A Demographic Analysis of Consumer Environmental Attitudes about Liquefied Petroleum Gas in Brazil

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Abstract

During in 1990s, structural reform of the Brazilian economy within the framework of neo-liberal policies brought about a change in the market competition and the purchase behavior of consumers. This study was aimed at identifying the extent to which purchase behavior of Liquefied Petroleum Gas (LPG) consumers reflects environmental concerns. The analysis was based on four demographics characteristics: education level, age, annual income and gender. The study profiled LPG consumer concerns in relation to these characteristics. A survey of 384 LPG consumers identified that a low percentage of respondents knew the meaning of environmental management. Cross-correlation studies demonstrated that such knowledge increases at higher educational and annual income levels and among younger age groups, but it is not influenced by gender in a statistically significant way. Good environmental performance and company risk management are expected by LPG customers, but most don't take these issues into account when purchasing. The study reveals that environmental demands are just beginning to be a determinant for LPG consumers in Brazil. Education of the consumer is seen an appropriate method for companies to increase perceived convenience and establish credibility.

Keywords

Environmental Management; Green Marketing; Consumer Behavior, Liquefied Petroleum Gas Industry; Socio-Demographics Variables.

Introduction

Beginning in the 1990s, Brazil has undertaken a major restructuring of the oil and gas industry as part of the overall effort to reduce the involvement of the government in the economy through the framework of neo-liberal policies under the "Plano Real" (Green, 2003). This framework can be seen as composed of three main blocks: market focus (trough trade liberalization), industrial change and a regime of incentives and regulations (Ferraz, et al, 1999). The competitive integration strategy can also be described as a market friendly approach to industrialization.

Trade liberalization, aimed at increasing both imports and exports and exposing the local industry to international competition, has changed the market focus. Industrial change included privatization of state companies and encouragement of foreign direct investment (FDI). Decreasing government intervention in the economy (deregulation) has been the main feature of the regime of incentives and regulations.

Brazil has changed fundamentally and in the recent period it has experienced a more stable process of democratization of its social and political institutions. Structural reform has meant that businesses are experiencing new pressures from regulators, clients, NGOs and media to become more transparent and accountable for their social and environmental impacts (Oliveira, 2006). Miles and Covin (2000) have shown that consumers demand high quality products and prompt delivery services consistent with societal and environmental values.

For the oil and gas industry the structural reform involved regulation and inspection by the new National Petroleum, Natural Gas and Biofuel Agency (ANP). Also, the energy corporation, named Petrobras, which is controlled by the Brazilian Government lost its monopoly. Activities, such as exploration, production, refining and distribution are carried out through concession or authorization in accordance with Brazilian Laws. These laws also require that companies have their headquarters and administration in Brazil.

These reforms allowed Liquefied Petroleum Gas (LPG) distributers to produce gas themselves or buy it from any other company. In theory, the reforms aimed at stimulating competition and participation of international companies in the Brazilian market. However, the logistic systems established by Petrobras act as entry barriers to new companies and Petrobras is the only company currently supplying LPG to distributers. In 2002, the situation was further complicated when the Brazilian government ended LPG price control. Thus, the distributer role is limited to filling the containers and delivering them to consumers.

There is considerable competition among LPG distributers but since the product is the same, companies attempt to gain competitive advantages through customer relationships. In order to increase market share companies continually re-allocate resource to improve their service to consumers while complying with regulations.

Given the significance of consumer relationships to LPG distributers it is important for them to understand how demographics characteristic influence consumers' attitudes and purchase decisions. This research examines this question in the Brazilian city of Fortaleza (population 2,375,000) in Northeastern Brazil which is one of the most underdeveloped regions of the country.

The paper is structured as follows. The next section examines the common hypotheses and theoretical explanations relating environmental concerns and demographic variables. The third section discusses the survey methodology while the fourth section presents the results. The final section draws conclusion as to where these efforts have brought us with respect to environmental attitudes among different types of LPG consumers in Brazil.

