Global Cement Industry: Competitive and Institutional Dimensions

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Abstract

The cement industry is a capital intensive, energy consuming, and vital industry for sustaining infrastructure of nations. The international cement market –while constituting a small share of world industry output—has been growing at an increasing rate relative to local production in recent years. Attempts to protect the environment in developed countries –especially Europe—have caused cement production plants to shift to countries with less stringent environmental regulations. Along with continually rising real prices, this has created a concerning pattern on economic efficiency and environmental compliance.

This paper attempts to critically analyze the forces affecting pricing and production of cement from two perspectives. Porter's five forces serve as our tool to analyze the competitive forces that move the industry from a market economy standpoint. On the other hand, the institutional economics framework serves to explain how governments and policymakers influence the structure and production distribution in the global market. Our findings suggest that the cement industry does *not* follow expected patterns of a market economy model. Additionally, it does not fully behave along the institutional economics paradigm. Hence, neither perspective explains the pricing or nature of the market on its own.

Combining market forces within an institutional setting provides a more clear understanding of price dynamics and industry performance. We find that local regulation alone is insufficient to ensure market efficiency due to weak institutional governance in developing countries aligned with private business interests of global cement firms. Moreover, the global impact of local environmental non-compliance generates economic spillover effects that cannot be corrected by market forces alone. Due to asymmetries in governance and structure, this paper recommends the establishment of an independent international regulatory body for the cement industry that serves to provide sustainable industry development guidelines within a global context.

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Global Cement Industry: Competitive and Institutional Frameworks

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1. The Case of Cement: Local Production with Global Impact

The international cement market is one of the least regulated markets on an international scale whereas international cement trade has been growing intensively in recent decades. While the amount of cement traded has increased, the percentage of internationally traded cement to total cement production remains in single percent digits (5% to 7%). This means that most of cement production exists to satisfy local consumption.

The problem this research will explore is identifying the most critical factors required to regulate the growing market for international cement. Initial fact finding suggests that cement production has recently been concentrating in the developing world (Miller, 2009). Such increasing production of a capital-intensive (labor-saving) industry means that the impact the cement market is having on the local labor markets is low compared to the impact it is having on the capital market. Even though economic rents are considerable, cement is one of the most polluting industries: 5% of the world's total emission of greenhouse gases is caused by cement production (Loreti, 2008). This means that the developing world is increasingly baring the environmental burden.

Any solution suggested to the problems caused by the cement industry has to be composed of three crucial elements. First, it must be implemented on an international scale. Local solutions cannot solve the problem. The environmental impact of burning fuel necessary to produce cement in China, if uncontrolled, will lead to global warming because of the emission of greenhouse gases caused by the burning. The impact of global warming however is not limited to China alone but may have an extended impact on countries even as far away as South Africa. Second, the developed world has to create an incentives system that does not shift all production to areas that are less regulated. While it is desirable for European and North American countries to achieve green economies by closing down cement factories or enacting strict environmental regulations, it is a major problem when such cement production is only shifted to countries with looser environmental regulations (Miller, 2009). Third, corruption and hidden transaction costs within developing nations exacerbate the problem. Whether it is the lack of strong environmental regulations or weakly implemented competition laws, developing countries can be a haven for poor environmental control and strong cartels especially in a very high fixed cost industry such as cement (Mishkin, 2007 and Selim, 2009). Any solution that does not contain these three elements should be considered lacking.

The growing production of cement calls on all countries and NGOs to begin seriously considering a global policy to solve the problems posed by this industry. An effective global policy can only be found if different actors cooperate. Being a capital-intensive industry that utilizes scarce resources to operate (such as fuel) means that governments need to keep some sort of an eye on production. Even though cement is locally produced the impact of the production is global and the presence of lucrative opportunities to shift production sites makes the industry an attractive one for governmental regulation. It is this interaction between the economic

(efficiency) and the political (institutional) that calls for finding a framework for evaluating solutions that takes into account both ends.

2. What is Cement?

At the basic level cement is a binding substance that is intended for use in building or construction material and can withstand varying environmental conditions. The four elements necessary for its creation are iron, aluminum, silicon, and calcium. These elements are burned together in a kiln and are finely pulverized to create the powder and used as an ingredient of mortar and concrete we then call cement. This powder hardens once it is mixed with water but water does not break the bond once it is formed. About 75% of cement production is used in ready mixed concrete to be utilized in construction. The remaining 25% is used for paving roads or extracting oil (Portland Cement Association, 2009).

The most common type of cement is Portland. This category is divided roughly into gray and white: gray is the most well known –most people refer to it when they say the word cement. White is the aesthetic alternative of gray which is used in buildings that have an aesthetic component: churches, museums, etc. Gray Portland is made from clinker and an additional substance usually calcium sulfate. On the other hand, white Portland is made from limestone, kaolin, and gypsum. A less common type of Portland cement is referred to as Pozzolana Portland cement. It is used in buildings which expect to be exposed to constant high humidity or water and it is made out of clinker, gypsum, and natural pozzolana —a raw material of volcanic rocks and ash. Finally, there is a special type of cement utilized in extraction of oil and withstands high pressure areas called Oil-well cement (Cemex, 2010). While other types of cement exist, the most important are gray and white Portland cement as they comprise the bulk of cement utilized in constructing roads, buildings, and other structures.

