FUEL PRICE INCREASE AND MANUFACTURING FIRMS SURVIVAL IN INDONESIA

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Abstract

The administered price of fuel has increased quite frequently since 1970. It has raised a concern on the survival ability of manufacturing firms that could be weakened by such policy. This research objective is for confirming whether the policy of increasing fuel price affects the survival of manufacturing firms in Indonesia. By using an Instrumental Variable Probit Model, it demonstrates that increasing fuel price does not affect firms' survival in the short-run, middle-run, as well as long-run. Nevertheless, the z-statistics increase when the period of estimation is expanded. It means that if the time span of sample observation is widened, the result might be different.

Keywords: Fuel price, survival ability, instrumental variable probit model
JEL classification numbers: H27, D22

Abstrak

Harga bahan bakar minyak (BBM) selalu meningkat sejak 1970. Kenaikan harga ini telah menimbulkan kekhawatiran pada kemampuan kelangsungan hidup perusahaan manufaktur di Indonesia yang bisa dilemahkan oleh kebijakan tersebut. Penelitian ini dilakukan dengan tujuan mengonfirmasi apakah kebijakan kenaikan harga BBM mempengaruhi kelangsungan hidup perusahaan industri manufaktur di Indonesia. Dengan menggunakan Instrumental Variable Probit Model, hasil penelitian menunjukkan bahwa peningkatan harga BBM tidak mempengaruhi kelangsungan hidupperusahaan dalam jangka pendek, menengah, serta jangka panjang. Namun demikian, z-statistik meningkat ketika periode estimasi diperluas. Ini berarti bahwa jika rentang waktu pengamatan sampel melebar, hasilnya mungkin akan berbeda.

Kata kunci: Harga BBM, kemampuan bertahan hidup, instrumental variable probit model
JEL classification numbers: H27, D22

INTRODUCTION

In Indonesia, the price of fuel is determined by government with a low price policy. Usually, the price is lower than the average cost of fuel production, and even lower than the fuel prices in the countries of Southeast Asia with the exception of Brunei Darussalam. Nevertheless, it is difficult to maintain low fuel price due to increasing of fuel subsidy burden.The rise of world oil price and increasing fuel domestic consumption cause the escalating of fuel subsidy.For that reason, government has constantly raised fuel price in the last 40 years. Every announcement of raising fuel price always heated political and social situation because such policy intiates inflation.

Manufacturing industry sector has also been taken the effect of raised fuel price. The multipiler effect of increasing fuel price influences the rise of input prices and accordingly causing higher production cost.[1] There are two options in adjusting

[1] Fuel consumption for the energy sector of the manufacturing industry is average on 30.85% (Indonesian Energy Sta-

the effect of cost burden rise on production operation, making production more efficient or shuting down the business. To make production more efficient will sacrifice some inputs including the workers. It promotes higher unemployment rate. If shutting down the business is the choice for many firms, the massive closure will reduce national production and also rising unemployment

After 2000, fuel prices had been increased for five times. During 2002-2006, there were three times of fuel price increasing[2]. The most phenomenal of raising fuel price was in 2005 which was increased by more than 100%. Several fuel price increases repeatedly was presumed brought bad impact to firms in the manufacturing industry. It weakened the survival of manufacturing firms.

It is assumed that manufacturing firms are misery in facing the rise of fuel prices. Based on the assumption, this study question is how big the effect of rising fuel prices on the possibility of manufacturing firms exit from the market. This study will use survey data medium and large firms in manufacturing industries, published by BPS with the period 2002-2006. This period was elected because in this period fuel price increased three times. It is expected to observe the impact of fuel price increases on the survival of the firm directly.

Table 1 shows that from 2002 to 2006, the firm mortality rate are 5.2%, 8.1%, 7.6%, 6.9%, and 12.2% of its previous year, respectively. The trend showing arising percentage of mortality rate indicates the problems become more difficult to be faced. While, the number of new firms that entered from 2002 to 2006 respectively also increased, which are 919, 1041, 2036, 1562, and 11,579 firms. It demonstrates that manufacturing industry in Indonesia is quite attractive. In the period of transition from a multidimensional crisis conditions experienced by Indonesia since 1998 leading to a more stable economic conditions. Although the number of firms were leaving the market rises but new firms were coming up as well.

Table 2 shows that the firms which were 5 to 10 years old have the lowest mortality rate (13.1%). Meanwhile, the highestmortality was a firm with 1 to 10 years old (29.9%). For a firm with over 10 years old also had a high mortality rate (17.73%). Based on these figures, the firm whose age over than 10 years have problem continuing its business. While new entrances have not had much experience in managing abusiness.

