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Exploring the Structure and Performance of Petroleum Retail Outlets in Pakistan

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ABSTRACT

Retail petroleum business is an important sector of any economy, but the analysis of its structure and performance has hitherto been missing in Pakistan. This paper is first such attempt using primary survey data for Pakistan. The results obtained from the petrol pumps included in our sample indicate that the petrol pumps make handsome profits. The petrol pumps in urban regions as well as those on highways have higher sales and earn higher gross profits, indicating that location of a petrol pump is an important determinant of a petrol pump s sales performance. Another locational variable that is statistically significant in contributing to higher sales and gross profits is the distance of the petrol pump from the nearest petrol pump. Size is one of the most important variables having a positive impact on the total sale volumes and gross profits of petrol pumps. As far as spatial differentiation is concerned, there is a non-linear relationship between the performance of the petrol pumps and the distance from their competitors.

JEL Classification: D24, L81, R30
Keywords: Production, Cost, Retail Business, Firm Location

1. INTRODUCTION

Petroleum industry is one of the most important industries in an economy and indeed Pakistan is no exception. Petroleum retail outlets which are commonly referred to as petrol pumps in Pakistan, play a very important role in keeping the proverbial wheels of the economy running for the obvious reason that they provide fuel both for the domestic and commercial transport activities. Despite the importance of this sector for the economy, its analysis has escaped the attention of the researchers thus far in Pakistan. Keeping in view the unavailability of any study that analyses the structure and performance of petrol pumps in Pakistan, this paper aims to fill this gap. To the best of our knowledge, this is the first study of its kind and we could not find any other study that has collected information on any aspect of the petrol pump industry in Pakistan.

Most of the literature related to retail segment of the petroleum industry discusses the petrol pumps in relation to their location (for a discussion on how location influences petrol pumps see the section on literature review). That is, the literature has focused on how the location of a petrol pump impacts its performance in terms of sales and profitability. In addition, since most of the literature is focused on developed countries, the impact of non-forecourt activities is also investigated. This is due to the fact in developed countries the petroleum industry is deregulated and because of intense competition, fuel retail businesses have to look for sources other than selling fuels to generate revenue. In this paper, we have also taken these factors, along with other relevant variables suggested by the literature.

In 2013, the year in which the data for this paper was collected, there were 7,198 petrol pumps in Pakistan, up from 6,377 in 2009, translating to 3.1 percent growth per annum [Oil Companies Advisory Council (OCAC); unpublished figures]. At the same time, the demand for petroleum products has also increased over the years. In 2008-09, the transport sector consumed 8.84 million Tonnes of Oil Equivalent (TOE), which increased to 10.3 million TOE in 2012-13 [Pakistan Economic Survey (2015-16)]. This amounts to 3.90 percent increase in consumption of petroleum products by the transport sector. Since the number of petrol pumps has increased over the years, this may also affect the sales performance and profitability of the petrol pumps. Moreover, our data also shows that the number of workers employed at the petrol pumps who

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are engaged directly in the fuel retail activities, and also those who are attached to secondary activities, such as convenience stores, tyre shops, etc. is quite significant. This means that, along with the smooth functioning of the economy, the livelihood and welfare of a great number of families, directly and indirectly, is attached to this sector.

Using the data on the cost structure, sales volumes, number of workers, and non-forecourt activities, we contribute to the empirical analysis of petrol pumps in Pakistan in two ways. Firstly, we analyse the structure of petrol pumps in Pakistan, that is, we analyse how costs are spread over various activities, which fuels have higher sales, which petrol pump employs higher number of which categories, and what are some of the activities, other than selling fuels, in which petrol pumps are involved. Secondly, we look into the performance of the petrol pumps through econometric investigation. The performance indicators we have used in our analysis are total costs, sales volumes, revenues, and gross profits of the petrol pumps. We have divided the data in two ways. The first division is based on the region, that is whether petrol pump is based in an urban or rural region and the second division is based on the location, that is, whether petrol pump is located on a highway or a non-highway. The literature suggests that these geographical divisions strongly influence the performance of petrol pumps [see, for example, Netz and Taylor (2002), Chan, Padmanabhan, and Seetharaman (2005), inter alia].

Our analysis is confined to two petroleum products, namely Motor Gasoline (which is simply called petrol in Pakistan; MoGas henceforth) and High-Speed Diesel (HSD; HSD henceforth) for the reason that these are the two main products that are sold at the petrol pumps. The petrol pumps do sell other products as well, such as High Octane Blending Component (HOBC). However, we do not include it in our analysis mainly for two reasons. Firstly, because this product is not sold at every petrol pump and secondly because the sale of HOBC is very little compared to two other main fuels—MoGas and HSD.

The concomitant increase in the number of petrol pumps and demand for the petroleum products by the transport sector could have important implications for the owners, both current and potential, of petrol pumps. Petrol pumps have often been a subject of public debate in Pakistan, mainly because their margins are fixed and they demand for increase in those margins from time to time. The margins they receive from selling a litre of petroleum products are fixed by the government and they cannot charge higher prices (margins are a part thereof) than those declared by the government, which are determined by government-approved formula. Their argument is that margins they receive from the sale of a litre of MoGas and HSD are quite low, and therefore they cannot run the petrol pumps profitably. This was also highlighted by the petrol pump owners during the course of data collection. Thus, one of the motivations of the present paper is to take the claim of the petrol pump owners that they make low profits, or even incur losses, to the data and see what the survey data tells us.

The next section reviews the literature that discusses the determinants of the performance of petrol pumps. Section 3 explains the methodology used for collecting the data, the empirical model, the methodologies used to analyse the data, and it also describes the sample. In Section 4, we present an overview of the retail segment of the downstream petroleum industry in Pakistan. The findings and results are presented in Section 5. The discussion is summarised and concluded in Section 6.

2. REVIEW OF LITERATURE

The literature on petrol pumps structure and performance is not vast. Most of the literature on petrol pumps focuses on the impact of a petrol pump s location on its performance. The locational impact is an application of the location theory, and although our paper is not concerned with the location theory or its application to the petrol pump industry per se, a few words on the concept of the location theory are in order as we do analyse the structure and performance of petrol pumps with respect to the location. In simple terms, location theory addresses the question of what businesses are put where and why. Our paper does not analyse why petrol pumps in our sample are situated where they are situated. In other words, we do not dig deeper into the location decision of the petrol pump owners. At the same time, however, geographical location is an important aspect of our analysis.

One of the predictions of the location theory is that when the product is homogenous, the firms tend to differentiate spatially, in the face of stiff competition. On the other hand, firms may also locate their firms closer to their competitors in order to attract more consumers [Netz and Taylor (2002)]. Applying the model to petrol pumps in Los Angeles, USA, they found that petrol pumps in Los Angeles tend to be located farther away from each other because of stiff competition. As regards the non-forecourt activities, they also found a positive impact of the presence of convenience stores on the performance of petrol pumps.

Reviewing the locational choices of retail firms, Schmidt (1983) argued that retail firms locational decisions are udgmental, combining ob ective economic or geographic elements, as well as intangibles , tempered by experience p. 68 emphases in original). As far as location of the petrol pump is concerned, the more convenience a petrol pump provides for consumers, the higher would be its sales volumes [Smalley (1999)]. By convenience he means the size of the petrol pump and petrol pump location, among other things. He argued that larger size and easily accessible location makes it easier for the customers to get fuel.

