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Firm Entry, Vertical Relations and the Philippine Downstream Oil Industry

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Abstract

This paper reviews the competition and efficiency aspects of the downstream oil industry in the Philippines within the context of vertical relationship among firms. It examines the effects of the law on firm conduct and entry possibilities using the theoretical tenets of market structure with entry barriers: monopoly and oligopoly. It finds that the situation in the Philippine downstream oil industry is not a monopoly at either upstream and downstream levels, and that the entry of more firms will improve industry efficiency in terms of market output, market prices and profits per firm.

Firm Entry, Vertical Relations and the Philippine Downstream Oil Industry

The Philippine downstream oil industry covers the trading, marketing, processing, refining, transporting and distribution to storage points of oil and petroleum products. On 28 March 1996, the introduction of Republic Act 8180 subjected this vital sector of the economy to deregulation. The following year, during the full implementation phase, the Philippine Supreme Court declared this law void on the basis of the following provisions which were considered unconstitutional: (a) the imposition of a four percent tariff differential on imports of crude oil and refined products; (b) the requirement of maintaining a minimum 40 days stock inventory and (c) predatory pricing.

This law was subsequently amended by Republic Act 8479, which was signed on 10 February 1998. Section 2, Chapter 1 of the Declaration of Policy clearly stated the intention of the new law:

> *It shall be the policy of the State to liberalize and deregulate the downstream oil industry in order to ensure a truly competitive market under a regime of fair prices, adequate and continuous supply of environmentally clean and high quality petroleum products. To this end, the State shall promote and encourage the entry of new participants in the downstream oil industry, and introduce adequate measures to ensure the attainment of these goals.*

The three provisions of the old deregulation law (R.A. 8180), which led to its rejection, were subsequently redressed in the new law. Additionally, R.A. 8479 aims to promote retail competition by encouraging entry of new participants and preventing unfair trade practices such as monopolization, cartelization, and predatory pricing. It also specified incentives for new investments. Clearly, these are laudable aims. But there are several considered not considered in the new law. First, the new law does not consider the vertical relations involving new and incumbent firms in this industry. This is serious for the oil industry has historically been characterized by a high degree of vertical integration. The probable effect of having more firms in the industry has not been studied; instead the framers of the law take it as a given that more firms is preferable to less. Lastly, no overt relation between the need to deregulate the downstream oil industry and national competition policy has been made. This paper weaves together all these considerations.

Framework

Vertical Relations and the Oil Industry

Developments in vertical relations in the domestic downstream oil industry closely reflect what has transpired in the international experience. The upstream oil industry includes the search and exploration of oil to the transport and shipment of oil to refineries, while the downstream level starts with the refining of oil up to the distribution of oil which includes familiar gasoline stations and bulk selling. At the onset of the 1970s, seven firms – Exxon, Shell, British Petroleum, Texaco, Standard of California, Mobil, and Gulf (Tanzer & Zorn, 1984) – completely dominated world oil trade and production from the upstream all the way to the downstream levels.

The domination by these seven oil firms was attributed to the formidable barriers to entry present: huge capital requirements, requisite economies of scale (present mainly into exploration and refining stages), and the necessary technologies in oil production and refining. Entry barriers faced by new firms has been further compounded by the 'premium on stability' placed by both downstream and upstream market agents. Upstream firms' processing of crude oil relies on stable demand downstream while downstream firms rely on a stable source of crude oil. Downstream agents avoid uncertainties associated with securing inputs at the intermediate stages of processing.

The hegemony of the seven dominant firms and existing vertical relations has essentially been preserved up to the first oil price crisis of 1973. By that time, radical shift in the distribution of monopoly power, political developments in the Middle East and structural changes in the production of petroleum products altered the situation. "In sum, then, it was a mixture of good fortune at first, high barriers to entry, and the economic advantages of vertical integration that gave control of world oil to seven companies. In time, though, entry barriers began to decline. This decline first weakened the position of the seven majors and, eventually, led to the demise of the vertically integrated structure of marketing itself" (Levy, 1982).