From the ownership point of view, firms owned by national private had the lowest mortality rate in the amount of 19%. Meanwhile, state-owned and foreign-owned firms had a mortality rate of 34.74% and 20.84% respectively. It can be said that national private owned firms had larger power struggle in maintaining their business than foreign-owned or state-owned firms.

Medium-large firms had the lowest mortality rate (16.57%). While large and medium firms had a mortality rate of 18.64% and 20.49% respectively. Large and medium manufacturing firms had higher mortality rate than medium-large firms.

Later, firms with export orientation had a mortality rate that was smaller than that not export-oriented firms were which is 16.1% versus 20.3%. Therefore, the firm that last longer were firms with export orientation.

In terms of the use of fuel in the production process, the firm which had

tistics 2009). The cost of fuel consumption of a firm contributes less than 5% of total cost of production on the average with a minimum share of close to 0% and the maximum share of more than 50% (Ministry of Energy and Mineral Resource, Republic of Indonesia, 2009).

[2] The fuel price increase occurred in 2002 (from Rp1,450,- to Rp1,550,- for a premium and of Rp1,200,- to Rp1,110,- for a diesel), 2003 (from Rp 1,550,- to Rp1,810,-for premium and from Rp1,110,- to Rp1,650,- for a diesel), and 2005 (from Rp 1,810, - to Rp4,500, - for a premium and of Rp 1,650, - to Rp4,300, -for diesel).

more than 50% fuel costs share to total production costs had high mortality rate. However, the highest mortality rate was the firms which have fuel costs share top roduction costs between 30% to 40% in the amount of 24.68% (Table 3). The lowest mortality rate in manufacturing firms was the firms which have fuel cost share between 10% to 20% which is 16.2%. This figure is lower than the mortality rate of the firms which have less than 10% fuel cost share. From this phenomenon, it can be assumed that the effect of fuel price increases are inconsistent with the firm's demise.

Table 1: Numbers of Firms in Manufacturing Industry Sector

Year	2001	2002	2003	2004	2005	2006
Numbers of Survived Firms	21,392	21,146	20,324	20,685	20,729	29,468
Numbers of Closed Firms	–	1,165	1,863	1,675	1,518	2,840
Numbers of New Firms	–	919	1,041	2,036	1,562	11,579
Dead Percentage (%)	–	5.2	8.1	7.6	6.9	12.2

Source: The Annual Survey of Medium and Large Enterprises, Central Statistical Agency

Table 2: The Anatomy of Dead and Survived Firms Manufacturing Industry Sector 2002-2006

	Dead (%)	Survived (%)	Numbers of Firms
Based on Ownership			
National Private	19.01	80.99	25,654
Foreign	20.84	79.16	2,078
Government Owner	34.74	65.26	927
Based on Size			
Middle (20 - 100 workers)	20.49	79.51	21,566
Big Middle (>100 – 500 workers)	16.57	83.43	5,226
Big (> 500 workers)	18.64	81.36	1,867
Based on Age			
1-5 year	29.09	70.91	7,249
> 5 -10 year	13.10	86.90	5,863
> 10 year	17.73	82.27	15,547
Export Oriented			
No Export	20.30	79.70	24,274
Export	16.10	83.90	4,385

Source: The Annual Survey of Medium and Large Enterprises, Central Statistical Agency

Table 3: Firms Description Based on Fuel Cost Share Group

Fuel Cost Share Group (X)	Dead (%)	Survive (%)	Numbers of Firms
1: < 10%	19.86	80.14	25,826
2: 10% ≤ x < 20%	16.20	83.80	1,784
3: 20% ≤x < 30%	17.38	82.62	558
4: 30% ≤x < 40%	24.68	75.32	235
5: 40% ≤x < 50%	24.63	75.37	134
6: ≥ 50%	21.31	78.69	122

Source: The Annual Survey of Medium and Large Enterprises, Central Statistical Agency

METHODS

The possibility of failure of firm to survive ini a market can be denoted as:

$$p(T \leq t) = F(t) \quad (1)$$

where T is survival spell and t is observation spell. $T \leq t$ means a firm leaves a market before and the same of the end of observation spell. While *F(t)* is failure function. It means that:

$$p(T \leq t) = 1 - F(t) = S(t) \quad (2)$$

Equation (2) is called survival equation which is the possibility of a firm to survive in a market during the observation.

Simply, it is likely the firm can not survive because the market price is lower than the point of shuting-down. The failure of a firm to lower its shut down point is caused by many internal and external factors. According to Jovanovic (1982), the characteristics of a firm in the face of market dynamics will determine the firm's ability to survive in the competition. The main factors of survival are age and firm size. The older the firm the more experienced the firm to deal with many obstacles. The larger the firm the greater the chances of survival because it has achieved economies of scale.