Chan, Padmanabhan, and Seetharaman (2005) developed a model of locational choice and pricing decisions in the gasoline market, which they also tested empirically using Singaporean data. The results suggested that the proximity of a

petrol pump to a highway has positive impact on its sales. Using the data from Montreal to test the sales performance of petrol pumps, Gagné, Nguimbus, and Zaccour (2004) showed that geographical zone does not affect the sales of a petrol pump. However, they argued that this could be due to the inclusion of the traffic variable in their analysis, which also captures the effect of geographical zone (e.g. urban area) on sales performance of a petrol pump. Among the non-location variables, they found that the most important variables contributing to the better sales performance of a petrol pump are the size (station service capacity) and identity of the marketing company. However, they did not include amenities in their regression analysis, which could be an important determinant of sales performance of a petrol pump, given the evolving nature of the petrol pump business.

Similarly, Sartorious, Eitzen, and Hart (2007) analysed the variables influencing the retail fuel industry in South Africa. They found that size of the petrol pump, measured by the number of bays did not have a significant positive impact on the profitability of petrol pumps. They used sales volume as a proxy for gross profits. This is problematic because higher sales do not necessarily translate into higher gross profits. Inefficient cost structure may lead to lower, or even negative profits, even if the sales are relatively higher. Taking this fact into consideration, in our analysis, we use both sales volumes and gross profits in separate equations. As regards the location of petrol pumps, Sartorious, Eitzen, and Hart (Ibid.) found that location is an important variable for the gross profitability of a petrol pump. They did not include convenience store in their econometric analysis to test its impact on the profitability of petrol pumps. Rather, employing the case study methodology, they asked the petrol pump owners about the impact of convenience stores on their businesses. According to them, the owners felt that the impact of having a convenience store was positive. In a study on the petrol pumps in the United Kingdom, the effect of non-fuel sales was also found to be positive [Deloitte (2012)]. As far literature on Pakistan is concerned, we could not find any study that analyses the structure and performance of the petrol pumps in Pakistan.

The literature review shows that performance of petrol pumps is mainly influenced by location of a petrol pump, non-forecourt activities, and the petrol pump size. In the light of the literature review, we test the predictions found in the literature on the performance of petrol pumps for the data on Pakistan.

3. METHODOLOGY

This section discusses methodology employed to select sample and collect data, along with the discussion on the techniques and methods used to present and analyse the data. We have used exploratory data analysis to present the data collected from the survey. In addition, we have also used regression analysis to analyse the determinants of gross profitability and sales volumes of petrol pumps. One of the contributions of our paper is that in addition to the

location of a petrol pump, we also include a variable that measures the distance of petrol pumps, included in our sample, from the nearest petrol pump. Moreover, we also include identity of the OMC as one of the determinants of the performance of the petrol pumps. Surprisingly, apart from one paper that we reviewed, no other paper has taken the identity of OMC into account while analysing the sale and profitability of the petrol pumps.

3.1. Survey Design and Sample Selection

The data on petrol pumps was collected through convenience sampling, using a structured questionnaire. Before proceeding to the data collection stage, we held numerous discussions with various stakeholders O A , Pakistan Petroleum Dealers Association, individual petrol pump owners, and MP&NR). During the discussions, it was suggested that due to spatial diversity of the petrol pump population that is scattered all over the country and due to security situation in some of the regions (especially Karachi and Balochistan), the most practicable sampling method would be a mixture of convenience and snowball sampling. Biernacki and Waldorf (1981) have suggested that when the standard sampling approach to collect sample is not practicable due to cost or coverage issues, then initial sample drawn through convenience sampling is also a viable alternative. Moreover, in case of hard to reach population non-probability sampling is an effective mean to collect data [Handcock and Gile (2011)]. The discussions with the stakeholders also yielded the conclusion that due to various reasons, such as mistrust and security issues, many of the potential respondents would not be readily willing to share information, especially the financial information. In such a situation, picking up random sample, in the first stage, would have resulted in large non-response, which would have rendered randomness ineffective and costly. Therefore, to ensure response, the convenience sampling technique was adopted for the data collection.

In order to avoid selection bias and keeping in view the dynamics of the sector, our sample covers both urban and rural regions. During data collection and gathering information from the stakeholders, it came to the fore that the share of different products like MoGas and HSD in total sales vary according to the geographical region of the petrol pump. For example, the sale of MoGas in cities is higher as compared to the sale of MoGas at petrol pumps located on highways. Therefore, this feature has also been captured in the sample by keeping both highway and non-highway locations[1] in our sample.

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[1] e have used the term location in a slightly different manner from the way it is used in location theory, which is briefly discussed in the literature review. In the location theory, the term location refers to the geographical location of the petrol pump, whether it is in an urban area or on, or close to, a highway. In this paper, on the other hand, the term location is used for the highway/ non-highway distinction and for the urban/rural distinction, we use the term region.

We have included petrol pumps in urban and rural areas and those on highways and non-highways in our sample to ensure that collected data is representative of the overall population. In this regard, most of the dynamics of the data are in conformity with the available national figures of petroleum products, such as the share of different products in total sales of petroleum products. For example, in Pakistan the sale of HSD is higher than that of MoGas. The HSD sales volumes are also higher in our sample as compared to MoGas sales volumes (detailed discussion of the data is presented in Section 5 below).

In addition, according to the data on the number of petrol pumps in Pakistan, provided by OCAC, there were 4,125 petrol pumps with modern facilities in 2013. This is almost 57 percent of the total pumps in Pakistan. Since it can be safely assumed that most of the pumps with modern facilities are in urban areas, our sample includes 52 pumps located in urban areas, which is 64 percent of the total petrol pumps surveyed. Based on the reasoning given above, we are confident that our data can produce reliable results. Additionally, the preference to probability sampling is emphasised because the non-probability sampling may lead to heteroscedasticity. In order to overcome this concern, we have used the heteroscedasticity-consistent estimation techniques.

3.2. Empirical Investigation

The data collected from the survey is analysed in two ways. Firstly, we use exploratory data analysis, which is carried out by disaggregating data on the bases of region (rural/urban) and location (highway/non-highway) of the petrol pumps. This is done because, as discussed above, the sales vary according to the region and location of the petrol pumps.

Secondly, regression analysis is also done in an attempt to understand the determinants of gross profitability and sales volumes of the petrol pumps. The gross profits are defined as total revenues minus total variable costs, i.e. $\Pi_i = TR_i - TVC_i$, where Π_i,TR_i, and TVC_i stand respectively for total profits, total revenues, and total variable costs for the ith fuel station. In this way, the measure, Π_i, used in our analysis is gross profit. Gross profits in accounting and finance literature are defined as total revenues less costs of goods sold.

Total revenues include revenues from sales of MoGas and HSD. The revenues of the petrol pumps are discussed in detail in Section 6.1.2 below. Here, it is worth mentioning that the petrol pump owners also get revenues from the sale of motor oil and from the sales at the tuck shop, tyre shop and car wash.[2] However, the owners of the petrol pumps were reluctant to share

[2]In some cases, the amenities are owned by the petrol pump owners but in most of the cases they rent out the space to other entrepreneurs who run these amenities.

the information on how much they make from these amenities and for this reason we have not included these in our calculation of gross profits. The breakdown of total costs, on the other hand, shows that these are composed of labour costs (the labour involved in operations of a petrol pump include attendants, commonly known as fillers in Pakistan, managers and cashiers), utilities (electricity, telephone, and water), generator, stationery, and uniform for the labour. The breakdown of the costs is given in Section 5, which presents the results.

