevant market is. The application of the two measures is explained below.

1.2.1. The Lerner index is expressed in the following formula:

$$L = \frac{P - MC}{P} = \frac{1}{\varepsilon_d}$$

P: Price for goods

MC: Marginal Cost

ε_d : Elasticity of Demand

a Considering the limited accessibility and availability of data on marginal cost in a relevant market, the CTFTC often uses the multiplicative inverse of the elasticity of demand of the goods at issue to estimate the Lerner index. For example, in 2011 and 2015, the CTFTC adopted the measure respectively in the wireless telecommunication sector and the instant noodle market. By looking into the changes between prices and quantities of goods concerned, the CTFTC first calculated the elasticity of demand, and then used its multiplicative inverse to estimate the Lerner index so as to analyze the degree of competition in the relevant market.

b As this analytical method requires data on the changes between the prices and the quantities of the goods under investigation to calculate the elasticity of demand, it cannot be applicable without such data or in a case where product prices remain stable. Furthermore, in certain cases, the resulting ranking of market power for individual firms at question based on their Lerner indices may not be consistent with the ranking of their market shares in the relevant market. This then requires further analysis to determine which measure is more contextually appropriate.

1.2.2. Profit margin analysis

6. Due to the weather and land use in Chinese Taipei, the self-sufficiency ratio of food crops produced domestically, including soybeans, corn and wheat, is very low and the shortfall needs to be met trough imports from the United States or Brazil every year. As a result, shipments of bulk grains through import agreements are a common practice in Chinese Taipei. A case regarding joint shipments of soybeans, outlined below, provides an example demonstrating how the CTFTC applied a Johansen cointegration test and a marketing margin approach to explore whether the importers and domestic food processors engaged in collusive behavior, and assessed the degrees of competition in the respective markets.

7. Overall, in consideration of difficulties in accessing data around marginal costs, the CTFTC often adopts indirect measurement, including calculating market shares and market concentration ratios to assess the degree of competition in a relevant market. For example, the HHI is a measure applied to many horizontal merger cases. The CTFTC follows an approach similar to the US Horizontal guidelines to determine the level of market concentration. By contrast, direct measurement approaches, such as the Lerner index are applied to few cases. A unique case explained below details where the CTFTC used average monthly prices of soybeans, soybean oil and soybean meal to complete a cointegration test and marketing margin analysis.

2. Case study

2.1. Import cartel exemptions

8. When the Fair Trade Act (FTA) was enacted in 1991, legislators referred to then-current competition laws in Japan, Korea and Germany, and similar to these jurisdictions, a cartel (concerted action) exemption provision was included in the FTA. The legislative reasons of the provision expressly stated that "different types of concerted action could bring various effects. Some might be exempted from the cartel prohibition provision if they were considered beneficial to the economy as a whole and public interest and thus approved by the competent agency. The specified categories of exemption included uniform specifications, specialization and rationalization of operations, export cartels, import agreements, crisis cartels and agreements among SMEs for the purpose of enhancing efficiency." Import agreements refer to a concerted practice for the importation of foreign goods, in which competitors engage to increase trade efficiency.

9. Soybeans are a key raw material of soybean oil and soybean meal. As the sizes of soybean fields in Chinese Taipei are small and the weather is not ideal for growing soybeans, domestic soybean consumption largely relies on imports from foreign countries. To reduce associated import costs, soybean importers intend to apply to the CTFTC for approval of a cartel exemption, which allows them to jointly purchase and ship soybeans in bulk. Each approval can only permit an exemption period for a maximum of five years. Prior to expiration of the period, the firms involved in the import agreement can submit an application for extension.

10. Since 1991, food importers, including soybean, corn and wheat importers have applied for the CTFTC's approval to jointly purchase and ship bulk grains. They have also applied multiple applications for extensions of exemption periods. In regard to soybeans, based on the locations of cargo ports where soybeans are loaded, handled and unloaded, currently two groups comprising eleven soybean importers have exemptions allowing them to reach import agreements.

2.2. An overview of the soybean market

11. Currently two groups – Central Group at the Port of Taichung and Southern Group at the Port of Kaohsiung, which comprise eleven soybean importers in total, have exemptions to reach import agreements on the purchase and shipment of soybeans. In 2015, the annual value of soybean imports from the Central Group and the Southern Group accounted for 35% and 55% respectively of the total import value of soybeans, equivalent to 90% of total import value. The following example is the application for extension of the exemption period submitted in April 2015 by the Central Group, consisting of six importers. In this case, the CTFTC applied multiple methods to measure the degree of competition in the relevant market.