According to Ghemawat and Nalebuff (1985), the propositions of Jovanovic model about the size of a firm can be wrong if the firm faces a receding market. The bigger the firm will be the greatercosts than other firms which are smaller size. Demand absorption of bigger firm's product become smaller and, therefore, it is more difficult to survive for bigger firms.

Based on two contrasting models, many studies refer to both models. By focusing on the age and size of the firm, the researchers found that the age and size of the firm is directly proportional to the ability to survive[3]. However, other results[4] found that the size and age did not affect the survival of the firm. The result of studies are consistent with Gibrat's law[5].

Further development is not only focused on the size and age of the firm itself but adds other factors both other firm characteristics or external factors. Moel and Tufano (2002) and Perez et al (2004) included financial elements as determinants of firm resistance. Factors technological advances affect the survival of the firm is the conclusion of research, Cefis and Marsili (2005), and Buddelmeyeret et al. (2006). A more comprehensive study conducted by Bernar and Jensen (2002). Findings showed not only a factor of the size and age of firms that affect the survival of the firm but it was also productivity, export orientation, and specialization. Another factor that reduces the survival of the firm is the ratio of non-production workers, the number of factories more than one, and the activities of multinational corporations.

Firm's survival researches in Indonesia were conducted by Narjoko and Hill (2006), and Kuncoro (2006). Narjoko-Hill analyzed the surivival of the firms in the middle of multidimensional crisis of 1998. The findings were foreign-dominated and export-oriented firms had a greater probability of survival than others. Kuncoro research focused on the effect of regional autonomy to the firm's survival. The regional autonomy was proxied by the intensity of collecting bribes by local authorities to the firm. Kuncoro found that the intensity of official visits by local government officers to the firm increased the probability of firms to exit the market.

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[3] Among them are Goddard et.al (2002), Koening and Faggio (2003), Harris and Trainor (2005), and Johansson (2004).

[4] Singh and Whittington (1975), Hardwick and Adam (2002), Chen and Lu (2003), and Lensink et.al (2005)

[5] Gibrat's law said the probability of a given proportional change in size is the same for all firms in a given industry, regardless of their size at the beginning of the time period (Mansfield, 1987)

This research will incorporate fuel price factor as the main factor that affect survival of manufacturing firms. Control factors over fuel price variable are a firm characteristic factors and demand factors. Demand factors are incorporated into the control factor because of rising fuel prices affect the survival of the firm through the supply side. If it is not offset by the demand side, uncontrolled behavior of error term will be more difficult to handle.

The econometric model of this research is as follows.

$$p(T > t) = bX + cY + dZ + e \quad (3)$$

$p(T > t)$ is dependent variable which has only two values, one if a firm still survive until the end of the observation period and zero if other. X is a firm characteristics vector, Y is a demand vector, and Z is main factor which is fuel price. Meanwhile, b, c, and d are coefficient vector of estimation. Firm characteristics and demand factors include the following.

Firm Characteristics Factors

The variables representing factors firm characteristics are firm size, firm age, firmproductivity, and ownership status. Firm size uses amount of labors as a proxy. The labor is directly related to production. Firm age is determined by age in 2002, the firm at the commencement of the study. Productivity are measured by the ratio of the volume of output and employment in the production. The volume of output is obtained from dividing the value of output with price index adjacent to the commodity ISIC group produced. Ownership status is divided into three groups which are foreign ownership, domestic private ownership, and government ownership. The firm is considered foreign owned if there is a foreign element in their possession though not dominant. It takes two dummy variables in explaining ownership status. The value of foreign ownership dummy variable is one if there is a foreign element and zero if other. The value of domestic private ownership dummy variable is one if the firm is worth a hundred percent privately owned nationwide and zero if other.

Demand Factor

Variables representing the demand factor is the orientation of exports and demand growth. Export orientation was chosen as one of the variables that represent the demand for exports is part of the demand for industrial manufacturing goods. While demand growth variable is used as a variable that represents the request because it directly has a variable demand itself. Variables such as export orientation dummy variable with a value of one if there is a partial or total sales are exported and the value of zero if other. While demand growth is volume output use variable.