The profitability of a petrol pump may depend on a number of things. The literature review shows that the performance of petrol pumps is influenced by the location of the petrol pump, size, and price of petroleum products. In the case of Pakistan, however, price is irrelevant because prices of MoGas and HSD are regulated and are the same across all fuel stations. Including the price variable in the regression analysis, therefore, would give singular matrix and for this reason, we do not include prices in our analysis. Moreover, since price is the same across all petrol pumps of different OMCs, the consumer would not be concerned about the price of MoGas of HSD. This means that the price would not affect sales, and profitability of a petrol pump.

3.2.1. *Identity of the OMC*

Apart from the price of the petroleum products, other factors that might influence the profitability of a fuel stations are numerous. One of the important factors is the identity of the OMC. Although, MoGas and HSD are homogenous products, consumers are partial to brands and may prefer one brand over another. For this reason, we include OMC as one of the determinants of profitability.

3.2.2. *Size of the Petrol Pump*

The size of a petrol pump is measured by the number of fuel dispensers, or bays, installed on the premises. The larger the size of the petrol pump, higher would be the sales and, presumably, greater would be the profitability. Higher number of bays installed on a petrol pumps simply means that the customers do not have to wait long for their turn to get the fuel. In this way, throughput increases and has a positive effect on the profitability of the business.

3.2.3. *Region and Location*

One of the most important factors impacting the performance of a petrol pump is where it is situated. The survey data reveals that fuel stations that are in urban areas have higher throughput as compared to the fuel stations in rural areas (see Section 5 below). In addition, petrol pumps situated on highways sell more HSD as compared to MoGas. However, it might be the case that fuel

stations that are in rural areas are situated along the highways. To take care of these factors, we include three dummy variables in our analysis that control for the geography of the petrol pumps: one for those petrol pumps that are in urban areas (region), second for the fuel stations situated on highways (location) and interaction dummy for these two variables.

3.2.4. *Non-Forecourt Activities*

To control for the non-forecourt activities of a petrol pump, we include dummies for tyre shop, car wash, and convenience store (or tuck shop). Availability of these services is postulated to affect profitability of fuel stations positively. Automobile owners may prefer those fuel stations to fill up their vehicles tanks that also have services such as tyre shop, car wash, and convenience store. The literature also shows a positive impact of non-forecourt activities.

3.2.5. *Distance*

According to the available literature on the retail petroleum industry, the sales performance of petrol pumps may be influenced by their proximity to the next nearest petrol pump. For one thing, the competition among the petrol pumps may spur the owners to improve their services. Furthermore, closely situated petrol pumps may lead to increase in the sales of petrol pumps, as the consumers will have more options to get fuel if there are long queues at a petrol pump during the rush hours. The flip side of the argument is that the presence of more petrol pumps in close vicinity can also affect the sale performance negatively. Since MoGas and HSD are regulated products in Pakistan and their prices do not vary within a city, the consumers are indifferent between products bought from two petrol pumps and therefore, presence of too many petrol pumps within touching distance of each other may affect the sale performance of fuel stations negatively. We also include the squared term of the distance variable in our analysis to capture any non-linear relationship between the distance and dependent variables.

3.3. Empirical Model

Based on the discussion above, in our empirical analysis we use the following specification to analyse the determinants of profitability of petrol pumps in Pakistan.

$$Gross\ Profits = f(distance, distance^2, size, amenities, location, locale, location * locale) \quad (1)$$

According to Equation 1, based on the literature available on the determinants of profitability of petrol pumps, the gross profits are postulated to

depend on distance (of the petrol pump from the nearest petrol pump), distance squared, size of the petrol pump (bays), non-forecourt activities (tuck shop, tyre shop, and car wash), region (rural or urban), and location (highway or non-highway). We have also included an interaction dummy for the region and location dummy variables to see how this combination affects the profitability of petrol pumps.

Thus, our econometric specification is as following:

$$\pi_i = \alpha + \beta_1 S_i + \beta_2 D_i + \beta_3 D_i^2 + \sum_{i=1}^{3} \gamma_i A_i + \sum_{i=1}^{2} \delta_i L_i + \varphi I_i + \epsilon_i \qquad (2)$$

In Equation 2 above, α is the constant term, D_i and D_i^2 are distance and distance-squared, respectively, and S_i is the size. D_i, D_i^2 and $S_i$are continuous variables, A_is are dummy variables for tuck shop, tyre shop, and car wash, which are defined as $A_i = 1$ if the petrol pump does not have a tuck shop, tyre shop or a car wash, and 0 otherwise; $L_i s$ are region and location variables ($L_1 = 1$ if rural, 0 otherwise; $L_2 = 1$ if non-highway, 0 otherwise) and I is interaction of L_1 and L_2 ($I = 1$ if petrol pump is urban and highway). The ϵ_i is the error term.

Similarly, to check the determinants of sales volumes of the petrol pumps the specification is as following:

$$Z_i = \alpha + \beta_1 S_i + \beta_2 D_i + \beta_3 D_i^2 + \sum_{i=1}^{3} \gamma_i A_i + \sum_{i=1}^{2} \delta_i L_i + \varphi I_i + \epsilon_i \qquad (3)$$

Z_i is the sales volume of the ith petrol pump. The description of the rest of the variables is the same as in Equation (2). It is plausible to assume the determinants of the sales volumes are the same as those of the gross profitability of the petrol pumps.

3.4. Description of the Sample

We collected information on various aspects of operating a petrol pump in Pakistan. The data collected and reported below pertains to monthly values. We collected information from 81 petrol pumps. The information was collected on workers, sales, and various costs that are incurred in running a petroleum pump. Apart from this information, we also asked whether the pump had a tuck shop, car wash, and a tyre shop. Out of these 81 petrol pumps surveyed, 52 are situated in urban areas and the rest of 29 are in rural areas. As regards the locational breakdown, 39 are on the highways and 22 are on non-highways. Since most of the petrol pumps are in the Punjab, therefore, our sample also included more petrol pumps from the Punjab, which were 57 in number. The breakdown of the sample according to region (urban/rural), location (highway/non-highway), and provinces is summarised in Table 1.

Table 1

Sample Breakdown—Regional, Locational, and Provincial

	Numbers
Region	
Rural	29
Urban	52
Total	*81*
Location	
Highway	42
Non-Highway	39
Total	*81*
Province	
Punjab	57
Khyber Pakhtunkhwa	9
Sindh	10
Islamabad Capital Territory	5
Total	*81*

It is important to note that the division of the sample based on the region and location is not mutually exclusive, i.e. the petrol pumps that are on highways also include those petrol pumps that are in urban areas as well as in rural areas. Similarly, non-highway petrol pumps include also those that are in urban areas and also in rural areas.

The sample also included most petrol pumps of PSO, amounting to 25, because of the fact that most of petrol pumps in Pakistan are operated by PSO as per national figures provided by the OCAC. PSO is followed by Shell Pakistan in terms of the number of petrol linked with each OMC. Our sample included 17 petrol pumps operated by Shell Pakistan. OMC-wise breakdown is given in Table 2.