Challenges to the domination of these seven oil firms came in the form of European oil firms, several smaller US oil independents and national oil companies established by the governments of oil producing economies. Later on, even the oil consuming and net importing countries' governments set up their respective national oil firms concentrated at the downstream levels of the industry. Entry of the new oil firms was facilitated by their willingness to enter into contractual agreements with oil producing countries that are more advantageous to the governments of oil producing countries. Likewise, these entrants were just as eager to sell their oil to vertically non-integrated new refineries downstream in an effort to dispose their new found oil.

Governments in oil-producing countries willingly played entrants against each other, further expropriating monopoly power unto themselves at the expense of both entrants and the seven dominant oil firms. Meanwhile, the governments in oil-importing countries participated in the emerging melee in an effort to get better bargains for their oil purchases. At about this time, national oil companies in both oil-producing and oil-consuming countries began to emerge. The

trend was further reinforced by the ascendancy of nationalist sentiments, relatively liberal credit terms and easier access to oil and refining technologies.

Direct marketing by governments of oil-producing countries to entrants and governments of oil-consuming countries further constricted the reliable supply of oil into the dominant firms. Governments of oil-consuming countries directly bought oil from the governments of these oil-producing countries to assuage their vulnerabilities to uncertain oil supply. The seven dominant firms relinquished their hegemony over world oil sources in response to their lack of control over a foreign resource. Instead, these firms opted to concentrate on their international oil distribution and transportation networks and selectively maintaining their vertical integration into downstream stages.

What becomes clear in the brief historical outline given is that the economic motivations to vertically integrate have disappeared. These motivations include: lowers transaction costs, assured supply of key inputs, minimization or elimination of externalities, avoidance of government restrictions, creation or promotion of monopoly power, and counter strategy to unfavorable distribution of monopoly power.

The international developments cited mirrored Philippine oil industry developments that saw consolidations among surviving firms, horizontal mergers and acquisitions by rival firms. Prior to the 1970s, there were four different refineries: Bataan Refining, Filoil, Caltex, and Shell, with six marketing companies: Esso, Filoil, Caltex, Getty, Mobil, and Shell (U, Peter, 2002). By the early 1970s, oil price regulation was introduced and the national government created the Philippine National Oil Company. PNOC subsequently acquired both Esso and Filoil. Ten years later, Caltex acquired Mobil, while Shell acquired Getty. PNOC also acquired Bataan Refining so that by 1985, only three oil firms remained: Caltex, Shell, and PNOC which then fully controlled Petron Corporation.

Wide fluctuations in the international price of crude oil and exchange rate prompted the government to set up the Oil Price Stabilization Fund (OPSF) in an effort to shield domestic consumers from the adverse effects of oil price movements. This role of oil price regulation was subsequently taken over by the Energy Regulatory Board (ERB) by 1986. Despite the good intentions embodied in such moves, this decade's experience of mergers and acquisitions exposed the then three domestic oil firms to accusations of monopoly, cartelization and other unfair trade practices. It was no surprise that R.A. 8479, which was designed to deregulate the domestic oil industry, emphasized the promotion of competition and fair trade practices.[1]

Competition Policy

More competition is primarily a means to promote market efficiency. To quote Medalla (2003):

[1] Besides the declaration of policy cited earlier, two chapters of R.A. 8479 out of seven were devoted to promotion of competition, anti-trust safeguards, prohibited acts and remedies. These are Chapters 2 and 3.

> *In sum, the primary task of competition policy is twofold: (1) to make sure that no entity would abuse its market power, and, where necessary, (2) to implement competition rules that would emulate the competitive process and make up for the market's failure to perform its price-allocation function efficiently.*

Efficiency as described in this quotation can be subdivided into allocative efficiency, i.e. allocation of available resources in their best possible use, and technical efficiency, i.e. the adoption of best possible means of producing the output. Inducing firm entry into markets can be necessarily (although not sufficient) viewed as a way of feasibly lowering production costs and prices, and maximizing output and consumer welfare. Embodied in this view is the consideration given for both sides of the market.

The lack or absence of competition in a market can be seen as the presence, either singly or in combination of three kinds of barriers to entry – structural[2], legal[3], and strategic[4]. The presence of any entry barrier allows one or more firms to exercise monopoly powers at the expense of consumers.