Main Factor

The main variable of this research is fuel price. The use of fuel prices as a independent variable will lead to another problem, the firms' reaction of fuel price increases vary. It depends on the size of the share of the fuel cost in cost of production. If the price of fuel is the main variable, it will lead to biased behavior. Therefore, the fuel price variable is replaced by a variable fuel cost share toward the cost of production. Replacement of this variable does not affect the analysis because Atmadji (2010) has shown that the share of fuel cost variable is a monotonic transformation of the variable fuel prices. Using this new variable has two advantages. First, it represents the movement in fuel prices. Second, it captures the fuel usage variations at each firm.

The econometric function to be estimated is:

$$p(T > t) = f(share, age, size, productivity, foreign, private, export, growth) \quad (4)$$

Share is the fuel costs share to the cost of production, *age* is the age of the firm, *size* is a measure of firm size, *productivity* is the productivity of the firm, *foreign* is foreign ownership, *private* is private ownership, *export* is export-oriented, and *growth* is the growth in demand. Estimation will use the Panel Probit method.

Probit estimation method requires only two points in time. Hence, the estimation uses six sets of time periods to accommodate the three-time fuel prices increases in the period 2002-2006. Three sets of time which is 2002-2003, 2003-2004, and 2005-2006 represents a short-term effect. For medium term, the sets of time are 2003-2005 and 2004-2006. A time set for long term effect is 2002-2006.

RESULTS

The estimation has two problems. The first problem is the presence of heterogeneity in the data to be estimated. Heterogeneity is caused by large variations of the firms that are in nine sub-sectors of the manufacturing industry. Treatment of heterogeneity is done by giving a dummy variable for each sub-sector of manufacturing. Dummy variable *D-food* (from the food and beverage sub-sector) will be equal to 1 for food and beverage firms, and zero if other. Other dummy variables, *D-textile* (textile sub sectors), *D-wood* (the wood processing sub sector), *D-paper* (paper industry sub sector), *D-chemical* (chemical goods sub sector), *D-cement* (cement sub sector), *D-metal* (metal industry sub sectors), *D-machine* (from sub sector machine industry) also include the value of 1 on the firms that are in the sub-sector in accordance with the group. Outside the group were given a value of 0. The anchor sub sector is miscellaneous sub sectors.

The second problem is that there are elements of endogeneity in main independent variable, fuel share variable. Rising fuel prices will increase the share of fuel costs in production cost. On the other hand, rising fuel prices also cause the price increase of other inputs hence it increases the cost of other inputs. The cost increasing of other inputs will reduce the cost share of fuel cost. Therefore, instrumental ariablefrom probit procedure applies. There are three variables selected as an instrument which are the ratio of total corporate tax contributions on a district by district nominal GRDP (Gross Regional Domestic Product), the average age of the firm at the same districts, and the average size of firms in the same district.

The result of application of instrumental variables method in panel probit estimation is presented in Table 4. The survival probability calculations based on the estimation presented in Table 4 with the average value of each of the independent variables (except the dummy variables) is in Table 6. Survival probability calculation results are grouped according to the share of the fuel cost at each firm. Marginal effect of the estimation result of Table 4 are presented in Table 5. Calculating the marginal effect using the method described by Anderson and Newell (2003).

Sub-sectoral Characteristic Influence

The estimations (Table 4) show that dummy variable *D-textiles* and *D-wood* are significant and positive in the long term. It means that firms from textile and wood sub-sector had greater possibility to survive compare to other manufacturing firms from other sub sectors. While in the medium-term period (2003-2005 and 2004-2006) showed that all sub-sectors of the manufacturing industry had no difference in survival probability because all sub-sector dummy variables are statistically insignificant. In the short term, only the period 2002-2003 showed the differences in survival p robability for the food sub-sectors and the textile sub-sector compared toothers. In other short-termperiod, all sub-sectors had the same survival probability. In general, the survival probability was no

different to all sub-sectors except the survival probability in the long term. In this long term period, firms in textile sub sector and wood sub sector showed better performance compare to firms in other sub sectors. Presumably, there was an element of high performance in export which leads to the difference between the two sub-sectors and other sub-sectors in terms of survival probability. Sub-sectors of textiles and wood had high export performance since most of the exported products had very high demands for Indonesian textiles and furniture products from abroad.