Table 2

Sample Breakdown—OMCs

	Numbers
Oil Marketing Company (OMC)	
Attock	5
Admore	9
Byco	1
Caltex	9
Hascol	1
PSO	25
Shell	17
Total	14
Total	**81**

4. OVERVIEW OF THE PETROLEUM RETAIL INDUSTRY IN PAKISTAN

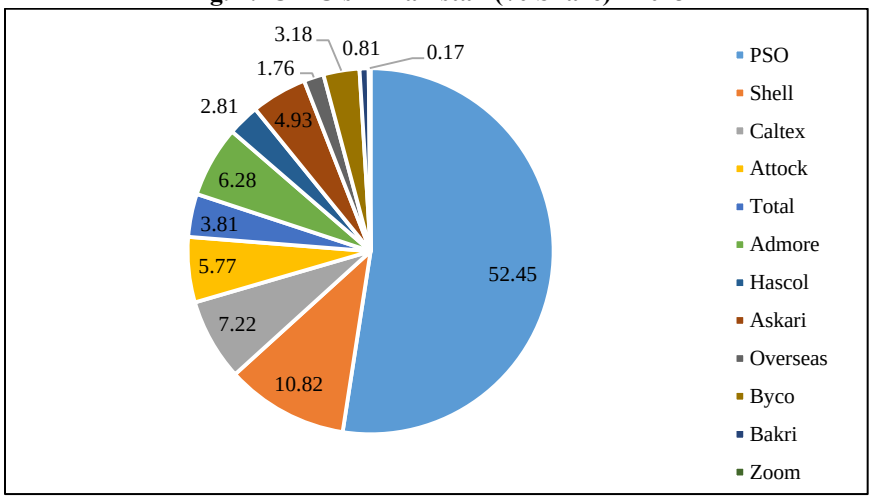
This section presents an overview of the petroleum retail outlet industry in Pakistan. At the time of collection of the data in 2013, there were 12 OMCs that supplied fuel to the 7,198 petrol pumps, as per the data provided by the OCAC, Karachi (OCAC; unpublished figures). The petroleum retail outlets operate under different arrangements made with OMCs. Some outlets are owned and operated by the OMCs themselves, some are owned by OMCs and operated by dealers, whereas the rest are owned and operated by the dealers, who pay license fee to the OMCs to use name of a particular OMC. However, there is no way for an average consumer to distinguish between different types of petrol pumps, and it does not affect their perception about the quality of services provided by the fuel retail outlets.

The petrol pumps in Pakistan do not operate in a competitive environment, as such. The prices of petroleum products, though deregulated over the years, are determined by the government approved formula, which is overseen by the Oil and Gas Regulatory Authority (OGRA) and the petrol pumps are bound to sell different petroleum products at the declared prices. The petrol pump owners receive a fixed amount per-litre as their margins. Currently, petrol pumps are allowed rupees 2.78 per litre on MoGas and rupees 2.30 per litre HSD as their margins. This is in contrast to how petrol pumps operate in more developed countries where the petroleum industry is deregulated and petrol pumps are largely free to sell fuel at different prices, keeping in view the market conditions and the extent of competition in their respective areas. In terms of setting up a petrol pump in Pakistan, on the other hand, prospective entrepreneurs may do so, rather freely after fulfilling the procedures set out by the concerned regulatory authorities. Presence of fixed margins in the petrol pump business compels the owners to depend upon the factors other than charging prices different from their competitors.

4.1. OMC-Wise and Geographical Distribution

The biggest player in the petroleum industry is the Pakistan State Oil (PSO), which has 3,775 petrol pumps situated all over Pakistan. The second highest number of petrol pumps is those of Shell Pakistan Limited, which are 779 in number. Caltex and Admore operate 520 and 452 petrol pumps, respectively. The others are even smaller players in the petroleum retail industry. Figure 1 below gives the petrol pumps operating under the banner of each OMC, as a percentage of total outlets, operated by all the OMCs.

Fig. 1. OMC's in Pakistan (% Share) - 2013

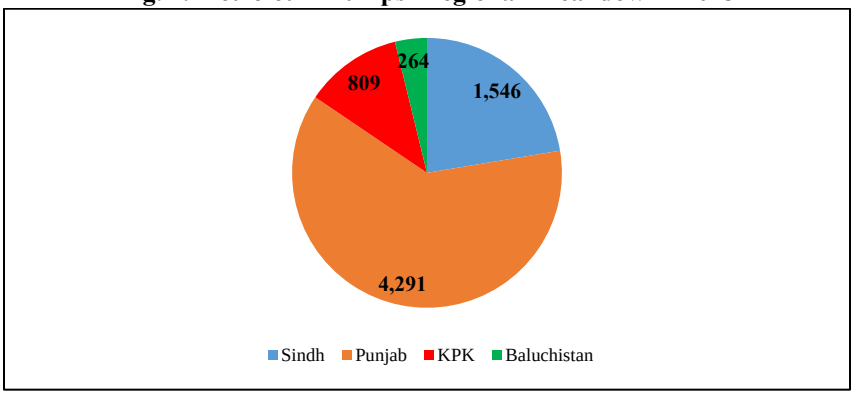


Source: Oil Companies Advisory Council (OCAC).

With the increase in demand and consumption of petroleum products, the number of petrol pumps has also increased. In 2009, the earliest year for which the data was available from the OCAC (unpublished figures), the number of petrol pumps was 6,377. The number increased to 7,198 in 2013. This amounts to an increase of roughly 3.1 percent per annum, from 2009 to 2013. Although, the growth rate of the retail outlets is modest, to put the number of outlets (7,198) in perspective, we might compare the situation with that in India. In India, in 2012, the number of petroleum retail outlets was roughly 51,870 and the number of registered vehicles was 159 million (Statistical Yearbook of India, 2016), which translates to 3,069 vehicles per outlet. In comparison, the number of registered vehicles in Pakistan in 2013 was 13.67 million, which increased from 6.56 million in 2009 (Pakistan Economic Survey, op cit.). This translates to an increase from 1,029 vehicles per petrol pump in 2009 to 1,899 vehicles per retail outlet in 2013. With the increase in vehicles on the roads due to import of used vehicles, among other things, the number of vehicles per petrol pump would probably increase over the years, given the modest growth in the petrol pumps. What these numbers imply is that the petrol pumps have become a lucrative business and with increase in vehicles on the roads their sales and earnings are also expected to have increased over time.

As far as regional distribution of petrol pumps in Pakistan is concerned, unsurprisingly, the highest number of petrol pumps are in the province of the Punjab (4,291), followed by Sind (1,546), KPK (809), and Balochistan (264). The regional breakdown of the petrol pumps is given in Figure 2.

Fig. 2. Petroleum Pumps' Regional Breakdown - 2013



Source: Oil Companies Advisory Council (OCAC).

4.2. Regulation of the Petroleum Products

In Pakistan the petroleum retail industry is regulated, that is the prices of the petroleum products are administered by the government. Although in 2011, the government deregulated the oil prices of petroleum products, including MoGas and HSD, the prices are set by the OMCs according to a Government approved formula. The Oil and Gas Regulatory Authority (OGRA) monitors the pricing of the petroleum products. The components of petroleum products prices are given below.

(i) Ex-refinery price based on the concept of import price parity (IPP).
(ii) Government levies, which include excise duty and Petroleum Development Levy (PDL)
(iii) Inland freight.
(iv) OM s and Dealers margins. These margins are set by the Government.
(v) Sales tax.

4.3. Operations of Petrol Pumps

The activities of the petrol pumps are typically divided into forecourt and non-forecourt activities. The forecourt activities include selling of fuels, which is the basic function of a petrol pump. Besides selling fuel, the petrol pumps also engage in other activities, which are known as non-forecourt activities. These activities include tuck shops, carwashes, and tyre shops. In more advanced countries, petrol pumps also have facilities such as auto teller machines (ATMs) but in Pakistan such an activity has only begun to appear and has not gathered pace. Moreover, in Pakistan some of the outlets also sell compressed natural gas (CNG) but our analysis does not include this segment of the market because the operation of CNG stations is governed by entirely different procedures, and rules and regulations.