3. Major Country Players

China leads the way in cement consumption and production around the world due to the large scale developments and infrastructure buildup projects that the Chinese government is undertaking. According to 2007 estimates the Chinese production hovers around 50% of world total while the second closest rival –India—hovers around 6%. Table 1 details production of the top ten nations. In addition to showing the production in the years 2006 and 2007 in columns 2 and 3, we have calculated in the fourth column the percent of market share of each country in the year 2007 by dividing the amount produced in each country by the world total. In column five, we calculate the percent increase in local production, whereas in column six we calculate the percent increase in world share (2006-2007). Some rounding errors are expected as the world total has been rounded. It is worthy to note that Thailand was very close to making it on the table as its production nears that of Brazil –and may exceed it in future years. Egypt on the other hand produces about 1.1% of the world's total.

Table 1: Top 10 Producing Nations of Cement

Country	Production, 2006	Production, 2007	Percent of World, 2007	Percentage increase in production (2006- 2007)	Percentage increase in share (2006-2007)
China	1,200,000	1,300,000	50%	8.3%	3.0%
India	155,000	160,000	6%	3.2%	0%
United States	99,700	96,400	3.9%	-3.3%	-0.2%
Japan	69,900	70,000	2.6%	-0.14%	-0.1%
Korea, Republic of	55,000	55,000	2.1%	0%	-0.04%
Russia	54,700	59,000	2.3%	7.9%	0.2%
Spain	54,000	50,000	1.9%	-7.4%	-0.2%
Turkey	47,500	48,000	1.8%	1.0%	-0.01%
Mexico	40,600	41,000	1.5%	0.98%	-0.01%
Brazil	39,500	40,000	1.5%	1.3%	-0.01%
World Total	2,550,000	2,600,000			

Source: UN Comtrade (Steinweg, 2008), Production figures are in thousand metric tons

Some of the slowdowns in production seen above are due to dramatic downward demand shifts in the residential housing markets of the United States and Europe. However, public projects are keeping the total cement production around the world on the rise. It is interesting to note that production is concentrated in developing nations (at least 70% of world total production is based in developing countries). With the exception of the US, Japan, and Spain, all other nations in Table 1 are still in a developing phase. While the majority of the production is locally consumed, a good chunk of the cement produced is exported. This means that some production has shifted to these nations –whether it is because of cheaper labor, less strict environmental regulations, or subsidies (Mishkin, 2007 and Miller, 2009).

4. Exporting Nations

It is unsurprising that China leads the way in this category since Chinese cement represents roughly 50% of world production. Below is a table detailing the total dollar value traded by the top ten nations along with the amount of cement traded. Half of those nations are *not* top producing nations. It is interesting to see that the exporting country list differs than the producing country list. For example, the United States, Russia and Spain are on the top producing list but not in the top 10 exporting countries. This is largely due to the fact that many of the producing nations utilize their cement for internal consumption within the growing local market. The third largest exporting nation also lies in Asia –Japan. This suggests that the Asian countries have a strong comparative advantage in producing cement (The Concrete Producer, 2006). It is also surprising to see Canada on the exporting countries list –however it is probably due to its proximity to the United States which is the world's largest importer. Hence, export markets tend to be regional in cement trade, but with significant variance in country concentration relative to local production with the exception of China.

Table 2: The Top 10 Cement Exporting Countries (in order of amount exported)

Country	Value of Cement Exports	Net Weight (in metric tons)	Percentage export intensity (country export relative to total world exports)
China	$1,180,621,971	36,129,658.562	37.9%
Thailand	$520,744,807	14,980,341.699	15.7%
Japan	$269,264,156	10,121,146.931	10.6%
Germany	$521,101,000	7,286,091.431	7.6%
Korea, Republic Of	$212,216,392	6,169,600.038	6.5%
Canada	$331,560,586	5,007,076.024	5.2%
India	$253,112,892	4,816,156.474	5%
Turkey	$250,240,781	3,803,691.757	4%
Malaysia	$137,963,081	3,721,707.074	3.9%
Greece	$184,186,904	3,354,438.405	3.5%

Source: UN Comtrade (Steinweg, 2008)
Production figures are in metric tons, 2006

The above shows how small the international market really is when compared with the total production of each country. In other words, highly producing countries do not necessarily have a high surplus. Exporting countries are the ones who have a surplus, but such a surplus is not indexed by their relative scale in local production. This is possibly due to the fact that they have a comparative advantage in producing cement via a lower cost of extracting raw materials (The Concrete Producer, 2006).

5. Importing Nations

The table below –Table 3—shows the dollar value of imported cement for the top ten countries as well as the net weight (converted from kilograms to metric tons) of cement imported. The United States leads the way in both aspects –though some slowdown is expected due to the financial turmoil in the housing market.

This table is even more striking –the top 5 nations which consume about 55% of cement-- are all located in Western Europe and North America. From the export-import contrast one can see a trend of production in developing nations towards consumption in developed nations. The only exception to this rule is Korea which appears in both the import and export list. This is probably due to the fact that cement does not only refer to ready made powder but may also refer to materials such as clinker –which Korea may be importing to produce the cement it ships out. The trend we see –producing in developing nations for the use of developed nations-- can be mainly attributed to environmental regulations in the EU which appear to send the production to third world nations but the final product back to Europe. Additionally, due to the increasing cost of European cement production it is clear that cement firms have chosen to move their production sites to developing countries where labor cost is lower and production regulations are less stringent.

The United States is by far the number one importer of cement as it imports 3 times that of Spain –the second largest importer. This means that the shortage within the cement market in

the US is very high and that national production does not supply the necessary demand. Other than Syria, no other country appearing on this list is from the Middle East region. The two tables –exporting and importing country lists— actually confirm that production and export is highly intensive in the developing world with lower relative demand, while consumption mostly happens in the developed world with lower relative supply. Such a Ricardian notion in global cement trade necessitates a comparative advantage for developing countries based on lower relative costs, with relaxed environmental regulations internalized within that cost.