Table 4: Estimation Result Using Probit Instrumental Variable

Variable	Time Period					
	2002-2003	2003-2004	2005-2006	2003-2005	2004-2006	2002-2006
FuelShare	-7.67388	-7.70967	0.466004	2.040012	-6.38492	-3.72796
	(-1.47)	(-1.41)	(0.09)	(0.34)	(-1.38)	(-1.28)
growth3	2.33E-05	-5.8E-05	0.052443	-5.3E-05	0.431457	0.002609
	(1.07)	(-3.65)***	(2.82)***	(-2.7)***	(5.05)***	(0.13)
ln_size	0.136384	0.102823	0.197187	0.129401	0.136438	0.162814
	(4.13)***	(4.06)***	(16.29)***	(12.39)***	(5.34)***	(11.45)***
productivity	-3.75E-09	-2.73E-08	6.45E-08	1.79E-08	9.53E-08	4.39E-08
	(-0.28)	(-1.61)	(2.23)**	(0.7)	(2.29)**	(2.99)***
ln_Age	0.151338	0.165517	0.24627	0.174293	0.253458	0.168791
	(5.79)***	(6.62)***	(10.75)***	(6.67)***	(11.07)***	(20.18)***
D-private	0.165555	0.136245	0.110822	0.254401	0.14743	0.205857
	(2.02)**	(1.67)*	(1.67)*	(5.46)***	(2.09)**	(4.9)***
D-foreign	0.031469	-0.18877	0.060517	0.07072	0.287868	0.117397
	(0.29)	(-2.72)***	(0.73)	(0.88)	(2.45)***	(1.91)*
D-export	0.337426	0.189276	-0.10361	0.076904	-0.03219	0.085954
	(4.16)***	(2.63)***	(-3.11)***	(2.45)**	(-1.08)	(3.25)***
D1-food	-0.28728	0.009594	-0.11381	-0.00538	-0.02193	-0.11467
	(-1.23)**	(0.05)	(-0.6)	(-0.03)	(-0.14)	(-0.83)
D2-textile	-0.54381	-0.21924	0.04472	-0.14105	-0.09784	-0.31174
	(-2.43)**	(-1.27)	(0.28)	(-0.98)	(-0.72)	(-2.41)***
D3-woods	-0.63778	-0.17472	-0.16117	-0.23232	-0.15266	-0.42334
	(-2.57)	(-0.96)	(-1)	(-1.56)	(-1.06)	(-3.18)***
D4-papers	-0.31949	-0.01103	0.117506	0.124883	-0.03589	-0.03341
	(-1.45)	(-0.06)	(0.71)	(0.82)	(-0.25)	(-0.24)
D5-chemical	-0.27291	0.010125	0.097577	0.12167	0.065008	-0.00023
	(-1.25)	(0.06)	(0.56)	(0.79)	(0.47)	(0)
D6-cement	-0.15606	0.112463	-0.08842	-0.03804	0.153472	-0.05877
	(-0.55)	(0.45)	(-0.31)	(-0.14)	(0.68)	(-0.36)
D7-metal	-0.30485	-0.15132	0.024665	-0.13426	-0.06871	-0.21045
	(-1.39)	(-0.86)	(0.15)	(-0.9)	(-0.49)	(-1.59)
D8-machine	-0.37053	-0.29847	-0.01649	-0.15436	-0.0575	-0.20015
	(-1.69)*	(-1.67)*	(-0.1)	(-1.05)	(-0.41)	(-1.52)
Constant	1.076952	0.946321	0.126416	0.249833	0.106474	0.04047
	(4.87)***	(5.24)***	(0.52)	(1)	(0.55)	(0.24)
Wald Chi^2	1060.26***	697.18***	1216.04***	712.48***	1967.34***	1498.86***
Numbers of Observation	34,149	33,034	34,140	34,060	32,524	33,279

Notes: ***: significant at significance level 1%;**: significant at significance level5%
*: significant at significance level 10%; Numbers in the parentheses is *Z* test