The existence of perfect competition or the complete absence of any entry barriers is not quite possible. Instead, what is usually striven for is promoting the contestability of markets. Contestability refers to the ease with which new firms can enter a market. The rationale for the promotion of contestability involves restricting the ability of incumbent firms to abuse its monopoly power. Threat of entry by potential competitors encourage efficiency gains into production of existing firms, discourage unfair trade practices and induces prices to become as low as possible[5].

The promotion of competition may be considered generally good but this is not a universal panacea to making markets work more efficiently. There are several exceptions, some of which are: market failures, existence of natural monopolies, network externalities, and monopolistic competition. In practice, competition policy may not work if the policy fails to consider the existing vertical relations. The promotion of competition at the downstream level of a market (and even if successful) may not allow the expected range of benefits to materialize if the upstream levels remain non-competitive.

[2] Structural barriers to entry have something to do with the market itself, such as inelastic demand and the lack of feasible substitutes.

[3] Legal barriers to entry are laws and government activities such as the grant of monopoly franchises and grant of trade protection.

[4] Strategic barriers to entry are attributable to firms' actions; predatory pricing and market foreclosure.

[5] In Baumol and Willig (1981), monopolists and oligopolists were demonstrated to act competitively when threaten with entry.

Models of Firm Entry: An Analysis

The model developed here to analyze the effects of firm entry into the downstream oil industry starts with the model developed in Pepall, Richards, and Norman (2002). This model was presented by the authors to look into vertical relations, the double marginalization problem and to assess the economic efficiency of vertical mergers. There are several assumptions given for this model. There are two monopolistic firms present at the upstream and downstream levels, upstream firm produces output at constant marginal costs **c**, upstream firm resells to downstream firm at price **r**, downstream firm sells to final consumer at price **P**; there are no downstream costs except reselling price (or costs of output sold **r**) and market demand for output is:

$$\mathbf{P = A - bQ}, \text{ where } \mathbf{c < A}$$

Bilateral Monopoly Case

The downstream firm by virtue of its being a monopoly is able to maximize profits. The relevant marginal revenue function at the downstream level is:

$$\mathbf{MR^d = A - 2bQ}$$

and with no other downstream costs except costs of output sold **r**, then the relevant profit maximizing output at the downstream level can be determined as:

$$\mathbf{A - 2bQ = r}$$

Solving for **Q** or output gives the profit maximizing output level at the downstream level:

$$\mathbf{(A-r)/2b = Q^d_{\Pi max}}$$

Substituting the profit maximizing output level of downstream firm into the market demand will result in

$$\mathbf{P = A - b[(A-r)/2b] = (A+r)/2 = P^d_{\Pi max}}$$

which gives the profit maximizing price of the downstream firm.

The downstream firm's profit function can be expressed as:

$$\mathbf{\Pi^d = (p - r)Q}$$

If the profit maximizing price and output level of the downstream firm is substituted into this function, the result will be the maximum profits of the downstream firm. That is,

$$\mathbf{\Pi^d_{max} = (A-r)^2/4b}$$

The downstream firm maximizes profits using a marginal revenue function:

$$\mathbf{MR^d = A - 2bQ}$$

This will then become the relevant demand function at the upstream level (i.e. $\mathbf{MR^d = A - 2bQ = P^u}$). The upstream marginal cost remains constant at **c**.

The profit maximizing output level for the upstream monopoly can be determined as:

$$\mathbf{A - 4bQ = c}$$

Solving the equality for Q will give the profit maximizing output of the upstream firm

$$\mathbf{Q^u_{\Pi max} = (A-c)/4b}$$

Substituting the profit maximizing output level of the upstream firm into the relevant demand function

$$\mathbf{P^u = A - 2bQ}$$

will result in the profit maximizing price at the upstream level

$$\mathbf{P^u_{\Pi max} = (A + c)/2}$$

The profit maximizing price of the upstream is of course the reselling price **r** that will be faced by the downstream firm. Using the profit maximizing price and output of the upstream firm into its profit function will result in

$$\mathbf{\Pi^u_{max} = (A - c)^2/8b}$$

It can be noted that if the upstream and downstream firms opted to undertake a vertical merger, the relevant marginal revenue function of the merged firm will be:

$$\mathbf{MR = A - 2bQ}$$

which is the same marginal revenue function of the formerly vertically separated downstream firm. Even with the vertical merger, the upstream marginal costs remain constant (no vertical costs synergies present) at **c**.