Demographic Influences on Environmental Knowledge and Attitudes of Consumers

Most large manufacturing firms now devote substantial time and resource to environmental management. This is important as it allows industry to contribute to ecologically sustainable development through the application of total quality environmental management processes or through the redesign of products and manufacturing technologies (Pujari and Wright, 1996).

Corporations are able to employ technologies to reduce the environmental impacts of production, increase efficiency in the use of raw material and energy, and optimize logistic systems to avoid any unnecessary impact on the environment during transportation. Furthermore, by systematically broadening their understanding of the impact of products, manufacturing processes and wastes on the natural environment, they can contribute to the formulation of practical and effective standards, laws and ordinances that afford better protection of mankind and the environment (Daub and Ergenzinger, 2005).

Abreu (2009) suggests that both environmental pressures and organizational characteristics cause firms to adopt environmental management practices. Companies should understand stakeholders' demands and pay special attention to market contexts and their internal organizational capabilities before making individual decisions about environmental approach.

Over the years, consumers have realized that their purchasing behavior had a direct impact on many ecological problems. According to D´Souza et al (2006), consumer interest in safeguarding the environment has made "greening" an important issue for managers and marketers. Concerns for environment protection have given rise to the notion that consumer purchases may be somewhat influenced by their attitude toward environmentally safe products.

Laroche et al (2001) indicates that demography is one of the five characteristics related to environmental responsibility that may influence customer's purchases along with knowledge, values, attitudes and behavior. He suggests that an environmentally conscious person can be characterized as female, pre-middle aged, with a high level of education (finished high school) and above average socioeconomic status. According to Diamantopoulos et al (2003), demographic characteristics are often used to identify market segments for profiling and targeting strategies.

The demographic characteristics commonly employed in marketing studies included gender, age, education level and income. Based on the available empirical evidence, Diamantopoulos et al (2003) pointed out that there is a lack of convincing theory regarding the impact of gender. Other studies, such as Jain and Kaur (2006) demonstrate that there is a significant relationship between gender and environmental knowledge.

Varies studies reach different conclusions about whether males or females are more environmentally aware. Jain and Kaur (2006) concluded that males tend to have a better knowledge about green issues than females, because they are generally more outgoing, and, hence, more exposed to the environmental information. However, Straughan and Roberts (1999) found that females exhibit higher concern and participate in various types of green behavior. Starr (2009) pointed out that women tend to shoulder more responsibility for shopping than men because they tend to be more knowledgeable about product choices. Based on these conflicting conclusions it is hypothesized that:

H1: There is no relationship between gender and knowledge about environmental issues.

With regard to age, Diamantopoulos et al (2003) postulated that younger people are more concerned about environmental quality. It is expected that youth support environmental reform and accept pro-environmental ideologies more than their elders. Straughan and Roberts (1999) argued that they grew up at the time when environmental concerns had already become a prominent issue.

For Starr (2009) young people have been educated more recently and may have a better grasp of problems related to environment and global warming than older people, so that the intrinsic value they attach to consuming ethically would be higher. Giving these arguments the following hypothesis is proposed:

H2: Younger people are more concerned about environmental issues than their elders.

A large number of studies have investigated the impact of education on environmental consciousness (Diamantopoulos et al, 2003). Consumer research recognizes knowledge as a characteristic that influences all phases in purchasing decision processes. Specifically, knowledge is a relevant and significant factor that affects how consumers gather and organize information, how information is used in purchasing decision making and how consumers evaluate products and services after purchase.

Diamantopoulos et al (2003) suggested that the better-educated are more knowledgeable about environmental issues and more concerned about environmental quality. Therefore, the higher-educated are more motivated to behave in an environmental responsible manner. Newell and Green (1997) pointed out that level of education may be indicative of environmental concern and increase with years of education. Starr (2009) argued that a person consumes ethically, as a result of acquiring and processing information on social, ethical and environmental issues. Therefore, a hypothesis is postulated for this component of the environmental domain:

H3: The better-educated are more knowledgeable about environmental issues.