Tabel 5: Estimation Result Using Probit Instrumental Variable

Variable	Time Period					
	2002-2003	2003-2004	2005-2006	2003-2005	2004-2006	2002-2006
	Marginal Effect	Marginal Effect	Marginal Effect	Marginal Effect	Marginal Effect	Marginal Effect
FuelShare	-0.8717	-0.8802	0.0519	0.2733	-1.1763	-0.8851
	(-0.823)	(-0.81)	(0.088)	(0.329)	(-0.996)	(-1.183)
growth3	3.E-06	-7.E-06	0.0058	-7.E-06	0.0795	0.0006
	(1.180)	(-1.870)*	(2.923)***	(3.340)***	(8.186)***	(0.128)
ln_size	0.0155	0.0117	0.0220	0.0173	0.0251	0.0387
	(3.161)***	(3.073)***	(10.517)***	(7.255)***	(8.135)***	(20.028)***
productiv-ity	-4.E-10	-3.E-09	7.E-09	2.E-09	2.E-08	1.E-08
	(-0.270)	(-1.030)	(2.070)***	(0.680)	(3.020)***	(3.090)***
ln_Age	0.0172	0.0189	0.0275	0.0234	0.0467	0.0401
	(2.628)***	(2.490)***	(23.464)***	(16.106)***	(5.010)***	(13.818)***
D-private	0.0206	0.0168	0.0132	0.0390	0.0291	0.0524
	(3.662)***	(2.522)***	(1.526)	(3.872)***	(2.788)***	(5.368)***
D-foreign	0.0035	-0.0243	0.0065	0.0091	0.0455	0.0265
	(0.335)	(-1.277)	(0.744)	(0.842)	(5.577)***	(2.206)**
D-export	0.0319	0.0196	-0.0122	0.0099	-0.0060	0.0198
	(2.452)***	(3.283)***	(-2.925)***	(2.332)***	(-0.920)	(3.393)***
D1-food	-0.0368	0.0011	-0.0132	-0.0007	-0.0041	-0.0281
	(-1.193)	(0.053)	(-0.560)	(-0.031)	(-0.143)	(-0.821)
D2-textile	-0.0802	-0.0278	0.0049	-0.0201	-0.0187	-0.0812
	(-1.742)*	(-1.114)	(0.291)	(-0.922)	(-0.684)	(-2.214)**
D3-woods	-0.0994	-0.0218	-0.0196	-0.0348	-0.0299	-0.1140
	(-2.125)*	(-0.954)	(-0.904)	(-1.329)	(-1.053)	(-2.932)***
D4-papers	-0.0454	-0.0013	0.0120	0.0154	-0.0067	-0.0081
	(-1.008)	(-0.060)	(0.774)	(0.873)	(-0.238)	(-0.241)
D5-chemical	-0.0364	0.0011	0.0103	0.0152	0.0116	-0.0001
	(-1.041)	(0.060)	(0.607)	(0.872)	(0.467)	(-0.002)
D6-cement	-0.0197	0.0119	-0.0105	-0.0052	0.0260	-0.0143
	(-0.585)	(0.407)	(-0.285)	(-0.139)	(0.626)	(-0.355)
D7-metal	-0.0426	-0.0192	0.0027	-0.0196	-0.0131	-0.0547
	(-1.078)	(-0.787)	(0.149)	(-0.808)	(-0.470)	(-1.462)
D8-machine	-0.0538	-0.0416	-0.0019	-0.0228	-0.0109	-0.0517
	(-1.238)	(-1.371)	(-0.101)	(-0.948)	(-0.394)	(-1.399)
Wald Chi²	1212.98***	1009.3***	1216.08***	828.83***	1435.19***	1370.92***
Numbers of Observations	34,149	33,034	34,140	34,060	32,524	33,279

Notes: ***: significant at significance level 1%, **: significant at significance level5%
*: significant at significance level 10%, Numbers in the parentheses is Z test

Demand Influence

The presumption that exports triggered the improvemant of survival probability were supported by the results of the dummy variable *D-export* which were significant in almost all periods of short, medium and long term, unless the medium period 2004-2006. The difference between the survival probability of firms which was not export-oriented and export-oriented is between 1 percent and 3.2 percent (Table 5). The difference was not much but was able to make the firms more competitive and better survival probability than firms which are not export-oriented.

Demand growth variable was significant in the short and medium term. For

the short term, this variable was significant in 2003-2004 and 2005-2006. While in the medium term, it was significant for the periods 2003-2005 and 2004-2006. The same result occured in the marginal effect of this variable (Table 5). In the period 2002-2003 and the period 2002-2006 (long-term), demand growth was not significant. In the transition period of crisis, variable demand growth was not as important as other variables to affect the survival probability. While in normal times, it started an important variable for the existence of the firm. In the long run, the influence of the transition process was too strong for the firm's survival probability that this variable is not significant in general.

Firms' Characteristics Influence

For dummy variables such as *D-foreign* (no element of foreign ownership) and *D-private* (100% domestic private ownership) showed a different level of significance. For *D-foreign* variable was significant period 2003-2004 (short term), 2004-2006 (medium term), and 2002-2006 (long-term). While that was not significant to the variable *D-foreign* in the period 2002-2003, 2005-2006 (second term), and 2003-2005 (medium term). This means that there was an element of foreign ownership did not affect the increase in survival probability for the short and medium periods. While the *D-foreign* variables that were significant in the short term was negative, which means the existence of foreign elements actually increase the possibility of the firm to exit from market. As for the periods 2004-2006 and 2002-2006, the *D-foreign* variable showed a high level of significance. If it is viewed from the marginal effect level (Table 5), the variable *D-foreign* only had an impact in the medium term (2004-2006) and long term (2002-2006), which means the difference between survival probability ownership firms with no foreign element that was foreign elements was 4.55% (medium) and 2.65% (long-term).