Table 3: The Top 10 Cement Importing Countries (in order of total weight imported)

Country	Value of Cement Imports	Net Weight (in metric tons)	Percentage import production intensity (country's net production weight relative to world total)
United States	$2,553,331,474	35,895,944.904	33.1%
Spain	$737,121,284	12,356,397.091	11.4%
Italy	$340,542,114	4,621,025.113	4.3%
Netherlands	$250,292,002	3,873,054.182	3.6%
France	$333,411,969	3,687,568.641	3.4%
Korea, Republic Of	$141,625,690	3,260,128.876	3%
Ghana	$163,413,617	3,230,817.192	3%
Singapore	$127,909,094	2,986,054.476	2.8%
Syria	$212,592,885	2,812,010.319	2.6%
Kazakhstan	$165,412,275	2,610,647.332	2.4%

Source: UN COM Trade 2006 (Steinweg, 2008)
All Figures have been converted to metric tons

6. Nature of the Market and Regional Pricing

The price of traded cement varies by country and region as multiple factors interplay. While we talk in more detail about pricing over a time period in subsequent sections, the purpose of this section is to provide a rough outline on pricing and to examine the critical regional pricing factors of the cement market.

For the purpose of simplifying the analysis we have assumed that dividing the dollar value of cement exported by the amount of cement exported will yield the price per metric ton for that country's cement. For example, dividing the dollar value of Chinese exports by their total exports and doing the same for Thailand yields that Chinese cement is being sold for roughly $32 per metric ton while Thai cement is being sold for $34. Japanese and Korean cement are being sold within the same range –the former being $27 and the latter $34. In contrast German cement runs for $71 a ton while Canadian cement runs for $66.

From a regional pricing structure, one can divide cement prices into two regional categories: Asian cement on one hand and European and North American (EU/NA) on the other. It is somewhat disenchanting however to see that such cement prices are not reflected in the prices for which cement is *actually* sold in the market. In other words, the actual price of a ton of cement varies in a different way that can be analyzed by dividing the dollar amount paid by importing nations by the amount of cement traded for each nation. By doing so, we have found that the US pays an average of $71 per ton of cement while Singapore pays $42. Most European

importers pay the same amount as the US –either due to high price of cement in neighboring countries or high price of transportation that is not usually included in the amount of money received by exporting nations. The average price of cement paid by importers is around $46 per metric ton. The average price of cement received by exporters is about $40. This means that about $6 per metric ton is being used for transportation, tariffs, or additional costs.

From such a pricing variation it is evident that multiple factors, in addition to relative production cost, interplay together to determine the actual price of cement in the market – such as taxes, shipping costs, and institutional costs. Furthermore, it is clear that cement is a non-homogeneous product in pricing. It is price differentiated by country of origin –subdivided into Asian and EU/NA. Korea still remains an interesting case as it exports and imports cement at differing prices. It imports it at a price of $43 per metric ton and exports it at a price of $34. While this may mislead us to assume that such prices mean that Korea probably imports finished products and exports raw materials, we must not forget that imported dollar values include tariffs paid to the country as well as transportation costs while exports do not include these values.

Such a pricing structure shows that Asian countries have a strong comparative advantage. While Thailand for example has lower production scale compared to the US, it is able to become the world's second largest exporter of cement because of a strong comparative advantage. Lower prices imply that the resources utilized for cement are utilized in the area where they are most needed. In other words, Asian countries can and are producing cement at a lower absolute cost *and* a lower opportunity cost to their nations. On the other hand, European nations are producing cement at substantially higher prices and costs. This cost differentiation is due to three factors. First, lower labor cost in Asian countries –European countries have a high minimum wage and stringent business/environmental regulations. Second, large subsidies from Asian governments. Third, comparatively low price of machinery in Asian countries.

Even with high prices in European nations the demand for European cement is still very high. This can be due to one of two factors. First, the generally high demand for cement and the existence of a shortage. Second, the fact that neighboring countries are forced to buy cement from areas closest to them to avoid high shipping costs. Hence, although cement is a homogenous product, there exists cost differentiation in the global cement market based on Asian vs. EU/NA regional pricing.

The demand for cement is considered to be price inelastic due to lack of apparent substitutes. This can be seen with varying degrees across the world today. As the economies of different countries are in recession and the construction business has been negatively impacted, cement prices persistently increased in real terms. In the UAE, for example, the price of cement has increased even though the real estate market is in turmoil. In Egypt, even though there has been a reduction in steel prices in 2008-2009, cement prices soared. In North America and Europe the prices are fluctuating but they are clearly on the rise (Portland Cement Association, 2009). This can be attributed to the fact that even when private enterprise is not using cement, the governmental demand on it is high as it needs it for infrastructure build-up. What is more intriguing is that while the cost of transportation has decreased due to the drop in oil and subsequent fuel prices, the price of cement has actually increased in real terms. Such evidence only serves to reaffirm the necessity of cement and the high demand relative to the supply that can cause the industry to withstand severe economic slowdowns around the world. It also shows the "resilience" of cement pricing to external shocks.