Finally, regarding income a number of studies have shown that consumers with medium or high incomes are more likely to act in an ecologically compatible manner. Diamantopoulos et al (2003) postulated a positive relationship based on the fact that people from a higher social class are more concerned with and actively involved in environmental issues.

Straughan and Roberts (1999) pointed out that higher income consumers are able to pay additional costs associated with supporting green causes and favoring green products. Starr (2009) argued that even if higher-income people are more likely to buy ethically than others, it is not clear that they are likely to adopt a broad array of ethical practices. On the other hand, Newell and Green (1997) reported that there are mixed finding concerning the relationship between income and environmental concern. The following hypothesis is proposed:

H4: Higher income people have greater environmental knowledge.

Gilg et al (2005) pointed out that the impact of socio-demographics variables on green consumption has led to the over-simplification of causative relationships. There is still a stereotypical view that green consumers are young, female, well educated, liberal and wealthy.

Extensive research has tried to categorize consumer environmental attitudes. However, it has focused predominantly on explaining motivation and practices by consumers in developed countries (e.g. Forbes et al, 2009;Welsh and Kühling, 2009; Rowlands et al, 2002; Hume, 2009).

According to Steenkamp and Burgess (2002), very little consumer research has been conducted in emerging consumer markets and transitional economies (ECMs), even less with large,

broadly representative samples. In this context, Brazil differs culturally, economically, and demographically from European and North America countries. At present, it is experiencing a historically unique and rapid rate of sociopolitical and economic change. The analysis describe in this paper is useful to answer the question whether or not the influence of demographic variables in consumer environmental attitudes in Brazil are similar to that in developed countries.

Methodology

A survey was undertaken to identify the environmental considerations that influence the purchacing decisions of LPG consumers. These consumers buy 13kg containers of LPG for use as fuel in cooking. The survey involved the residents of Fortaleza, a city in Northeastern Brazil, with a population of 2,375,000 according to estimates by to the Brazilian Institute of Geography and Statistics (IBGE, 2006).

Fortaleza is a city of large variations in socioeconomic conditions. For this reason, it was decided to use a stratified sample based on the six administrative regions of the city. This study adopted the following parameters: maximum permissible error (d= 5%); significance (95%; z=1.96); population (2,375,000); number of households (593,704); success probability (P = 50%) and failure probability (1-P = 50%). The following equation of standard error of a proportion was used to determine the sample size:

$n= z^2. P (1-P)/d^2$

Based on this equation, the survey was administered to 384 consumers. The sample was distributed by region in proportion to the number of households as shown on Table 1. Survey participants were selected randomly by municipal region and participants were limited to LPG residential consumers (homeowners), over 18 years of age who are responsible for LPG purchase. The inclusion criteria were designed to standardize the sample and achieve a more comprehensive diagnostic framework.

A pilot study involving 40 respondents was initially used to test the questionnaire. The questionnaire was then revised and these respondents were excluded from the final sample. In the second phase, after the corrections, the final questionnaire was applied to the sample of 384 as shown in Table 1. A group of interviewers was selected for each regional subdivision, and given training on how to use the final questionnaire. The questionnaire was applied to customers at the time they purchased the container of LPG. The data collection phase took place during three months in 2006.

The first part of the questionnaire collected information on demographic characteristics: gender, age, annual income and education level. The remaining questions collected data on wide range of issues related to environmental and risk management. Most of these questions asked respondents to answer with "yes", "no" or "never thought about it". Other questions involved a 5 point Likert scale with 1 "never" to 5 "always" or a 3 point Likert scale with 1 "low importance" to 3 "high importance".

The questions covered knowledge of meaning of environmental management; the identification of one or more companies (not necessarily LPG companies) that practiced environmental management in Fortaleza; whether or not the respondent had bought a LPG from a company accused of being a polluter and the identification of which of the four LPG distributers were considered to be the most environmentally conscious. The risk management questions covered the extent to which respondents had acess to information about risks in handling LPG; the importance given to specifc health and safety risks associated with LPG and whether or not environmental, health and safety issues were taken into to account in purschasing decisions.