12. Considering market structure, between 2012 and 2014 the CR4 ratio was relatively stable, with a slight increase from 61.93% to 65.30%. Over the same period the HHI index increased from 1,363 to 1,731. The CTFTC's investigation showed that changes in the HHI index might have been caused by the exit of an importer. However, there was little change in the overall market structure due to new entrants entering into the market. Table 1 below shows the market shares of the key importers over three years and the levels of market concentration.

Table 1. Market shares of the key importers and the levels of market concentration

	2012	2013	2014
Market Share of the Central Group	40.65%	34.43%	35.91%
Market Share of the Southern Group	52.90%	54.03%	54.37%
CR4	61.93%	64.00%	65.30%
HHI	1,363	1,534	1,731

2.3. Cointegration test

13. The law of one price is used to validate if transactions among regional markets satisfy the criteria of market integration. The purpose of the integration models is to examine the geographical extent of market integration and thereby make an inference on the existence of transportation and sales barriers. The three main test methods focusing on prices of certain time series are the Engle-Granger cointegration test, Ravallion's model of market integration and Johansen's maximum likelihood test for cointegration.

14. Domestic demand for soybeans is highly reliant on imports. Provided that the domestic soybean market is efficient and its level of competition is relatively high, market prices should be able to reflect all available and relevant information, and no domestic soybean suppliers should be able to gain excessive profits. In this application, the CTFTC applied Johansen's cointegration test with three series of monthly average soybean prices in New Taiwan dollars (NTD) to determine if a common long-term trend existed and if the variables were cointegrated. The three prices of soybeans between January 2012 and June 2015 included the CIF prices (the prices set by international grain traders, hereinafter referred to as "C"), the average import prices (the import costs for domestic companies, hereinafter referred to as "T") and the prices for self-collection at port (the wholesale prices in the domestic market, hereinafter referred to as "A").

15. First, the CTFTC used EViews (a statistical software program) to compute the Augment Dickey-Fuller test (ADF test) in order to test if a unit root was present within variables, and to further assess the order of integration (I(c)). Table 2 below shows the cointegtation results. Below the significance level of 0.05, irrespective of intercepts and trends, the soybean prices for the C, T and A categories in first differences all rejected the null hypothesis of a unit root. In other words, the three prices all were I(1) series and had the same order of integration.

Table 2. The ADF test results

	Variable	Level of significance		First differences		Order of Integration
		T-value	P-value	T-value	P-value	
Including intercepts and trends	C	-2.432742(0)	0.3582	-5.474985(0)***	0.0003	I(1)
	A	-2.5323341(1)	0.3119	-3.923857(0)**	0.0200	I(1)
	T	-3.288216(1)	0.0828	-4.469220(0)***	0.0050	I(1)
Including intercepts abut excluding trends	C	-0.683020(0)	0.8398	-5.246920(0)***	0.0001	I(1)
	A	-1.171915(1)	0.6771	-3.401491(0)**	0.0168	I(1)
	T	-1.453453(1)	0.5465	-3.939394(0)***	0.0041	I(1)
Excluding intercepts and trends	C	-0.531808(1)	0.4804	-5.278061(0)***	0.0000	I(1)
	A	-1.539489(1)	0.4770	-3.399738(0)***	0.0012	I(1)
	T	-0.368820(0)	0.5453	-3.972715(0)***	0.0002	I(1)

Note 1: [*] represents that the null hypothesis of a unit root is rejected as the significant level is less than 0.1; [**] represents that the null hypothesis of a unit root is rejected as the significant level is less than 0.05; [***] represents that the null hypothesis of a unit root is rejected as the significant level is less than 0.01.
Note 2 : The value in the brackets is the lag selected against the Schwartz Bayesian information criterion.

16. Under the principles of Johansen's model (1994), at the significance level of 0.05, the trace test and the maximum eigenvalue test results suggested that there was only one cointergating vector among the three price variables (C, T and A). This meant that the three price series associated with soybeans from January 2012 to June 2015 were cointegrated. The long-term fluctuations of the three prices presented a similar pattern and the existence of a long-run equilibrium relationship. The previous import agreement for joint purchase and shipment therefore did not distort competition in the import market and wholesale market for soybeans.

2.4. Marketing margin analysis

17. In Chinese Taipei, most soybeans are processed into soybean oil and soybean meal for sale. To assess the state of competition in the soybean processing market, the CTFTC used the marketing margin approach to analyze prices between soybeans and the processed products (soybean oil and soybean meal).