7. Environmental Impact

The process of producing cement causes negative environmental externalities at all levels of production. To make clinker and mix it to prepare concrete the material must be grounded and heated to more than 1500 ^{o}C. Such energy intensive production releases NO_X (nitrogen oxides), CO_2 (carbon dioxide), and SO_2 (sulfur dioxide). All of these gaseous materials cause harmful effects on the environment and contribute to the global climate change on earth. Cement alone contributes about 5% of the world's total greenhouse gases (Adam, 2007 and Loreti Group, 2008). Not only do these gases contribute to global warming, they also contribute to poor air quality that can cause weakening in human health and respiratory systems. When cement factories become even more concentrated in the developing world, this means that children and people living in these areas will be paying the price for construction firms to use the cement in Europe or North America (Miller, 2009). Hence, the global cement industry can be characterized as having global distributional inefficiency across space and time.

The environmental impact is further complicated through the harmful effects of resource depletion. In order to make cement and burn the components at the aforementioned temperature, the amount of fuel used –oil or coal—is very high. While clinker is not under the threat of being depleted anytime soon, the economic costs of fuel resource depletion needed to make the cement is under attack. Furthermore once the final product is produced, some solid wastes remain as a result of the production process. Such solid waste, in countries with loose environmental regulations or weak enforcement mechanisms, is thrown into the water or burned in an uncontrolled location. This lack of oversight continues to cause levels of inequality that the world cannot sustain in the long run.

These environmental challenges have gone uncontrolled because of the importance of cement for developing countries due to industrialization, export proceeds, and infrastructure requirements. The industry traditionally has gone under the radar –unlike the aviation industry that has been under attack for environmental impact. It is worth to mention here that industry leaders have taken the lead, in real or artificial terms, to meet and discuss the impact of their industry on the environment (Adam, 2007). Specifically, the World Business Council for Sustainable Development (WBCSD) has started a Cement Sustainability Initiative (CSI) led by global industry firms. However, action has yet to take place in an organized and succinct manner that can prevent the long term environmental and health damage that is caused by the production of cement on a global scale.

The environmental challenges posed to the world are exacerbated because of the lack of substitutes for cement. Building hospitals, hotels, homes, schools, etc is a necessary component for development and infrastructure build up. Without cement, building is virtually impossible. However, according to the United States Geological Survey, "virtually all Portland cement is used either in making concrete or mortars and, as such, competes in the construction sector with concrete substitutes such as aluminum, asphalt, clay brick, rammed earth, fiberglass, glass, steel, stone, and wood" (United States Geological Survey, 2008). In other words, some of these materials can be utilized in higher proportions to decrease the use of concrete which has the effect of decreasing the use of cement. Actual cement substitutes are "a number of materials, especially fly ash and ground granulated blast furnace slag, which develop good hydraulic cementitious properties [the ability to set and harden under water by reacting with the lime released by the hydration of Portland cement]. These (materials) are increasingly being used as partial substitutes for Portland cement in some concrete applications" (United States Geological Survey, 2008). Any framework that will be used to solve the environmental problem must

balance the importance of continuing cement production for development with the heightened need to keep our environment safe for future generations.

8. Applying Porter's Five Forces: The Competitive Dimension

To begin analyzing different frameworks that we can use to assess solutions for the growing environmental impact of the cement industry and the market regulations needed, a better understanding about the *forces* that critically affect the industry must be distilled.

Porter's five forces provides a "competitive forces" framework that allows us to better understand the different dimensions that govern market competition. Porter's five forces are: (1) rivalry, (2) threat of substitutes, (3) buyer bargaining power, (4) supplier bargaining power, and (5) barriers to entry and exit (Porter, 2008).

Rivalry within the cement industry is moderate. The structure of the market tends to be oligopolistic in different regions around the world. In other words only a few firms control the market in many different countries. This is due to the high fixed cost (approximately 10 million dollars a plant). This creates a highly concentrated firm environment with limited rivalry. On the other hand, cement products are not differentiated. This means that competition between existing firms can get intense. When consumers do not bare a cost by switching from one firm to another (low switching costs) and when the product lacks differentiation, this creates a haven for competition and intense rivalry. The combination of the above factors result in moderate rivalry within the global cement industry.

The second force is the threat of substitutes. Lack of substitutes –other products that are not within the same industry but can be used instead—means that the industry does not face a credible threat of competition. This represents the reality of the cement industry. No product exists to date that can substitute effectively for cement. While construction firms can use less cement in exchange for using other materials that have some cementitious quality, that substitution effect is negligible on the market price of cement (United States Geological Survey, 2008). An industry is only threatened if another industry produces a similar product (e.g. aluminum cans vs. plastic bottles), or if consumers of that product can decrease the ratio of their use of that product and use another product i.e. minimal partial substitution. Both of these choices are virtually non-existent to cement consumers, hence the threat of substitutes is very low.

The third force of competition is buyer bargaining power. This refers to the effect customers can exert on a particular industry. Pure buyer power exists when only one buyer exists in the market (monopsony). In this case power is entirely in the hands of the buyer. In the cement industry, facts suggest that this effect is minimal. The power of consumers is limited due to the lack of substitutes, the small number of cement firms (oligopoly), and the inelastic demand that consumers have for the product. Buyers are said to be powerful if they are highly concentrated, purchase a large amount of the product, or if there is product standardization. The last effect exists but its impact is weak because of persistent shortages in the cement market. Given the fact that the buyers in the cement market lack the characteristics that give them power over producing firms, the competitive level of the industry judged through this force is very low. Firms have an easier time setting price while buyers act generally as price takers.