Cross-correlation was used to analyses the relationship between demographic variables and environmental issues on purchasing decision process. Statistical calculations used single frequency, percentage and average to test the hypotheses outlined in the previous section of this paper.

Results

The demograhic characteristics of the sample are presented in Table 2. They included age, education level, gender and personal annual income. Typical characteristics of the respondents are female (55.7%); 18 to 29 years old (27.6%); primary school educated (48.0%); and annual income between US$ 4,940 and US$ 7,410 (35.9%). The characteristics of the sample are representative of the population of Fortaleza according to IBGE surveys (2006).

In this context, Brazil and particularly the Northeastern part of Brazil has significant economic and demographic differences from European and North America countries. There is a majority of women and despite gradual aging the Brazilian population is young relative to developed countries.

According to Carlos Chagas Foundation (2006), educational level has gone up steadily over the years. In 1976, 35% of the population had no education or had completed less than a year of school. However by 2002, this number had dropped to 12%. Changing income distribution in Brazil shows a small reduction in the number of workers with low earnings. In 1976, 56% of men and 68% of women earned less than two minimum wages (less than US$ 2,470). In 2002, 51% of men and 58% of women earned less than two minimum wages. These proportions vary among regions of the country. For example, in the Northeast 68% of men and 61% of women earned less than two minimum wages in 2002 (Carlos Chagas Foundation, 2006).

Crosstabs analysis was conducted related four demographic variables (education level, age, annual income and gender) to environmental attitudes. Statistical test concerning the validity of the results. Understanding of environmental management is highly correlated with educational level, age and annual income level. However, the variable gender does not influence the consumers knowledge of environmental management in a statistically significant way (p = 0.349).

Overall only 27.6% of respondants knew the meaning of environmental management. On the other hand, Table 3 show that 70.0 % of university educaded respondents had an understanding of it and that educational level is positively correlated with knowledge of environmental management.

The survey revealed that more individuals aged between 18 to 29 years (35.8%) understand environmental management than other age groups (Table 4). This result reflects the fact that individuals of this age group have acess to more information on environmental issues than others.

The results show that overall 68.1% of respondants with annual income of more than US$ 12,350 knew the meaning of environmental management (Table 5). The result show that respondent knowledge of environmental management increseas with income level.

When ask to indicate a company that practices environmental management in Fortaleza, over 80% of respondents could not identify any firm, as shown in Table 6. LPG companies were just behind bottled water companies in terms of frequency of identification. However, the level of LPG companies may reflect the fact of this question is part of the survey involving these

companies.

In 2006, Fortaleza had eight companies with environmental management systems certified by ISO 14001, including two oil and gas companies, one eletricity distributer, four textile firms and one wastewater treatment company. Those companies that are giving attention to environmental management are doing a poor job of comunicating their actions. Communication is an important sign that a firm is committed to environmental management and maintaining relationships with the stakeholders.

Good environmental performance and risk management are expected by most LPG customers (91.7%) despite the lack of knowledge about what does environmental management means (Table 7). Cross correlation with educational level shows that this is the case at all educational levels with percentages ranging from 83.3% for those with no education to 95.0% for those with university.

Environmental issues are also considered important for all age groups, ranging from 85.3% for people over 50 to 94.4% for those from 18 to 29 years old, as shown in Table 8. Similarly, the importance of environmental issues is high (over 90%) at all income level.

However, when respondents were asked if they had bought LPG from a company accused of being a polluter 46.6% of them said they had not and another 40.4% of them said they never thought about this issue, leaving only 13% who said they had (Table 9). Crosstab analysis shows that the environmental performance of a company may still not be a significant factor in purchasing decisions even amoung consumer likely to have a high level of education. Similar behaviour was found for costumer of all ages (Table 10), as well as customers at all income levels.