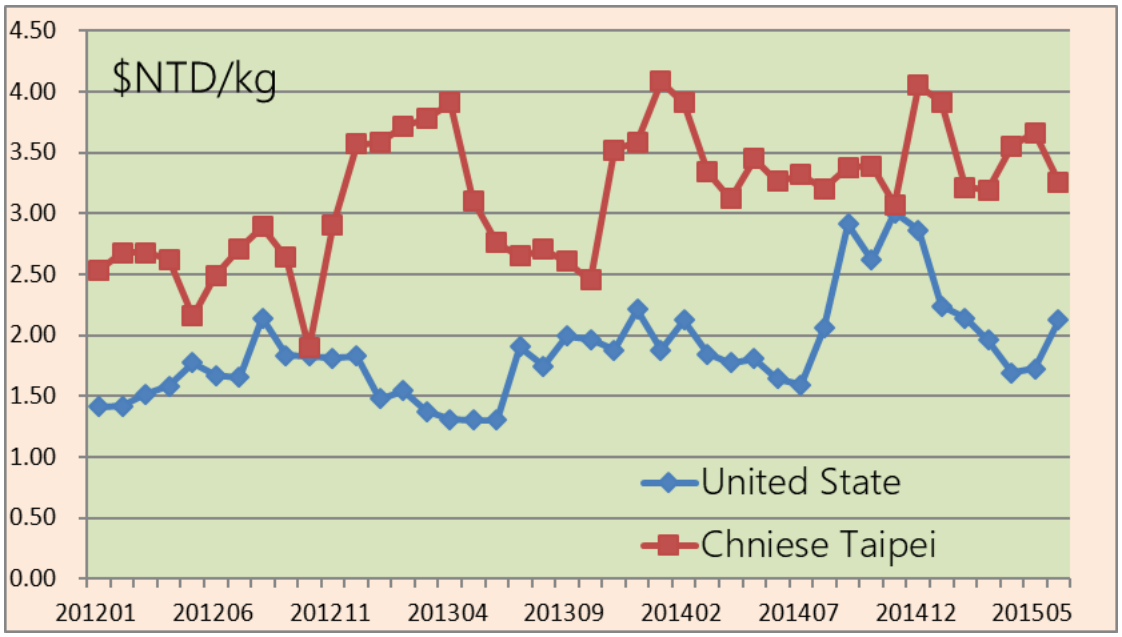
18. The marketing margin refers to the price difference between vertical markets. For instance, 0.18 kilograms of soybean oil and 0.82 kilograms of soybean meal can be extracted from one kilogram of soybeans. As a result, the marketing margin in the soybean processing market would be equal to the residual value by subtracting the price of one kilogram of soybeans from the sum of the weighted prices for soybean oil and soybean meal. If the level of competition in domestic markets regarding soybeans, soybean oil and soybean meal were considered intense, the marketing margin of soybeans in the domestic market should be generally stable without many opportunities for arbitrage. The equation is shown below: the marketing margin of soybeans = (0.18×the price for soybean oil +0.82×the price for soybean meal) - the price of soybeans.

19. The CTFTC used empirical data on the basis of the wholesale prices for soybeans, soybean oil, and soybean meal in the domestic markets to calculate the marketing margins from January 2012 to June 2015. Chart 1 below shows that the marketing margin varied within a range from around $2 NTD to $4 NTD.

Figure 1. The marketing margin of processed soybean products between January 2012 and June 2015

20. To determine if the marketing margin of soybeans was abnormal, the CTFTC compared the marketing margin based on monthly average prices of soybeans, soybean oil and soybean meal futures listed on the Chicago Board of Trade. Chart 2 below shows that the marketing margin in Chinese Taipei (between around $2 and $4 NTD) was higher than in the United States (between $1 and $3 NTD). This implied that the level of competition in the soybean processing market in the United States was higher than in Chinese Taipei.

Figure 2. Comparison of the marketing margins of processed soybean products in Chinese Taipei and the United States



3. Conclusions

21. Measuring the degree of competition in a market requires various data, for example, market shares of individual firms, market concentration, product price, marginal cost and profit margins. As collection of data around marginal cost is relatively difficult, the CTFTC often uses indirect measurements, such as market shares and concentration ratios (CR4 and the HHI) to assess the level of competition in a relevant market. Direct measurement approaches, such as the Lerner index and marketing margin analysis are applied to fewer cases.

22. The above-mentioned example involving the soybean import and the processing markets is one of the few cases where the CTFTC adopted both the cointegration analysis and the marketing margin analysis. These two methods only require price data on processed soybean products. Given the data collection is relatively easy, the CTFTC can carry out an empirical economic analysis to assess the state of market competition.