Supplier bargaining power is the fourth force that Porter argues influences industries. Suppliers if powerful can extract some of the profits that producing firms are making off of consumers by raising the prices of raw materials. In the inputs market for the cement industry, suppliers are concentrated –but buyers are also concentrated. This means that initial bargaining is

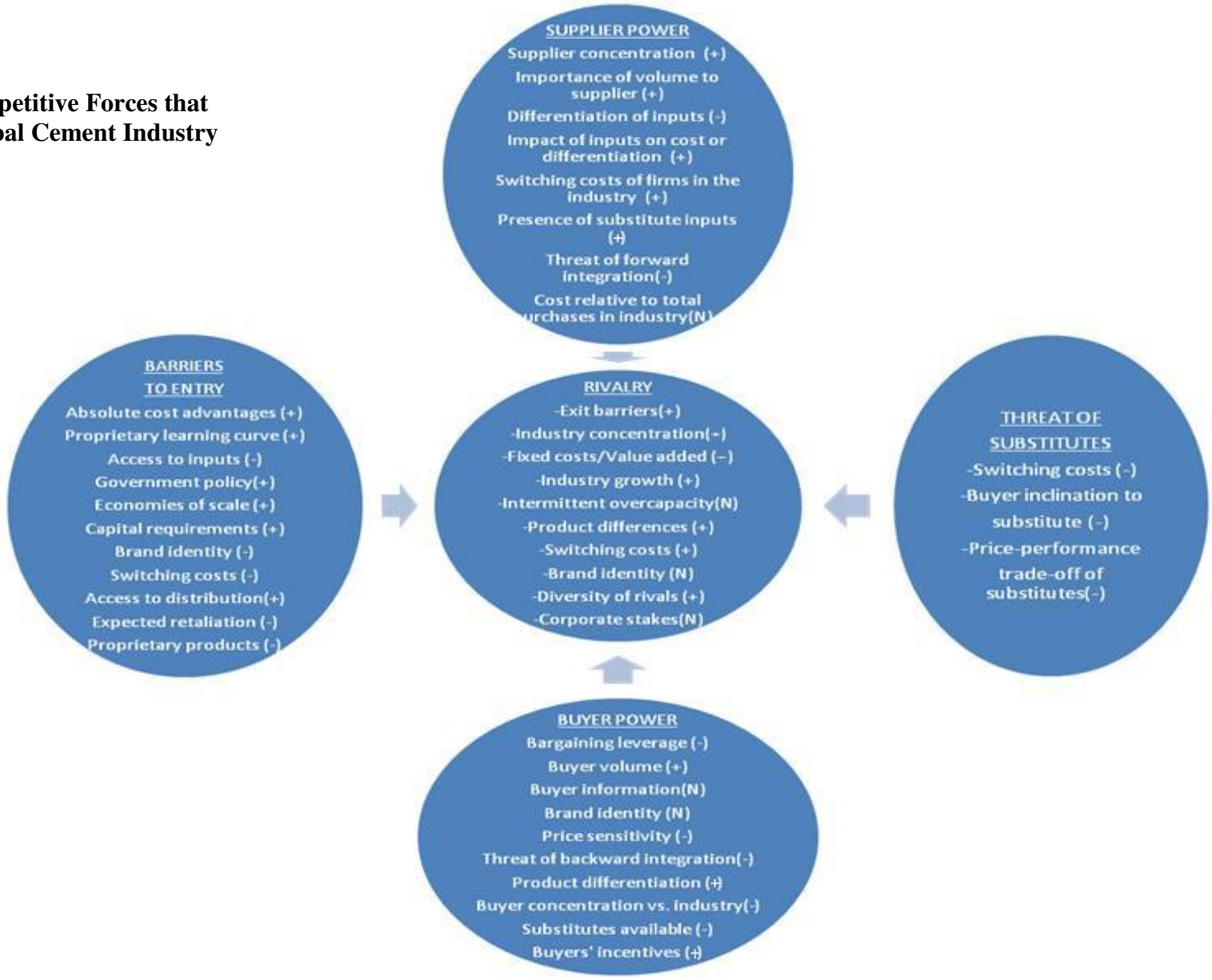
practically on equal footing. Suppliers of cement industry are divided into two categories: suppliers of transportation and suppliers of raw materials (clinkers). Cement manufacturers have argued that price hikes in the cement industry are due to increases in the price of both transportation and raw materials. This means that suppliers are powerful enough to force new prices on the cement industry. However, the weakness of the final consumers relative to both implies that the burden is mostly shifted to the price of the final product. In general suppliers are powerful if there is a credible forward integration threat (suppliers can buy producing firms), suppliers are concentrated (no switching opportunity), the cost is prohibitive to switch suppliers, and/or if a supplier can rally up the final consumer (such as fair trade farmers). In the case of cement the power of suppliers comes from their concentration regionally and from the high cost in switching between suppliers. It is not easy for a cement firm to buy clinker from China and ship it to Egypt or vice versa. This means that local raw material production must be utilized and that local or regional suppliers have high bargaining power.

The final force that Porter uses to measure forces of competition within an industry is barriers to entry and exit. High barriers to entry mean that firms already in the industry do not fear outside competition. This means that rivalry amongst firms is not "intense". In fact, incentives for intra-industry cooperation in this case, or backhanded collusions such as cartels, are highly plausible. Barriers to exit on the other hand means that firms already in the market are "locked in". This can result from the firm's inability to sell the assets if it decides to leave the industry. Barriers to entry and exit can be seen in four different ways. First, government creates barriers by limiting the number of licenses it sells for production. Cement is energy intensive as well as highly polluting; therefore entry to such a market has to be highly regulated in the eyes of many governments. Second, patents create entry barriers. Patents on new production methods or machines create difficulties for firms to enter. However, the cement industry is not a patent-dependent industry, unlike other industries such as pharmaceuticals. Third, assets needed to produce cement cannot be easily utilized for another industry (i.e. the cement industry is highly *asset specific*). This means that if a firm decides to enter into the market it must realize that a cease in its production will be very costly. Finally, economies of scale can prevent entry. For cement firms, neutralizing the high fixed costs requires a minimum efficient scale of production that creates a strong barrier to entry. Overall, the cement industry has high barriers to entry *and* high barriers to exit.