These types of results were also confirmed when consumers were asked if particular issues, such as, environmental impact of the products and the companies environmental management systems or other conservation practices were taken into account in purschasing decisions, as shown in Table 11.

Thus, the survey clearly indicate a significant divergence between what consumers say they expect from LPG distributers and what they taken into account in their actual purchasing behaviour. This divergence is probably the result of a lack of knowledge of environmental, health and safety aspects of LPG. LPG is a combustible product composed of propane and butane. Submitted to high pressure LPG is liquid but at atmospheric pressure it is gaseous. It is flammable and toxic and can kill by asphyxiation. The survey reveals that only 24.2% of consumeres have some knowledge about the environmental impacts of LPG while 57.8% do not and 18% never think about the issue (Table 12).

The survey showed that 97.4% of consumers considered the safety of the seals on LPG containers to be the most important health and safety aspect. Other important issues are the lack of container defects (95.6%), risks in consumption (91.4%) and the disagreable smell of the LPG (91.2%), as shown in Table 13. Regarding the smell, people are not aware that the substance named mercaptan is introduced by the supplier in order to permit easy identification of gas leakage.

The respondents were not satisfied with main sources of risk information concerning LPG handling (Table 14). Consumers main sources of informations were media and product packaging. Although laws require companies to provide information to their costumers about health and safety issues, there is probably an oportunity for companies to do a better job of this. Improved trainning of employees having direct contact with costumers and information publications could be considered. In particular, employees, should inform customers about procedures in case of leakage, how to handle LPG containers and contacts in case of product complaints. Despite the lack of information, most customers (86.7%) place high importance on buying products which are safe.

During the survey consumers were asked to identify the leading environmental responsible company. At the time of the survey, four LPG distributers had operational activities in Fortaleza. These companies are identified herein by the letters A, B, C and D, in order not to expose their names, as shown in Table 15. The leading company was identified by 74% of respondents while the company considered to be least environmental responsible was identified by only 8.1% of respondents.

The Company identified most frequently is also the market share leader and has captured the image of an environmentall responsibility company and is seen as having a highly safe product. In fact, Company A was the first independent distribuiter to operate in Fortaleza. That company has used comunication programmes to develop consumer loyalty which is easily associated with environmental, health and safety concerns.

Discussion and Conclusion

Demographic variables can, to some degree, be used to profile the environmental knowledge and attitudes of LPG consumers in Fortaleza. The environmental issues are related to demographic characteristics exactly as hypothesized. Since the hypotheses were based largely on research undertaken in developed countries it seems that the way demographic variables influence environmental attitudes is similar between developed countries and Brazil.

The survey makes it clear that environmental concerns vary significantly across education levels, age and annual income but not across gender. Younger consumers with high levels of education and high incomes seems to have more knowledge and views of what is important about environmental issues, but they don't really take these considerations into accounting in purchasing decisions.

According to the study´s findings, environmental demands are just beginning to be a factor for purchasing decision by consumers in Fortaleza. The percentage of people who take these demands into account in purchasing is consistently low for all ages, income brackets and levels of education.

The survey found that most consumers don't know the meaning of environmental management nor check whether or not the company they're buying LPG has any environmental or risk management practices. In spite of the lack of comprehension, consumers consider it extremelly important to purchase their LPG containers from companies that don't have a negative impact on the environment and have a high regard for companies

Table 1 – Regional breakdown of sample in Fortaleza

Regional division	Households	Population	Sample size
1	94.302	377.209	61
2	86.458	345.833	56
3	94.408	377.632	61
4	72.038	288.153	47
5	125.560	502.238	81
6	120.938	483.750	78
Total	**593.704**	**2.374.815**	**384**