5. FINDINGS AND RESULTS

This section presents the main findings emerging from the analysis, focusing on factors that can affect a petrol pump s performance and profits. This includes factors such as sales volume, revenues, workforce, costs, profits and location.

5.1. Sales Volumes

Table 3 provides a snapshot of sales volumes of MoGas and HSD. MoGas is used in cars and motorcycles, i.e. mainly in Light Transport Vehicles (LTV) whereas HSD is used as a fuel in trucks, tractors, and other Heavy Transport Vehicles (HTV). The sale of MoGas is higher in urban areas due to the fact that most of the vehicles that consume MoGas are in urban areas. On the other hand, the sale of HSD is higher along highways because most of the HTVs, which use HSD, travel along the highways. On average, a petrol pump sells 284,915.60 litres of fuel (MoGas and HSD) per month. The mean is higher for urban areas (367,017.3 litres) and also for highway petrol pumps (361,364.2 litres) as compared to non-highway petrol pumps (202,586.3 litres). Although, the sale of HSD is also higher in urban areas (200,479.5 litres) but this is because urban petrol pumps also include those petrol pumps that are situated on highways. The petrol pumps on highways sell lower volume of MoGas (118,147.9 litres) as compared to non-highway pumps (140,901.3 litres). On the other hand, highway petrol pumps sell significantly higher volume of HSD (243,216.3 litres) as compared to non-highway petrol pumps (61,684.98 litres).

Table 3

Sales Volumes (Per Month; '000 Litres): Total, MoGas, and HSD

Variable	Mean	Std. Dev.	Minimum	Maximum
Total Volume (MoGas+HSD)	**284.92**	**331.64**	**33.46**	**2,129.40**
Region				
Rural	137.70	80.45	48.67	380.25
Urban	367.02	387.01	33.46	2,129.40
Location				
Non-Highway	202.59	158.05	33.46	882.18
Highway	361.36	423.10	39.55	2,129.40
MoGas (Overall)	**129.10**	**137.48**	**0.00**	**760.50**
Region				
Rural	61.98	43.50	0.00	162.15
Urban	166.54	156.90	6.08	760.50
Location				
Non-Highway	140.90	137.16	9.13	760.50
Highway	118.15	138.52	0.00	608.40
HSD (Overall)	**155.81**	**260.05**	**0.00**	**1,673.10**
Region				
Rural	75.72	59.27	6.08	243.36
Urban	200.48	313.80	0.00	1,673.10
Location				
Non-Highway	61.68	44.44	0.00	182.520
Highway	243.22	337.44	6.08	1,673.10

A surprising statistic is zero sales volume of MoGas at a petrol pump situated in rural area along highway. Even though, as discussed above, MoGas sales are lower in rural areas, zero sale of MoGas is surprising due to the fact that there must be some of vehicles that fill up MoGas at a pump in rural area. On the other hand, zero sales volume of HSD at a petrol pump in urban area, which is not situated along a highway is not surprising. Diesel engine cars are becoming rarer in Pakistan and mostly the vehicles that need HSD fill up at pumps that are along main highways.

5.2. Revenues

A petrol pump s main source of revenues is the sale of Mo as and H D. Petrol pumps also get revenues from the sale of motor oil, or lubricants, and in some cases, from renting out space at the petrol pump site to tuck shops, tyre shops, and car washes. However, in our analysis, our main focus in on the revenues from the sale of fuel. This is done for two reasons. Firstly, the respondents were not ready to share information on the rental income they received from renting out space to other businesses. Secondly, the main source of revenue for the petrol pumps is from the sale of fuels. In cases in which they shared information on sales of motor oil, it was found out that revenues from such sales were quite low.

It can be seen from the Table 4 that the revenue figures, naturally, are commensurate with the sales figures reported in Table 3 above; higher sales result in higher revenues and vice versa. Therefore, not surprisingly, the revenues are higher in urban areas (rupees 924,077, on average) and for petrol pumps situated along highway (rupees 887,848).

Table 4

Total Revenues (Per Month; '000 Rs)

Variable	Mean	Std. Dev.	Minimum	Maximum
Total Revenues (Overall)	**717.2**	**808.58**	**87.18**	**5,116.64**
Region				
Rural	346.46	200.07	111.95	940.28
Urban	924.08	939.04	87.18	5,116.64
Location				
Non-Highway	533.58	427.36	87.18	2,394.05
Highway	887.85	1,022.02	95.34	5,116.64

5.3. Workforce

The workforce at a petrol pump typically consists of managers, supervisors, cashiers, and fillers. Some of the petrol pumps do not employ all the categories of workers because in some cases one category of worker performs multiple tasks. Table 5 shows the number of workers, on average, employed at petrol pumps. For the sake of brevity, we have lumped all the categories together and have given statistics for total workers. The breakdown of the categories, i.e. manager, supervisor, cashier, and filler is discussed below but tabular form is relegated to the Appendix. Table 5 shows that, as expected and as is the trend for other variables such as sales, costs, and gross profits, the urban petrol pumps employ higher number of workers as do the highway petrol pumps.

Table 5

Total Workers (Numbers)

	Mean	Std. Dev.	Minimum	Maximum
Total Workers (Overall)	**13.79**	**8.75**	**2**	**48**
Region				
Rural	9.90	5.74	2	26
Urban	15.96	9.42	2	48
Location				
Non-Highway	12.54	7.37	4	43
Highway	14.95	9.82	2	48

In one case, petrol pump employs as many as 48 workers, which is situated in the urban region, on a highway. In total, there are 2 petrol pumps that employ 40 or more workers, both of which are in urban areas. This shows that the variation is quite large given the fact that some petrol pumps only operate with 2 workers. There are 3 petrol pumps that employ only 2 workers and all 3 are in rural areas.

As far as categorical breakdown is concerned, overall there are 12 petrol pumps that do not employ a manager and 40 pumps are operating without a supervisor. However, it is clear from the Appendix Table 1 that there is no trend in the employment of managers and supervisors in the petrol pumps covered in our sample. Put another way, the likelihood of a petrol pump employing more managers and/or supervisors does not change with the region of the petrol pump, i.e., it does not depend on whether the pump is in urban area or whether it is located along highway. However, it is clear that most of the petrol pumps that employ more than 2 managers and supervisors are in urban areas and/or are situated on highways.

Similarly, Appendix Table 2 gives the same breakdown for number of cashiers and fillers employed on petrol pumps for all the petrol pumps combined, and also sub-divided for rural/urban and highway/non-highway petrol pumps, just as we did for managers and supervisors. The table shows that there are 29 pumps that do not employ any cashier, whereas, as expected, there is no petrol pump that is without a filler. This means that the filler is the only category of the workforce that is indispensable. In one case (not shown in the Appendix Table 2 and lumped with the 10+ number category), a petrol pump has as many as 38 fillers at the site. That particular pump was located on a highway. There are also a number of pumps that employ 10 or more fillers, most of which are either in urban areas or on highways. The absence of a manager, cashier, or a supervisor is not surprising as during the survey it was revealed that in some cases it is the fillers, or even the owners themselves in some cases, perform the job of managing, supervising, and collecting cash from the customers. But that is true mostly of the petrol pumps that do not have very high throughput.

5.4. Costs

To analyse the structure of costs and expenses incurred in running a petrol pump, we have bifurcated the costs into labour and non-labour costs. The labour costs comprise the wage bill of the workforce. Added together, labour costs combine to form the largest chunk of costs of running a petrol pump. The other substantial cost is the expense on electricity. Some petrol pumps also spend a sizeable amount on running a generator in order to be able to keep on operating during power outages that are prevalent across the country, especially so during the time the survey was conducted.