Porter's five forces is a framework that looks at rivalry and consumer-firm-industry relations from a "market forces" perspective. In the case of cement it is clear that the final consumer has little say in the price because of the high inelastic demand. Production is very costly and regulated in most areas which keep rivalry in moderation. The power of suppliers of raw materials and cement firms forces the burden of price hikes to shift to the consumers. This conclusion must be taken into account when comparing Porter's model with the institutional viewpoint, in order to come up with an effective framework to analyze policies related to the cement industry in general.

Figure 1 depicts the five competitive forces that shape the global cement industry. Rivalry is moderate, the effect of substitutes is weak, buyer power is minimal, supplier power is high, and entry/exit barriers are both high. In essence, the vertical supply chain has pricing power over final consumers, whereas the horizontal dimension of competition is lacking due to lack of the possibility of differentiated advantages in production. Inelastic demand neutralizes the consumer power associated with product standardization, whereas proximity of raw materials to production sites generate regional cement clusters.

Figure 1:
The Five Competitive Forces that Shape the Global Cement Industry



The above diagram explains Porter's five competitive forces as they relate to the global cement industry. A plus sign means that the force has an effect on the cement industry in intensifying rivalry. A minus sign means that it plays an opposing role. An (N) means that the force has neutral or no relevance to the industry.

9. The Institutional Economics Dimension

The *market niche* is a newly developed concept by institutional economists and it refers to the segment of the market in which production supply meets with the highly inelastic portion of demand, the latter being elastic at price extremes. It is widened or narrowed through "product innovation, advertising, (and) after sales services" (Kasper & Streit, 1998). In other words, it is that segment in a market which does not respond to little variation in pricing. Whether it is due to the necessity of the product or loyalty for the product, a niche is the single most important segment for which different firms try to compete.

The consumers of Portland cement can be divided into three categories: governments, construction firms, and individual home owners. Assuming a downward sloping aggregate demand curve, individual home owners would be the consumers on the demand curve that are most elastic. Whether it is utilizing cement for repair or for home expansion, this segment will always respond to price changes. On the more inelastic portion of the curve lie the construction firms and the government. Government projects are time sensitive and generally relate to infrastructure build up. This means that sensitivity to price is almost negligible as the time constraint of project implementation dictate the government's consumption of cement. Construction firms will not respond to small changes in price but may respond if crashes (or shocks) occur in the housing market. However, the presence of the niche –government and big firms—means that the price of cement can be affected little by individual decisions. Pricing for the niche takes place separately than that for individual consumers because the impact of pricing is quite different. This differs than the generic pricing model in that the institutional framework (Kasper and Streit, 1998) applied to cement firms divides consumers into *different sensitivity groups* and shows that the demand curve is *not* fully uniform –but rather can be affected by different groups within the same market. Figure 2 depicts a typical market niche and shows how the demand curve can behave according to institutional economics.

Understanding how pricing can be tailored to different consumers will help in shaping a framework to judge the regulation or deregulation of the cement industry. Having a strong hold on the market niche means that firms in the cement industry will respond little to market mechanisms. Whether it be large subsidies from the government or guarantees of large projects, such activities lead to *unintentional price fixing* through institutional means. If cement firms were insecure with the niche –the fear that governments or buyers may switch to other firms—then cement producers would be more sensitive to pricing as determined by the market mechanism.

In order for us to test the hypothesis of institutional economics as applied to the global cement industry, we decided to collect data on four countries: Thailand (second largest exporter), China (largest producer/exporter), France (European production center for cement), and Spain (second largest importing country but not on the top ten list of cement exporters). After selecting these countries we gathered data about their cement production in 3 different years 2006-2008 for the former three and 2005-2007 for Spain (2008 data was not available). After collecting this data we calculated the (average) price elasticity for the different countries in real terms. Since we are examining demand elasticity we assumed that what this country exports constitutes what the world effectively demands from that country– given that all of what is exported is being consumed. Quantities used in the calculation were obtained from the UN Commodity Trade Statistics.

Results show *three* different *critical points* of demand elasticity. Thailand's average price elasticity of demand is 1.08 which means that demand for Thai cement is unitary elastic. Chinese and French cement, in contrast, are found to be highly inelastic at 0.10 and 0.14, respectively. Spanish cement is highly elastic at 4.44. Correlating these elasticities with real cement prices –which we call price points- we derive that the demand curve for cement within the institutional