The profit maximizing output of the integrated firm then becomes:

$$\mathbf{A - 2bQ = c}$$

or solving for output **Q** will give the profit maximizing output level of the vertically integrated firm. This will result in:

$$\mathbf{Q^{I}_{\Pi max} = (A - c) /2b}$$

Using this output level into the relevant demand function of the integrated firm will produce the profit maximizing price for the integrated firm:

$$\mathbf{P^{I}_{max} = A - bQ = A - b[(A - c) /2b] = (A + c)/2}$$

As with the (formerly) vertically fragmented upstream and downstream firms, the profit maximizing price and output of the vertically integrated firm will be substituted into the relevant profit function:

$$\mathbf{\Pi^{I} = (P - c)Q}$$

Doing so will result in the maximum profits of the vertically integrated firm:

$$\mathbf{\Pi^{I}_{max} = (A - c)^2/4b}$$

At this point a comparison output, prices and profits of vertically fragmented firms and the vertically integrated firm will reveal several key insights. A comparison of the profit maximizing price at the downstream level with the profit maximizing price of the vertically integrated firm will show that prices are lower with vertical integration; i.e. $\mathbf{(A+r)/2 = P^{d}_{\Pi max} > P^{i}_{max} = (A + c)/2}$. This observation becomes valid with **r**, the reselling price have to greater than **c**, the upstream marginal production cost. A similar comparison with output and profits will show that both are higher with vertical integration:

$$\mathbf{Q^{d}_{\Pi max} = (A-r)/2b \text{ or } Q^{u}_{\Pi max} =(A-c)/4b < Q^{I}_{\Pi max} = (A - c) /2b}$$

in the case of output levels, and

$$\mathbf{\Pi^{I}_{max} = (A - c)^2/4b > \Pi^{d}_{max} = (A-r)^2/4b + \Pi^{u}_{max} = (A - c)^2/8b}$$

in the case of profits.

The situation just illustrated refers to the double marginalization problem. This phenomenon arises from the maximization of profits at the upstream and downstream levels resulting in higher prices, lower quantities and profits for both monopolists. Conversely, the phenomenon can be used to point out the economic efficiency of the upstream and downstream firms integrating vertically.

However, the situation in the Philippine downstream oil industry is not a monopoly at either upstream or downstream levels. There are two refineries present at the upstream level: the Shell refinery in Batangas, and the Petron refinery at Bataan. A total of 57 firms are present at the downstream retailing and bulk selling stages of the industry. This total includes the own-operated downstream outlets of the two firms with refineries and the entrants since the

implementation of the oil deregulation law. Specifically, a Cournot oligopoly[6] was chosen to represent both upstream and downstream levels of the industry. As mentioned earlier, the focus will be to assess the effects of entry by new firms into this segment of the industry. In particular, the model given below focuses on output and price levels.

Upstream Oligopoly

With a Cournot oligopoly located at the upstream, the relevant market demand remains as:

$$\mathbf{P = A - 2bQ}$$

which is also the marginal revenue function of the downstream oligopoly.

The effective demand for Firm 1 located at the upstream will then be:

$$\mathbf{P = (A - 2bq_2 - \ldots -2bq_n) - 2bq_1}$$

with the subscripts **1, 2,…, n** representing **n** number of oligopolistic firms located at the upstream.

