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Food Price, Firm Productivity and Market Structure in Indonesian Food and Beverages Industry

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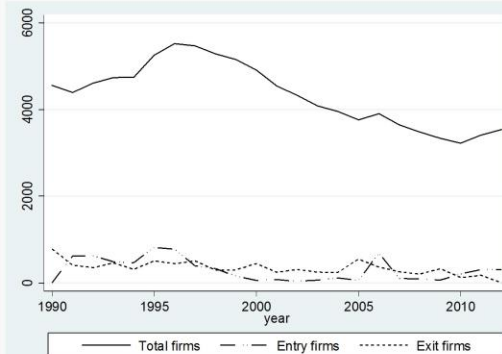
Background

- Food and beverages industry has always been an important sector in Indonesia and this sector contributed to as much as 7% to the GDP and 28% to total industrial manufacturing output in 2014 yet this industry is characterized by high price volatility, high concentration, and low productivity (Setiawan et al., 2012; Warr and Yusuf, 2014).
- Competing theories exist about the relationship between industrial concentration and efficiency: Quiet-life hypothesis (Hicks, 1935) suggests high industrial concentration lowers competition and therefore decreases efficiency; Efficient-structure hypothesis (Demsets, 1973) claims that firms with higher efficiency have larger market share.
- Lots of studies explore the technical efficiency in Indonesia's food and beverage sector (Margono and Sharma, 2006; Ikhsan, 2007) but the relationship between food price, efficiency and market structure is underexplored.

Objective

- Using firm-level data spanning from 1990 to 2012, this paper investigates the evolution of technical efficiency and market concentration of firms in food and beverages industry in Indonesia as well as the relationship between food price, firm efficiency and market structure.

Firm Dynamics



Empirical Model

- We use a simultaneous equation system to investigate the relationship between the three variables, which can be represented as following:

$$Price_{jt} = \alpha_0 + \alpha_1 TFP_{jt-1} + \alpha_2 HHI_{jt-1} + \alpha_3 Input_price_{jt-1} + \epsilon_{jt} \quad (1)$$

$$TFP_{jt} = \beta_0 + \beta_1 HHI_{jt-1} + \beta_2 Marketshare_{jt-1} + \beta_3 Entry_{jt-1} + \beta_4 Exit_{jt+1} + \mu_{jt} \quad (2)$$

$$HHI_{jt} = \gamma_0 + \gamma_1 Price_{jt-1} + \gamma_2 TFP_{jt-1} + \epsilon_{jt} \quad (3)$$
- We follow Amiti and Konings (2007) by assuming a plant with Cobb-Douglass production function:

$$Y_{it} = A_{it}(\tau) L_{it}^{\beta_L} K_{it}^{\beta_K} \quad (4)$$
- where y_{it} is the total revenue of firm i at time t deflated by wholesale price index of food and beverages industry. Labor, L_{it} , and capital, K_{it} are also adjusted by separate deflators. Using the estimates of the production coefficients, the log of measured TFP of plant i at time t is denoted by

$$TFP_{it} = y_{it} - \hat{\beta}_L L_{it} - \hat{\beta}_K K_{it} \quad (5)$$
- As for the industrial concentration ratio, we use the Herfindahl-Hirschman Index (HHI)

$$HHI_j = \sum_{i=1}^n (MS_i)^2 \times 10,000 \quad (6)$$
- where $j = 1, 2, \dots, n$ denotes the subsector, $i = 1, 2, \dots, n$ indexes firms within a subsector, MS_i denotes the market share of firm i in its respective subsector.
- We use three-stage least square method to estimate the simultaneous equation system. The method can increase inefficiency and help to get unbiased and more efficient estimators.

Data and Measurement

- We operationalize the empirical model using firm-level data from Indonesia between 1990 and 2012 collected annually by the central Bureau of Statistics, *Budan Pusat Statistik (BPS)*.
- The Annual Manufacturing Surveys cover the population of manufacturing firms in Indonesia with at least 20 employees and include firm-level information like revenue, value-added, number of employment, capital, machinery, and fixed assets etc.. The sample covers the period from 1990 to 2012 during which the data are tractable and comparable.
- We use the food and beverages sector at the 2-digit level of International Standard Industrial Classification (ISIC) system.
- We use the World Input-Output Database (WIOD) developed by Timmer et al. (2015) as our major source of construction of price index.
- As for the model adopted to estimate the technical efficiency of firms, output is defined by total output divided by wholesale-price Index (WPI) of food and beverages. Labor efficiency units are used as a proxy for labor use. We define fixed capital as fixed assets, deflated by the WPI of machinery (excluding electrical products), transport equipment, residential, and non-residential buildings.

Estimation results

	(1) All firms	(2) Foreign firms	(3) Domestic firms
<i>Dependent variable: Price</i>			
TFP	0.0420 (0.61)	0.286 (1.75)	0.00477 (0.06)
HHI	-259.3*** (-24.50)	-424.1*** (-9.17)	-291.0*** (-34.01)
Input price	0.907*** (226.85)	0.850*** (49.16)	0.895*** (280.57)
Constant	23.38*** (25.59)	35.79*** (9.64)	26.16*** (35.45)
<i>Dependent variable: TFP</i>			
HHI	-9.950*** (-29.67)	8.778*** (5.96)	-9.692*** (-26.94)
Market share	4.557*** (46.13)	3.068*** (16.77)	4.871*** (41.32)
Entry	0.0884*** (4.17)	0.237*** (4.79)	0.0216 (0.92)
Exit	-0.0164 (-0.98)	-0.157* (-2.36)	0.00490 (0.29)
Constant	1.711*** (151.30)	1.557*** (45.69)	1.682*** (135.66)
<i>Dependent variable: HHI</i>			
TFP	0.000147 (0.34)	0.00128 (1.94)	-0.0000232 (-0.05)
Price	-0.000374*** (-125.70)	-0.000370*** (-53.83)	-0.000367*** (-113.26)
Constant	0.0863*** (163.13)	0.0805*** (41.25)	0.0859*** (146.41)
N	64606	5843	58763

Conclusion

- Food and beverages industry is a relatively mature industry, and higher concentration benefits consumers in the sense that it decreases the product price.
- Foreign firms benefits from high concentration in that concentration leads to higher TFP, yet high concentration is harmful for domestic firms in the sense that high concentration results in lower TFP of domestic firms.
- Divergent effects of concentration on foreign and domestic firms necessitate careful FDI policies as well as manufacturing policies.

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