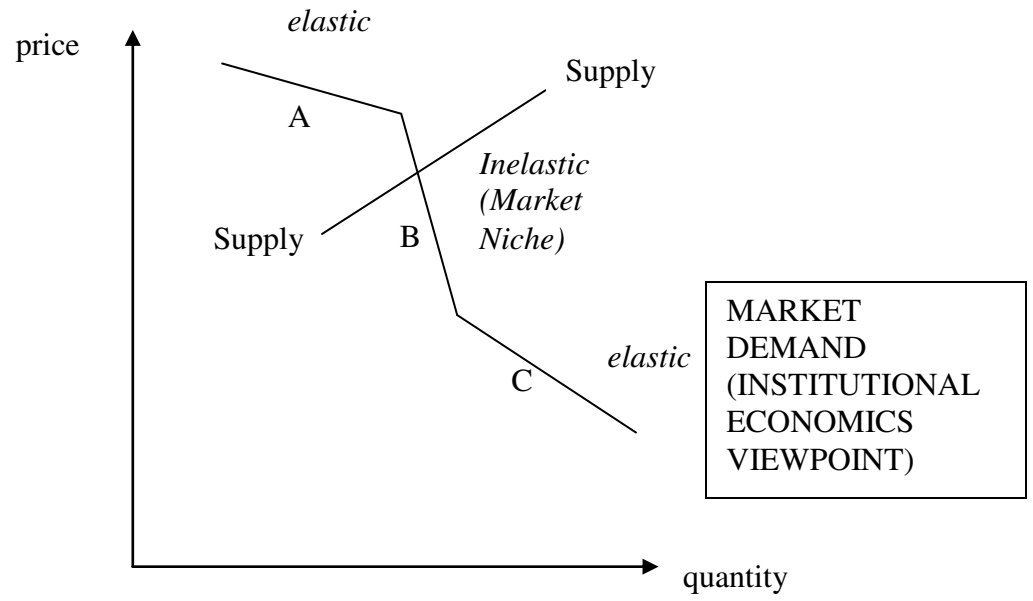
framework has a "double-kink" as obtained from our calculations (see Figures 2 and 3). Thailand with the unitary elastic demand had the lowest price ($26 per metric ton) while Spain had the highest price ($141 per metric ton) and the highest elasticity. China and France respectively fell in the middle ($41 and $63) even though the demand for their cement proved to be inelastic. These *price points* were then re-tested (and re-indexed) with US cement import/export data found from the United States Geological Survey, and results were found almost fully conforming. The final result for the cement market niche argument, based on the institutional economics dimension, is shown in Figure 3.

Based on the above calculations, it is implied that at the lowest price level ($26) the demand is unitary elastic and at the highest ($141) the demand is elastic. The middle range between $41 and $63 is where the market is inelastic –or where the niche lies. Countries producing and exporting the highest quantities have the most inelastic portion of the demand curve almost fully covered. This is the market niche.

If we draw this demand curve it will be easy to notice that the institutional proposal does not completely fit into the cement market data. The demand curve begins at low quantity and high price corresponding with a high elasticity and then as quantity grows (scale expands) we seem to enter the inelastic range and lower prices at the critical price of $63. The inelastic market niche then occurs between $41 and $63. Where our derived curve differs from that of the institutional economists is that at low prices (Thailand) quantity drops and the line becomes unitary elastic. In other words, unlike what institutional economists would suggest [i.e. that at the lowest portion of the curve quantity increases, price decreases and the demand is elastic], the findings seem to suggest that quantity and price drop together in the cement market data.

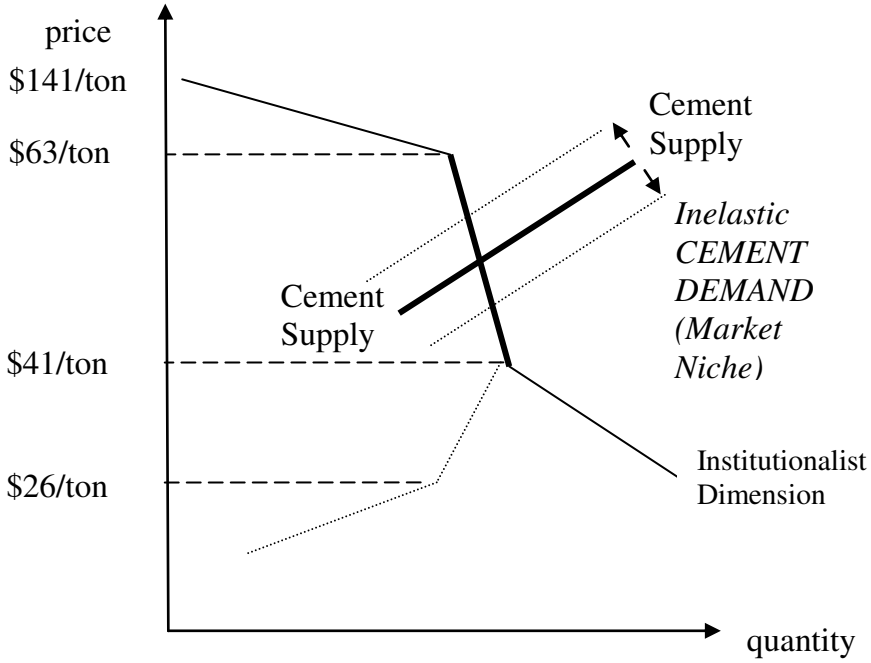
Some reasons for the discrepancy between the institutionalist demand curve and the one derived in this paper is probably due to the fact that there is a minimum quantity at which you will be considered a real player in the market (i.e. in the niche area). If unable to reach this minimum level, you are actually considered out of the market. This explains why *any* pricing outside the niche correlates with low quantity. Furthermore, players outside the niche price according to location i.e. there exists regional price differentiation *outside* the niche. This explains why Asian pricing is different than European pricing even though both produce at similarly low quantities. For the market niche players, the relative price difference is lower because market niche competition is more intense. This re-affirms that the institutional niche concept correctly elucidates the price dynamics as applied within the global cement market.