Different result occured in national private ownership. This variable was convincingly significant for all periods (see Table 4). However, in terms of marginal effect level (Table 5), the difference between a national privately owned that was not happening in five periods with an insignificant period (2005-2006). The differences in survival probability were for the five periods between a 100% privately nationaly owned firms and others between 1.68% to 5.24% (Table 5). Thus, national private ownership firms could improve the survival ability of the firms from bankruptcy. This is because national private firms owners knew betterhow to deal with domestic issues, economically and politically.

In the long run, productivity variable showed a significant performance in the impact on the survival probability of the firms from 2002-2006. In the medium term, productivity was only significant in the period 2004-2006. While in the period 2003-2005, productivity was not significant. In the short term, productivity was not significant in the periods 2002-2003 and 2003-2004. While in the period 2005-2006, productivity was important factor for survival in the market. The pattern shows that productivity was not that important in the transition period from the multidimensional crisis into the normal condition, as firms strived to survive by not raise the productivity. However, after the transition was complete, productivity began to be important factor in its influence on the survival of the firm. In general, productivity was still important to the survival of the firm because in the long run the performance of productivity is significant.

For other firm characteristics, age and size were dominant for all periods. Both Table 4 and Table 5 shows that the two independent variables were highly significant in influencing the survival probability ofmanufacturing firms. Age had a major impact on the survival of the firm. The older the firm, the higher the ability of the firm to

cope the problems in competition and internal or external distractions. From Table 5, it is showed the marginal effect of the variable age on survival probability of the firms. These figures show that every 1% increase in the age of the firm would increase the chances of firms survival from 1.72% until 4.67%. In the short term, this figures of marginal effect increase from 0.0172 (2002-2003), 0.0189 (2003-2005), until 0.0275 (2005-2006). While in the medium term, the period 2003-2005 had lower marginal effect rate than in the period 2004-2006. While in the long term (2002-2006), the marginal e ffect rate was close to the period 2004-2006. After the transition was complete and enter the normal time, the age factor became more important for firms to improve the survival probability manufacturing firms.

Although the firm age had the same performance with firm size, it had smaller-marginal effect. In the short term, marginal effect of firm age in the 2002-2003 was greater than the marginal effect of firm age in the period 2003-2004. However, in the 2005-2006, firm age had the greatest marginal effect which is 0.0220. It means that every increment of one percent the size of the firm would increase the survival probability of 2.2%. Based on the value of marginal effect, an increase of firm survival probability during the period 2004-2006 (medium term) had higher probability of survival than those faced by firms in the period 2003-2005. It is likely that at normal times, the size of the firm was becoming increasingly important in the challenge of external and internal problems. This suspicion was even stronger when the estimation results indicated it in the long term. Firm size variable had higher marginal effect value than the marginal effect of the short and medium term. It means that firm size-was an important variable in dealing with the problems of the firm. Large size firms were difficult to be shaken by numerous problems since most of their production scale had reached the economies of scale. In addition, the significance of firm size variable was additional evidence how Gibrat law does not apply to the manufacturing industry in Indonesia.

Main Factor: Fuel Cost Share

Figures from the estimation of fuel cost share were negative except for 2005-2006 and 2003-2005. This is consistent with the notion that the increase of fuel cost share would raise the possibility of firm's death. What happens in 2005-2006 and 2003-2005 showed that the increase of fuel prices at those time did not affect the survival of the firm.

Based on Table 4 and Table 5, the fuel cost share variable was statistically insignificant to influence the survival probability of a firm, both in the short term, medium term, or long term. However, in *z* test point of view, it shows that the longer the time spell observed would increase the value of its *z* test. It subtly suggests that the increase in fuel prices remained miserable firm. In the short term, the firm was still able to adjust due to rising fuel prices. But if it continued to face, rising share offuel costs would weaken the survival of the firm.

From the survival probability point of view, there was low possibility to die for manufacturing firms because the possibility was above 95% on average (Table 5).[6] In the short term, the total survival probability of firms was above 96%. In the medium term, the lowest survival probabilities were 88.11% (2003-2005) and 93.25% (2004-2006). While in the long term (2002-2006), survival probability of manufacturing firms was 91.27% on average.

If related to the fuel cost share in the survival probability, there were inconsistencies in the results. The firm with the highest share ofthe cost of fuel did not necessarily have the lowest probability of survival Instead, the firm with the lowest fuel cost share, did not necessarily have the

[6] Table 5 exhibits survival probability calculation based on Table 4 and the mean of each independent variables.

highest probability of survival. Table 6 shows the sequence of firm survival probability in each period. The table shows that-the inconsistency occurred in the short term, medium term and long term. In the short term, the survival probability of the order of lowest to highest were inconsistent when compared to the three short term periods. The firm with the lowest fuel costs share on the average was not the firm with the highest survival probability. While firms with the highest share of the cost of fuel did have the lowest survival rate probability unless the period 2005-2006.