For Firm 1, the effective demand will imply a marginal revenue function:

$$\mathbf{MR_1 = (A - 2bq_2 - \ldots - 2bq_n) - 4bq_1}$$

Equating this marginal revenue function of firm1 to its constant marginal costs **c** will result in:

$$\mathbf{(A - 2bq_2 - \ldots - 2bq_n) - 4bq_1 = c}$$

With **n** number of firms located at the upstream level and transferring the last term on the left the equality to the right, the equality can be re-expressed as

$$\mathbf{A - 2b(n-1)q_i = c + 4bq_1}$$

The subscript **i** on the left of the expression indicating all other firms at the upstream except Firm 1. Expressing this equality in terms of the output of Firm 1 alone will result in the reaction function of Firm 1:

$$\mathbf{q_1 = (A - c)/4b - [2b(n-1)q_i]/4b}$$

[6] This type of oligopoly was chosen due to the competition by outputs. See Shapiro (1989).

With the same marginal costs at the upstream level, the output of each upstream firm will be the same. Translating this outcome using the reaction function given previously and solving for q or the output of each oligopolist will yield the equation

$$\mathbf{q = (A-c)/[2b(n+1)]}$$

which will indicate the level of equilibrium output at the upstream of each firm. The market output of course can simply be given as **Q = nq** or the output of each individual firm multiplied by the **n** number of firms located at the upstream. A comparison of the market output under an oligopoly at the upstream level with the case of the upstream monopoly given earlier will be higher. That is,

$$\mathbf{Q^{co} = n\{(A-c)/[2b(n+1)]\} > (A-c)/4b = Q^{u}_{\pi max}}$$

with $\mathbf{Q^{co}}$ the market output under a Cournot oligopoly while $\mathbf{Q^{u}_{\pi max}}$ the under a monopoly. It can be noticed that taking the partial derivative of the output equation of each individual firm with respect to **n**, the number of firms will be

$$\mathbf{\partial q/\partial n = [(A-c)/2b][-1/(n+1)^2] < 0}$$

With **A > c**, and **b** most probably **0 < b ≤ 1** and **n** obviously positive, the expression is clearly going to be a negative term. Considered in another way, the expression indicates that increasing the number of firms **n** at the upstream oligopoly will reduce the output of each firm. By implication and with the output of each firm in a Cournot oligopoly the same, the market output will be increased by increasing the number of firms **n** at the upstream level. This can be demonstrated as:

$$\mathbf{\partial Q/\partial n = (A - c)/[2b(n+1)]^2 > 0}$$

To get market price or reselling price at the upstream level, the market output **nq = Q** can simply be substituted into the relevant market demand **P = A - 2bQ**. That is,

$$\mathbf{P = A - 2b\{(nA-nc)/[2b(n+1)]\} = (A + nc) / (n + 1)}$$

Comparing the reselling price of the upstream firms with the case of an upstream monopoly will show that prices will be relatively lower or

$$\mathbf{(A + nc) / (n + 1) < (A + c)/2}$$

with marginal costs **c** the same for the two types of markets. It can be noted that the market price under an oligopoly will further decrease with a greater number of firms **n**. This can be clearly demonstrated by taking partial derivative of the oligopoly price equation with respect to **n**:

$$\mathbf{\partial P/\partial n = (c - A) / (n + 1)^2 < 0}$$

The expression given above will be negative since **A > c**.

Downstream Oligopoly

At the downstream level, the relevant market demand will be:

$$\mathbf{P = A - bQ}$$

Using this market demand, the effective demand for Firm 1 located at the downstream can be expressed as:

$$\mathbf{P = (A - bq_2 - \ldots - bq_n) - bq_1}$$

with the subscripts **1, 2,…, n** again representing the number of oligopolistic firms located at the downstream level. For Firm 1, the marginal revenue function can then be given as

$$\mathbf{MR_1 = (A - bq_2 - \ldots - bq_n) - 2bq_1}$$

Equating this marginal revenue function of firm1 to its constant marginal costs **r** (which is just the reselling price from the upstream oligopolistic firms) will result in

$$\mathbf{(A - bq_2 - \ldots - bq_n) - 2bq_1 = r}$$

With **n** number of firms located at the downstream level and transferring the last term on the left of the equality to the right, the equality can be re-expressed as:

$$\mathbf{A - b(n-1)q_i = r + 2bq_1}$$

The subscript **i** on the left of the expression indicates all other firms at the downstream except Firm 1. Expressing this equality in terms of the output of Firm 1 alone will result in the reaction function of Firm 1:

$$\mathbf{q_1 = (A - r)/2b - [(n-1)q_i]/b}$$

With the same marginal costs **r** from the upstream level, the output of each downstream firm will be the same. Translating this outcome using the reaction function given previously and solving for **q** or the output of each oligopolist will yield the equation

$$\mathbf{q = (A-r)/[b(b+n+1)]}$$

which will indicate the level of equilibrium output at the downstream of each firm.