Figure 2: The Institutionalist Viewpoint



This graph shows the demand curve for an industry based on the institutional economics viewpoint. Note that demand sensitivity to price is not uniform: as price increases, quantity decreases significantly (approaching the niche), then becomes more inelastic (market niche area), then decreases significantly again (moving away from the niche). The demand curve is elastic at the top and bottom and inelastic in the middle. This middle area represents the market niche (Kasper and Streit, 1998).

Figure 3: Global Cement Industry within the Institutionalist Viewpoint



This graph represents the derived demand of the global cement industry based on the institutionalist viewpoint. This is in contrast to the generalist institutional economics graph in Figure 2. From top to bottom, the first segment represents the high price low quantity elastic portion of the demand curve with a price range from $141/ton to $63/ton. The second segment between prices of $63 and $41 represents the inelastic *market niche segment* of the market. The third segment represents unitary elasticity with a low quantity low price range between $26/ton and $41/ton. The fourth segment with price below $26/ton represents elastic demand at the very low quantity low price range.

10. Effective Regulatory Control: A Call for a Proposal

It is evident that Porter's competitive forces and the institutional economics framework do not independently offer a holistic picture of the global cement industry. Hence, each approach on its own cannot be used as a policy evaluation tool for effective regulation of the market. Porter's five forces do not fully explain the inner workings of the market except from a rationality standpoint. The changing role of government and environmental groups is not directly assessed. Moreover, the involvement of exogenous players outside the industrial supply chain- or even behind the scene shifting instruments - are not fully accounted for. On the other hand, the institutional economics framework explains segmented demand behavior in the market pricing mechanism but cannot on its own account for the rational forces of competition which led to such price variations. Therefore, we propose that both dimensions be taken together in order to efficiently manage the interaction between global players in the industry and create an effective regulatory policy framework to monitor the growing global cement market.

The cement industry is a crucial industry for infra-structure buildup which is necessary for economic growth. Left unchecked however it can cause detrimental long run sustainability problems: impact on climate change, health hazards, as well as excessive energy resource depletion. As stated in our introduction, any solution to the cement industry must have a *global enforcing mechanism*. Any local solution to the problem will not work on its own. As an example, when the European Union restricted cement production in order to protect the environment, major firms just shifted their production sites to developing countries (Hardy, 2008). In addition, governments in the developing world cannot be the only regulatory body over the cement industry firms. Due to the necessity of the product, firms have a major bargaining power against most governments. Also, hidden transaction costs can cause a slow down in the enforcement of laws and regulations designed to protect the sustainability of the global industry. The insurance of fair competition practices across borders is also necessary to curb predatory oligopolistic behavior in the cement industry. Big business can easily take advantage of the lack of fair competition laws that may exist in developing countries (Miller, 2009). In a high barrier industry that is not very closely monitored, the room for cartel behavior – such as the recent case found in Egypt— is readily observed (Mishkin, 2007). Without appropriate fair competition mechanisms, businesses can easily collude and engage in behavior contrary to fair consumer rights and to efficient long run resource sustainability (Hardy, 2008).

Since the cement industry cannot be left unchecked and unregulated on the global scale, we propose that the option of *cooperative regulation* must be explored. Specifically, one of the solutions that we strongly believe warrants examination is *the creation of an international regulatory body for the cement industry*. This body should be composed of international representatives from: (1) cement firms (business), (2) cement associations (independent/business), (3) real estate and construction groups (business/government), (4) consumer rights groups (independent/government), (5) environmental agencies (government), and (6) environmentalist groups (independent). Establishing an interactive platform with the objective of continuous communication between the above stakeholders will generate enforcement mechanisms that tackle critical regulatory issues pertinent to the global cement industry. Among such critical issues would be consumer protection, competition policy, institutional governance, environmental pollution, and fair market practices.

The inner workings of the proposed regulatory body need to be examined in a separate research undertaking. However, in this paper we have provided the necessary tools for understanding significant economic dimensions in the global cement industry from the competitive and market niche viewpoints.

11. Conclusion

It is fundamental for governments and cement firms alike to recognize the importance of finding a coordinated international approach that can direct the global cement industry towards both economic efficiency and environmental compliance. Policy makers need to realize that there are three specific forces, with corresponding effects, that actually govern this interesting but peculiar market. These are summarized below in Table 4.

Table 4: Critical Forces Governing the International Cement Market

Force	*Effect*
(1) Absolute Cost advantage	Prevents new firms from entering because incumbent multinationals control such an advantage
(2) Substitutability	Keeps the power of the buyer (consumer) weak relative to cement firms reinforcing the above advantage
(3) Industry Concentration	Curbs rivalry providing a haven to back handed collusion in the local governance structure of the industry and creates competition compliance concerns

In order to keep the power of cement firms in check and sustain economic and natural resources for future generations, governments and different stakeholder groups must organize themselves into an international regulatory body. This body should be comprised of consumer rights groups, environmentalist groups, independent cement associations, cement businesses, related industries, and policy representatives from different governments. The bottom line of such an organization is to design regulatory frameworks in order to reach a sustainable level of industry development within a global context. In essence, current local asymmetries in governance and structure within the cement industry should be neutralized, or at least coordinated, on a global scale.

This paper calls for a concrete proposal to address global enforcement mechanisms for effective regulatory control over the global cement industry. A proposed body will act as an effective oversight system where corruption can happen and collusion may occur. The development of the global cement industry is necessary in so far as it provides the implementation of fair market practices and the protection of the environment to citizens around the world.

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