In the medium term, the order of survival probability from the lowest until the highest were not necessarily the same as the order of fuel cost share from the highest to the lowest level. Survival probability was a random sequence. Even for the period 2004-2006, the firm with the lowest share of fuel cost (less than 10%) appeared to have the second lowest survival probability after the firms which have the share of fuel costs between 40%-50%. Firms with the highest share of fuel costs (more than 50%) were in the third lowest order of survival probability. As for the period 2003-2005 also showed inconsistent sequence as in the 2004-2006 period but in a different order. The lowest survival probability was suitable with the estimation that belongs to firms which have the highest fuel cost share. However, the highest survival probability did not belong to the firms with the lowest fuel cost share but firms with the share between 10%-20%.

In the long run, the lowest survival probability belonged to the firms which had the highest share of the fuel cost (more than 50%). While the second and third rank of the lowest survival probability belonged to the firms which had fuel cost share 40% - 50% and 30% -40% respectively. However, for the following order was not in accordance with the order of the share of fuel costs Survival probability was the highest in the firm's share of the cost of fuel with 20% -30%. While firms with the lowest fuel cost share had a fourth rank survival probability. It can be concluded that, rising fuel prices in the long run affected the survival probability with the firm which had high fuel cost share. While rising fuel prices had little impact on the firms which had less than 30% fuel cost share. It means, in the long term, rising fuel prices began to feel an impact for firms with a high share of fuel costs.

CONCLUSION

The death risk of firms in the manufacturing sectors had no different for firms which were in the sub-sectors of the food industry or machinery industry. Even for the entire sub-sector of the manufacturing industry, all firms faced the same probability to survive. Similarly to the ownership of the firm, or a foreign country (state/enterprises) were equally likely to survive in the market.

Table 6: Survival Probability of Manufacturing Firms Based on Fuel Cost Share

Fuel Cost Share	Time Period					
	2002-2003	2003-2004	2003-2005	2004-2006	2005-2006	2002-2006
<10%	0.9872 (5)	0.9749 (4)	0.8809 (4)	0.9319 (2)	0.9608 (4)	0.9109 (4)
10%-20%	0.9884 (6)	0.9759 (5)	0.8838 (6)	0.9381 (4)	0.9629 (5)	0.9180 (5)
20%-30%	0.9873 (4)	0.9763 (6)	0.8830 (5)	0.9505 (6)	0.9644 (6)	0.9182 (6)
30%-40%	0.9863 (3)	0.9741 (2)	0.8736 (2)	0.9386 (5)	0.9595 (3)	0.9099 (3)
40%-50%	0.9861 (2)	0.9745(3)	0.8748 (3)	0.9304 (1)	0.9566 (1)	0.9096 (2)
>50%	0.9850 (1)	0.9729 (1)	0.8672 (1)	0.9336 (3)	0.9579 (2)	0.9005 (1)
Total	0.9873	0.9750	0.8811	0.9325	0.9610	0.9127

Notes: The calculation based on Table 4 and each non dummy variables average. The numbers in parentheses are the survival probability rank from the lowest (1) until the highest (6)

Unlike foreign-owned and state-owned firms, national private firms had higher survival probability in the market than other firms. More experience about how to manage the firm in the face of the business environment in Indonesia was believed to be an important factor why firms with national private ownership had higher probability to survive.

At first, productivity did not significantly affect the firm's first in survival. However since 2004, productivity became an important factor in increasing the probability of survival for manufacturing firms. With a more favorable economic conditions after 2004, productivity became an important factor if a firm wanted to increase the survival probability.

Among the various factors of firm characteristics, size and age were dominant in increasing the probability to survive for a firm. The larger the size and the older the age would increase the survival ability to a firm. Firms which had been managed by the second generation of the firms' owner would enhance the survival ability of firms' life. While the larger size of the firm will increase the competitiveness of the business which means improved possibility to survive.

The increasein fuel prices over the period 2002-2006 showed that the firm was still able to adjust in the short term. However, the longer and more often cope with the increasing fuel prices, the firm would find it difficult though still viable. During the period 2002-2006, the increase in fuel prices barrage would weaken the survival of a firm though not lethal. For that reason, government should not have to increase the price of fuel too often that firms manufacturing industry had enough time to adjust to the new fuel prices.

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