5.4.1. *Labour Costs*

Table 6 below reports salaries of the different categories of workers involved in running a petrol pump. The figures are reported for all the petrol pumps, and sub-divided for rural/urban and highway/non-highway regions. Table 6 shows that the managers command the highest remuneration among all the categories of workers. Unsurprisingly, the maximum salary is also paid to a manager working in a petrol pump in urban area. The trend is the same for all other categories as the highest salary in each of the other three categories of workers (supervisors, cashiers, and fillers) goes to those who work in the petrol pumps located in urban areas. It is interesting to note that in quite a few cases, the workers at petrol pumps were given salaries that were below the legal minimum wage prevailing at that time, which was rupees 10,000.00 in 2013. In 34 out of 81 cases the fillers were given salary which was below the minimum wage. As can be seen from Table 6 above, the minimum salary for fillers was rupees 4,000 in our data. For managers, supervisors, and cashiers there were 4, 6, and 9 cases respectively.

Table 6

Employees' Salaries (Per Month; '000 Rs)

Variable	Mean	Std. Dev.	Minimum	Maximum
Managers (Overall)	**15.54**	**6.58**	**6.50**	**50.00**
Region				
Rural	12.83	4.32	6.50	25.00
Urban	17.18	7.18	7.00	50.00
Location				
NHW	16.10	8.19	6.50	50.00
HW	14.96	4.40	7.00	30.00
Supervisors (Overall)	**10.44**	**4.44**	**6.00**	**34.00**
Region				
Rural	8.88	2.37	6.00	15.00
Urban	11.50	5.20	7.00	34.00
Location				
NHW	10.52	5.65	6.00	34.00
HW	10.35	2.70	6.00	16.00
Cashier (Overall)	**9.03**	**1.96**	**5.00**	**15.00**
Region				
Rural	9.06	2.29	5.00	15.00
Urban	9.01	1.80	6.00	15.00
Location				
NHW	8.63	1.66	5.00	13.00
HW	9.50	2.21	6.00	15.00
Fillers (Overall)	**7.88**	**1.73**	**4.00**	**15.00**
Region				
Rural	7.38	1.60	4.00	10.00
Urban	8.16	1.74	5.00	15.00
Location				
NHW	8.05	1.83	4.00	15.00
HW	7.72	1.63	4.00	10.00

To present overall picture of the labour costs incurred in running a petrol pump, average total labour costs are presented in Table 7 below. On average, total labour costs stood at rupees 124,083.30, with the highest being rupees 454,000 and the lowest rupees 15,800, which is surprisingly quite low. However, on closer observation, it turns out that such a small wage bill was for the petrol pump which only employed two fillers and no other category of worker. It was located in a rural area.

Table 7

Total Labour Costs (Per Month; '000 Rs)

Variable	Mean	Std. Dev.	Minimum	Maximum
Total Labour Costs (Overall)	**124.08**	**85.64**	**15.80**	**454.00**
Region				
Rural	82.11	47.46	15.80	212.00
Urban	147.49	93.32	15.80	454.00
Location				
Non-Highway	113.62	76.26	30.00	454.00
Highway	133.80	93.38	15.80	380.00

5.4.2. *Other Costs*

In our analysis, the other costs include electricity expenses, generator expenses (i.e. fuel for running generator), product loss, and sub costs, which include telephone, water, uniform, stationery and maintenance expenses. We lumped these costs into a single sub-cost category because they are miniscule and reporting them separately would not be very illuminating. Before moving further, a few words on explaining the product loss category are in order. MoGas is a volatile product and tends to evaporate easily, especially in the weather conditions of Pakistan. HSD, on the other hand, is less volatile than MoGas and, therefore, does not evaporate all that much while stored. International practices also allow for 0.5 percent product loss for MoGas whereas, normally, no allowance is given for evaporation of HSD. The respondents of our survey also told that they only factor in the loss of MoGas due to evaporation. In accounting practices, such losses are called normal loss and are a part of the cost of goods sold.

he breakdown of the other costs is given in able 8 below. The table shows that the mean of the generator expenses (rupees 81,746) is higher than the mean of electricity expenses (rupees 48,866.81). The data show that the highest expenditure on generator is highest for the petrol pump that also has the highest throughput. Similarly, the petrol pump that has the lowest electricity expense also is the pump that does not have generator installed at their site. Since the cost of running a generator is significantly higher, due to higher fuel price compared to cost of per-unit electricity, the mean of generator expense is also higher. The electricity cost is higher in urban areas and for the petrol pumps situated along highways. The sub-costs are also higher in urban areas and highway petrol pumps because this is where most of the petrol pumps that have highest throughputs in our sample are situated.

Table 8

Other Costs (Per Month; '000 Rs)

Variable	Mean	Std. Dev.	Minimum	Maximum
Electricity (Overall)	**48.87**	**48.58**	**4.00**	**300.00**
Region				
Rural	28.45	14.35	4.00	80.00
Urban	60.25	56.74	6.69	300.00
Location				
NHW	35.28	24.65	4.00	110.00
HW	61.48	60.85	12.00	300.00
Generator (Overall)	**81.75**	**68.38**	**10.00**	**350.00**
Region				
Rural	58.52	40.50	13.21	150.00
Urban	91.50	75.39	10.00	350.00
Location				
NHW	60.48	33.60	10.00	125.00
HW	99.19	83.67	13.21	350.00
Product Loss (Overall)	**17.61**	**18.20**	**0.85**	**105.71**
Region				
Rural	8.92	5.92	1.27	22.54
Urban	22.28	20.76	0.85	105.71
Location				
NHW	19.59	19.06	1.27	105.71
HW	15.72	17.37	0.85	84.57
Sub Costs* (Overall)	**17.53**	**21.17**	**1.25**	**109.00**
Region				
Rural	11.10	16.05	1.70	87.50
Urban	21.11	22.92	1.25	109.00
Location				
Non-Highway	16.36	15.53	1.70	58.33
Highway	18.61	25.47	1.25	109.00

As far as the product loss is concerned, since it is calculated at 0.5 percent of the total volume sold, it would rise as sales volume increases. The calculation of product loss is explained with the help of the following hypothetical example, for the sake of ease. Let us assume that the price of 1 litre of petrol is rupees 100 and a petrol pump gets a 100 litre of MoGas from an OMC. The total cost of MoGas, thus, would be rupees 10,000 and the product loss would be 10,000 x 0.5 percent = 50, i.e. rupees 50.

Table 9 below combines electricity, generator, product loss and sub-costs. ummary statistics of otal Other osts are obtained by simply adding together the costs reported in Table 8.

Table 9

Total Other Costs (Per Month; '000 Rs)

Variable	Mean	Std. Dev.	Minimum	Maximum
Other Costs (Overall)	**155.44**	**128.20**	**10.77**	**722.43**
Region				
Rural	90.55	61.92	10.77	247.93
Urban	191.62	141.23	46.02	722.43
Location				
Non-Highway	120.85	71.83	10.77	287.16
Highway	187.55	158.41	22.70	722.43

To give an overall picture of how much total costs petrol pumps bear in running a petrol pump, Table 10 below reports total costs. These total costs are a sum of total labour costs and total other costs. Table 10 shows that the highest cost is associated with petrol pump in urban area on a highway. On average, the lowest costs are borne by petrol pumps located in rural areas. This is due to the fact that labour costs as well as other costs are lower in rural areas as compared to urban areas. Similarly, average costs of running a petrol pump are lower for petrol pumps situated in non-highway areas. Costs would naturally be lower in rural areas because total sales volumes are also lower in rural areas as compared to urban areas. Also, total sales volumes are lower for non-highway petrol pumps as compared to highway petrol pumps (see Table 3 above).