The market output **Q = nq** can be given as **[n(A-r)]/[b(b+n+1)]**

It can be recalled that the market output of a downstream monopolist is given as:

$$\mathbf{Q^d_{\pi max} = (A - r)/2b}$$

A comparison of market output levels at the downstream level under the two different market structures will indicate oligopolistic market output levels to be relatively higher:

$$\mathbf{[n(A-r)]/[b(b+n+1)] > (A - r)/2b}$$

It can be noticed that taking the partial derivative of the output equation of each individual downstream firm with respect to **n** the number of firms will be:

$$\mathbf{\partial q/\partial n = [(A-r)/b][-1/(b +n+1)^2] < 0}$$

with $\mathbf{A > c}$, and **b** most probably $\mathbf{0 < b \leq 1}$and **n** obviously positive, the expression is clearly going to be a negative term. This result suggests that [as with the case at the upstream level], increasing the number of firms **n** will reduce the output of each downstream firm. By implication, this result further implies market output at the downstream level will be increased with more number of firms present at the downstream. This can be shown by obtaining the partial derivative of market output at the downstream with respect to **n** or the number of firms:

$$\mathbf{\partial Q/\partial n = (A -r)/[b(b + n +1)]^2 > 0}$$

At the downstream level, the market price (price to final consumers) can be obtained by simply substituting market output into the relevant demand equation $\mathbf{P = A - bQ}$. Doing so will result in:

$$\mathbf{P = A - b\ [n(A-r)]/[b(b+n+1)] = \{[Ab(b +n+1)] - bn(A -r)\}/\ [b(b + n + 1)]}$$

Comparing this price of the downstream firms with the case of a downstream monopoly will show that prices will be relatively lower or

$$\mathbf{\{[Ab(b +n+1)] - bn(A -r)\}/\ [b(b + n + 1)] <\ (A + r)\ /\ 2}$$

with reselling price of upstream firm(s) **r** the same for both types of markets. It can be noted that the market price under an oligopoly will further decrease with a greater number of firms **n**. This can be clearly demonstrated by taking partial derivative of the oligopoly price equation with respect to **n**:

$$\mathbf{\partial P/\partial n =\ -\ (A - r)/b\ *\ [(b-1)/(b + n -1)^2] <\ 0}$$

With the expression both **(A - r)** and $\mathbf{n > 0}$, the presence of a negative sign suggests the whole equation is going to be positive.

Conclusion

Findings in this paper indicate that promoting firm entry into the Philippine downstream oil industry will promote efficiency in the context of existing vertical relations. This finding relies on the assumption that both the upstream and downstream firms behave as Cournot oligopolists. Any efficiency improvement in this context is viewed with consideration for market output, market prices and profits per firm.

Similar findings have been similarly verified in other studies. For instance, the same effects on market output, market prices and profits per firms by the entry of new firms in studies of vertically related oligopolists have been given by Salinger (1989) and Greenhut and Ohta (1979). In Salinger (1989), consideration for market concentrations at upstream and downstream levels were taken. With Greenhut and Ohta (1979), the assumption of fixed proportions (or the upstream output is combined in fixed proportions as downstream intermediate input) is adopted.

However, any enthusiasm about the promotion of entry in the oil deregulation law and as a significant aspect of government energy strategy is dampened by the absence of consideration for scale economies and other costing aspects. This is most relevant especially at the more upstream stages of the Philippine downstream oil industry.

An analysis of the outcome of the Vector Error Correction Model's dynamic adjustment process reveals the dramatic way the model is able to track positive and negative political shocks that happened in the country's modern political history. Such finding provides compelling evidence of the efficiency of the T-bill-commercial lending rates spread as a predictor of market sentiment, thus, a useful indicator of the country's economic performance.

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