Table 2 - Demographic characteristicis of the sample

Variables	Range/ Characteristic	Number (N)	Percentage (%)
Age	18 to 29 years	106	27.6
	30 to 39 years	92	24
	40 to 49 years	84	21.9
	50 year or more	102	26.6
Education level	No education	48	12.5
	Elementary/Middle school	184	48
	High school	112	29.2
	University	40	10,3
Gender	Male	170	44.3
	Female	214	55.7
Annual income	Less than US$ 2,470	44	11.5
	US$ 2,470	119	31
	US$ 4,940 to US$ 7,410	138	35.9
	US$ 9,880 to US$ 12,350	36	9.4
	More than US$ 12,350	47	12.2

Table 3 - Educational level and knowledge of environmental management

Educational level	Knowledge of environmental management			
	Yes		No	
	Freq	%	Freq	%
No education	8	16.7	40	83.3
Elementary/ Middle school	31	16.8	153	83.2
High school	39	34.8	73	65.2
University	28	70.0	12	30.0
Total	106	27.6	278	72.4
x^2 of pearson = 52.90	(p = 0.000)		V of Cramer = 0.371	

Table 4 - Age and knowledge of environmental management

Age	Knowledge of environmental management			
	Yes		No	
	Freq	%	Freq	%
18 to 29 years	38	35.8	68	64.2
30 to 39 years	15	16.3	77	83.7
40 to 49 years	27	32.1	57	67.9
50 years or more	26	25.5	76	74.5
Total	106	27.6	278	72.4
x^2 of pearson = 10.58	(p = 0.014)		V of Cramer = 0.166	

Table 5 - Annual income level and knowledge of environmental management

Annual income	Knowledge of environmental management			
	Yes		No	
	Freq	%	Freq	%
Less than US$ 2,470	5	11.4	39	88.6
US$ 2,470	22	18.5	97	81.5
US$ 4,940 to US$ 7,410	30	21.7	108	78.3
US$ 9,880 to US$ 12,350	17	47.2	19	52.8
More than US$ 12,350	32	68.1	15	31.9
Total	106	27.6	278	72.4
x^2 of pearson = 58.61	(p = 0.000)		V of Cramer = 0.391	

Table 6 - Industry sectors that practice environmental management

Sector	Number (N)	Percentage %
Bottled water	23	6.0
LPG distributers	19	4.9
Oil and gas	7	1.8
Textile	2	0.5
Food	2	0.5
Supermarket	2	0.5
Regulatory agency	2	0.5
Don't know	317	82.6
Others	10	2.6
Total	384	100

Table 7 - Educational level and importance of environmental issues

Educational level	Importance					
	Low importance		Neutral		High importance	
	Freq	%	Freq	%	Freq	%
No education	3	6.3	5	10.4	40	83.3
Elementary/ Middle school	5	3	11	6	168	91
High school	2	1.6	5	4.1	116	94.3
University	1	3.4	-	-	28	96.6
Total	11	2.8	21	5.5	352	91.7

Table 8. Age and importance to environmental issues

Age	Importance					
	Low importance		Neutral		High importance	
	Freq	%	Freq	%	Freq	%
18 to 29 years	2	1.9	4	3.8	40	94.4
30 to 39 years	2	2.2	2	2.2	168	95.7
40 to 49 years	3	3.6	4	4.8	116	91.7
50 years or more	4	3.9	11	10.8	28	85.3
Total	11	2.9	21	5.5	352	91.7

Table 9 - Educational level and purchasing behaviour related to companies accused of being polluters

Educational level	Purchased from a company accused of being polluters					
	Yes		No		Never thought about it	
	Freq	%	Freq	%	Freq	%
No education	6	12.5	21	43.8	21	43.8
Elementary/Middle school	28	15.2	80	43.5	76	41.3
High school	8	7.1	63	56.3	41	36.6
University	8	20.0	15	37.5	17	42.5
Total	50	13.0	179	46.6	155	40.4

Table 10 - Age and purchasing behaviour related to companies accused of being polluters