Table 10

Total Costs (Per Month; '000 Rs)

Variable	Mean	Std. Dev.	Minimum	Maximum
Total Costs (Overall)	**279.52**	**199.85**	**38.70**	**1,102.43**
Region				
Rural	172.66	91.83	38.70	425.36
Urban	339.11	218.88	102.27	1,102.43
Location				
Non-Highway	234.47	135.03	50.77	741.16
Highway	321.35	239.39	38.70	1,102.43

Presenting costs in per-unit (i.e. in rupees per litre) terms would be more illuminating of the cost structure. Thus, in Table 11, we have calculated per-unit total costs. We have only reported total per-unit costs for the reason that some of the per-unit costs are very small. The table clearly shows that the per-unit costs are higher in rural areas as compared to those in urban areas. Further, the total per-unit costs are the lowest in highway petrol pumps. One of the reasons is higher throughput, which results in economies of scale. Another reason could be that the petrol pumps where per-unit costs are lower are more efficient.

Table 11

Per-Unit Costs (Per Month; Rs/Litre)

Variable	Mean	Std. Dev.	Minimum	Maximum
Total Costs (Overall)	**1.35**	**0.82**	**0.34**	**4.70**
Region				
Rural	1.41	0.73	0.44	3.59
Urban	1.32	0.87	0.34	4.70
Location				
Non-Highway	1.43	0.74	0.44	3.74
Highway	1.28	0.89	0.34	4.70

5.5. Gross Profits

In our analysis, we define gross profits as total revenues (i.e. revenues from the sale of MoGas and HSD) less total variable costs, or cost of goods sold. Table 12 below gives the summary statistics of the gross profits. It can be seen from the table that the gross profits, on average, are the highest in the urban areas. This shows that gross profits are dependent on the sales volumes (since sales volumes are also the highest in the urban areas). Although the total costs are also the highest in the urban areas, these are more than offset by higher sales volumes, which in turn result in higher total revenues.

Table 12

Gross Profits (Per Month; '000 Rs)

Variable	Mean	Std. Dev.	Minimum	Maximum
Gross Profits (Overall)	**437.76**	**648.40**	**-231.00**	**4,014.22**
Region				
Rural	173.79	152.28	-78.55	514.92
Urban	584.97	764.88	-231.00	4,014.22
Location				
Non-Highway	299.11	317.08	-37.83	1,652.89
Highway	566.50	831.80	-231.00	4,014.22

Similarly, gross profits are also higher for highway petrol pumps as compared to non-highway petrol pumps for the same reason as they are higher in urban areas as compared to the rural areas. Some of the petrol pumps, 8 in total, also incur losses in their businesses. The highest loss incurred is rupees 231,003 and the lowest is rupees 7,684.34. Out of those 8 petrol pumps that incur losses, 3 are in the rural areas and 5 are in urban areas.

5.6. Non-Forecourt Activities

Petrol pumps, as discussed above, also engage in non-forecourt activities other than selling fuels. These services include convenience stores (referred to as tuck shop here), tyre shops and car wash. In Table 13 below we have given the number of petrol pump with each amenity.

Table 13

Petrol Pumps with Amenities (Numbers)

	Tuck Shop	Tyre Shop	Car Wash
Overall	**17**	**22**	**17**
Region			
Rural	6	6	5
Urban	11	16	12
Location			
Non-Highway	11	16	12
Highway	6	6	5

There are 17 petrol pumps that also operate a tuck shop, 6 of them are in rural areas while the rest are in urban areas. As regards the highway/non-highway divide, 11 of petrol pumps that have a tuck shop are non-highway petrol pumps. It can be seen from the table that most of the petrol pumps that have different amenities are in the urban region.

5.7. Size of the Petrol Pump

As discussed in Section 4.2.2, the size of a petrol pump is measured by the number of fuel dispensers, or bays, installed on the facility. Table 14 summarises the size of the petrol pump, i.e. the number of bays installed at petrol pumps according to region and location. The table shows that petrol pumps in urban areas and those situated on highways have higher number of bays. The minimum number of bays at any petrol pump is 2 and the highest number is 14.

Table 14

Number of Bays Installed

Variable	Mean	Std. Dev.	Minimum	Maximum
Bays (Overall)	**4.05**	**1.96**	**2.00**	**14.00**
Region				
Rural	3.55	0.99	2.00	6.00
Urban	4.33	2.29	2.00	14.00
Location				
Non-Highway	3.74	1.93	2.00	13.00
Highway	4.33	1.96	3.00	14.00

5.8. Distance

We calculated the distance variable using the Google Maps. We have addresses of the fuel stations that were surveyed and also names and addresses of all the fuel stations in Pakistan, accessed at the OGRA website. We calculated the distance between the surveyed fuel station and the closest fuel station by entering the addresses of the two fuel stations into the Google Maps utility, which gave us the distance in kilometres between the two fuel stations. Table 15 below summarises the distance variable. According to the table, the mean distance of the petrol pumps, included in the sample, from the nearest petrol pump is 6.25 kilometres. The distance between two petrol pump increases in the rural areas by about 2.25 kilometres, on average, as compared to the petrol pumps in the urban areas. The average distance is also higher for highway petrol pumps as compared to the non-highway petrol pumps.

Table 15

Distance from the Nearest Petrol Pump (Kilometres)

Variable	Mean	Std. Dev.	Minimum	Maximum
Distance (Overall)	**6.25**	**4.38**	**0.70**	**22.00**
Region				
Rural	7.70	5.11	1.20	22.00
Urban	5.44	3.74	0.70	18.00
Location				
Non-Highway	5.74	4.34	1.50	21.10
Highway	6.72	4.42	0.70	22.00

5.9. Regression Results

The results of the OLS regression are given in the Table 16 below. In Equation 1 the dependent variable is gross profits whereas in Equation 2 the dependent variable is total sales volume. Most of the results for both the models are in accordance to expectations, both in terms of signs and significance. We also used Breusch-Pagan test to see if there was a problem of heteroscedasticity. The results show that null hypothesis of homoscedastic variance is rejected and therefore we use robust standard errors to correct for the problem of heteroscedasticity.

The distance variable is significant at 10 percent level of significance and its sign is positive. It means that the profitability of a petrol pump increases as its distance from the nearest petrol pump increases. What it implies is that since the prices of the petroleum products are same across all petrol pumps in a given geographical area, the consumers are distributed among petrol pumps located close by. This results in reduced sales and possibly hurting a petrol pumps gross profits. The sign of the squared term of

distance is negative, as expected, and significant in both the specifications. This indicates that the gross profits and sales volumes have a non-linear relationship with the distance of the petrol from the nearest petrol pump. It implies that as this distance increases beyond a certain threshold level, starts to impact gross profits and sales negatively. The size of the petrol pump, measured by the number of bays installed at the facility, is highly significant, i.e. it is significant at 1 percent and it is also positive. The explanation for this is straightforward. The consumers prefer those petrol pumps where waiting time is lesser owing to higher number of bays installed.