Age	Purchased from a company accused of being polluters					
	Yes		No		Never thought about it	
	Freq	%	Freq	%	Freq	%
18 to 29 years	13	12.5	51	48.1	42	39.6
30 to 39 years	12	13	42	45.7	38	41.3
40 to 49 years	10	11.9	37	44	37	44
50 years or more	15	14.7	49	48	38	37.3
Total	50	13.0	179	46.6	155	40.4

Table 11 - Environmental aspects that consumers pay attention before purchasing

Environmental aspects	Consumers pay attention before purchasing			
	Yes		No	
	Freq	%	Freq	%
Product impacts the environment	44	11.5	340	88.5
Company has implemented EMS or other conservation practices	45	11.7	339	88.3

Table 12 - Knowledge about LPG environmental impacts

Knowledge about environment impacts	Frequency	Percentage (%)
Yes	93	24.2
No	222	57.8
Never thought about	69	18
Total	384	100

Table 13 - The importance of health and safety aspects in purchasing

Health and safety aspects	Importance					
	Low importance		Neutral		High importance	
	Freq	%	Freq	%	Freq	%
Seal's safety	6	1.6	4	1.0	374	97.4
No container defects	10	2.6	7	1.8	367	95.6
No risks in consuming	16	4.2	17	4.4	351	91.4
No bad odors	16	4.1	18	4.7	350	91.2

Table 14 - Main sources of risk information concerning LPG handling

Sources of information	Attention									
	Never		Sometimes		Don't know		Frequently		Always	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Product packaging	118	30.7	114	29.7	18	4.7	38	9.9	96	25.0
Distributer	244	63.5	79	20.6	12	3.1	28	7.3	21	5.5
Media	78	20.3	136	35.4	12	3.1	78	20.3	80	20.8
Don't perceive need for information	137	35.7	132	34.4	33	8.6	48	12.5	34	8.9
Door to door promoter	341	88.8	25	6.5	13	3.4	4	1.0	1	0.3

Table 15 - Consumer views about environmental concern of company

Company recognized as environmental responsible	Freq*	%
A	284	74
B	108	28.1
C	98	25.6
D	31	8.1
No answer	43	11.2
*OBS: The respondent could choose more than one company		

that manage LPG health and safety risks.

The fact that younger aged LPG consumers are more concerned about environmental and risk issues than other age groups may be related to the Environmental Education National Policy, which makes environmental education in schools mandatory. The education of the consumer is seen as an appropriate method for increasing perceived convenience and establishing credibility.

The survey clearly indicate that consumers think environmental and safety issues related to LPG are important but lack information on whether or not companies are taking action on these issues. LPG distributiers have an opportunity to strengthen consumer relationships by disseminating practical information to the costumer on the handling of LPG. It is of importance for companies to provide positive feedback on a regular basis in order to show costumers that they really are making a difference. Businesses which seriously consider environmental issues may create a sustainable competitive advantage.

Some limitations in this study should be recognized. First, the survey is limited to Fortaleza city. We can not generalize our results to a Brazilian context, because many parts of the country are more developed than Fortaleza and stakeholders are more demanding. Clearly more research is need in this area. A second limitation is that because the research design was cross-sectional, the present study does not shed light on changes in environmental demands over time. The third limitation is the exclusion of non demographic consumer variables. Following Diamantopoulos et al (2003), some of the associations observed in the survey may not reflect "true" relationships but "noise" associated with the measurement process. More research is needed to study other variables, such as values, actions and knowledge.

In spite of these limitations, the paper sheds light on the multifaceted aspects of consumer environmental attitudes about liquefied petroleum gas in Brazil, which has an extraordinary social, cultural and ecological diversity. The need for businesses to become better engaged in environmental practices requires ongoing knowledge of the overall effect of demographic characteristics on consumer behavior. Such information would allow companies to identify and implement strategies to gain competitive advantages through customer relationships and position themselves as having an image of environmental responsibility

Environmental concern is a market place reality, surveys such as one described in this paper not only help establish the potential to implement environmental management practices, but also provide interesting insights into the role played by social dynamics in emerging economy, such as Brazil.

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