Table 16

OLS Regression Results—Profitability and Sales Volume Determinants

Dependent Variable:	**Model 1**	**Model 2**
Variable	**Gross Profits Coefficient**	**Sales Volume Coefficient**
Distance	93.8	43.20
	(2.45***)	(2.19**)
Distance-squared	-3.56	-1.57
	(-1.97**)	(-1.76*)
Size	201.01	103.21
	(3.21***)	(3.07***)
Admore[+]	74.38	3.48
	(0.41)	(0.04)
Attock	-77.91	-82.05
	(-0.49)	(-1.07)
Byco	-15.05	-69.63
	(-0.04)	(-1.04)
Caltex	32.95	-252.96
	(0.19)	(-0.92)
Hascol	-472.89	-206.26
	(-0.73)	(-1.64)
PSO	358.49	130.26
	(2.29**)	(1.79*)
Shell	170.47	59.53
	(1.05)	(0.74)
Tuck Shop	79.32	40.00
(=1 if no Tuck Shop)	(0.57)	(0.55)
Region (=1 if Rural)	-141.35	-84.95
	(-1.20)	(-1.50)
Location	110.97	31.80
(=1 if Non-Highway)	(0.85)	(0.48)
Region*Location (=1 if Urban & Highway)	306.78	159.46
	(1.64)	(1.70*)
Constant	-106.33	-415.88
	(-2.26**)	(-1.68*)
Number of Observations	81	81
F (13, 67)	2.20**	2.75***
Prob>F	0.0166	.0035
R^2	0.65	0.65
Root MSE	420	220
Breusch-Pagan est [2])	49.54***	56.07***

Note: ***, **, * denote significance level at 1 percent, 5 percent, and 10 percent, respectively. Figures in parentheses are t-values. [+]Total Petrol Pumps is the base category.

None of the OM s dummies, except for that of P O, are significant. he Total OMC is used as a base category. This means that the petrol pumps working under the PSO banner are more profitable. The PSO dummy is significant at 5 percent level of significance. One of the possibilities could be the higher labour productivity of PSO. Total sales per unit of labour are the second highest for PSO, which is 27,095.42 litres of total sales volume per unit of labour. To calculate labour productivity, we divided total sales volumes (MoGas *plus* HSD sales volumes) with the total number of workers (sum of all categories of workers, i.e. managers, supervisors, cashiers, and fillers).

Results regarding the region and location of the petrol pumps are also interesting. A petrol pump located in an urban area is more profitable, whereas a non-highway petrol pump is more profitable, according to the results of the present paper. However, both the results are insignificant. We also added an interaction dummy of region and location variables, which take the value of 1 if region is urban and location is highway and 0 otherwise. The coefficient of this interaction dummy is positive, meaning that petrol pumps that in urban areas, along a highway are more profitable as compared to those located in rural areas and are non-highway petrol pumps. The coefficient, however, is only marginally significant (at 11 percent level of significance) in gross profits equation and significant at 10 percent in total sales volume equation.

6. SUMMARY AND CONCLUSIONS

To the best of our knowledge, no existing study has explored the determinants of the performance of petrol pumps in Pakistan and this paper has attempted to fill this gap. The literature on the performance of the petrol pump business indicates that both location and non-location factors are important determinants of the petrol pump business. Our results are also in line with the existing evidence on this topic.

The results show that revenues and gross profits are higher for the petrol pumps situated in the urban areas. This is as expected because petrol pumps in urban areas have higher throughput. The reasons for higher throughput are many. One of the main reasons is that the population that have automobiles and higher incomes are concentrated in urban areas. At the same time, costs of running a petrol pump are also higher in urban areas. However, when costs are calculated on per-unit (i.e. per litre) basis, the results show that these are lower in urban areas. Because of higher throughput and lower per-unit costs, the petrol pumps in urban areas reap higher profits.

When the sample is broken down on the basis of highway and non-highway petrol pumps, the results show that highway petrol pumps have higher throughput, lower costs, and higher profits. The existing literature [Chan, Padmanabhan, and Seetharaman (op. cit)] also shows that petrol pumps that are in close proximity to highways have higher sales. Since, according to our

results, the highway petrol pumps also have lower per-unit costs, therefore, their gross profits are also higher. This is mainly because most of the heavy and inter-city traffic runs on highways and naturally consume more fuel.

The regression results show that the size of petrol pumps matters. Theoretically size is deemed to be an important variable in contributing to higher sales and gross profits simply because having higher number of bays reduces wait time for the consumers. Our results show that the size variable is highly significant in both the equations. The distance variable is also significant and positive. This could be an evidence that petrol pumps that are spatially differentiated are more profitable. The non-linear term of the distance variable is negative and significant, which could have important implications for potential entrepreneurs who wish to set up a petrol pump.

As far as the urban versus rural petrol pumps are concerned, although the region dummy that uses urban as the base category, is positive but it is not significant. Similarly, the urban/highway interaction term is also positive, hinting that the petrol pumps that are on highways in urban areas are more profitable. Our results also show that the PSO petrol pumps are the most profitable. Although, petrol is a homogeneous product, identity of the company is important, which is also the evidence found by Gagné, Nguimbus, and Zaccour (op cit.).

There are some limitations that must be kept in mind while interpreting the results. Although, most of the petrol pumps in our sample make positive gross profits, some handsomely so, it must be borne in mind that we could not get data on some of the financial aspects of the petrol pumps. Land is an expensive factor of production and the land on which petrol pumps are set up could have huge opportunity cost. Therefore, taking fixed costs into account could potentially change the picture. Similarly, the start-up cost of a petrol pump is high, which must be dug deeper into in future research.

As we discussed in the description of the sample, our ability to collect more in-depth data and larger sample was hampered by cost considerations. Although, our results are in line with the existing literature but to have a better understanding of the petrol pump business, future research should be based on a larger sample. The theoretical literature shows that why and where a retail business is placed is very important, therefore, the process of finding a location for petrol pump should be one of the focal points of the future research. The caveats notwithstanding, our results show that petrol pump is a lucrative business as all but eight petrol pumps in our sample had positive gross profits. Some petrol pumps even make profits to the tune of millions of rupees per month. This finding is contrary to what the normal perception is about the viability of opening and running a petrol pump, under the current rules and regulations.

APPENDIX

Appendix Table 1

Employee Breakdown (Numbers) – Managers and Supervisors

	Managers					Supervisors				
Nos.	Overall	Rural	Urban	NHW	HW	Overall	Rural	Urban	NHW	HW
0	12	3	9	4	8	40	12	28	18	22
1	53	24	29	31	22	13	7	6	9	4
2	10	2	8	3	7	17	7	10	10	7
3	3	0	3	1	2	4	1	3	0	4
4	1	0	1	0	1	6	2	4	2	4
5	0	0	0	0	0	1	0	1	0	1
8	2	0	2	0	2	0	0	0	0	0

NHW=Non-Highway; HW=Highway.

Appendix Table 2

Employee Breakdown (Numbers)—Cashiers and Attendants

	Cashiers					Fillers				
Nos.	Overall	Rural	Urban	NHW	HW	Overall	Rural	Urban	NHW	HW
0	**29**	11	18	11	18	**0**	0	0	0	0
1	**9**	7	2	6	3	**2**	2	0	0	2
2	**15**	5	10	9	6	**6**	5	1	2	4
3	**7**	1	6	4	3	**5**	4	1	2	3
4	**14**	3	11	8	6	**6**	1	5	4	2
5	**0**	0	0	0	0	**5**	2	3	3	2
6	**3**	1	2	0	3	**7**	2	5	4	3
7	**1**	0	1	0	1	**7**	3	4	4	3
8	**2**	0	2	1	1	**12**	5	7	9	3
9	**0**	0	0	0	0	**3**	2	1	1	2
10+	**1**	1	0	0	1	**28**	3	25	10	18

NHW=Non-Highway; HW=Highway

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