Comprehensive Evaluation of the Foreign Direct Investment (FDI) Opportunities in Iraq: The Karbala Cement Manufacturing Company as a Case Study

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Comprehensive Evaluation of the Foreign Direct Investment (FDI) Opportunities in Iraq: The Karbala Cement Manufacturing Company as a Case Study

This paper explores the benefits of foreign direct investment (FDI) into the Karbala Cement Manufacturing Company (KCMC) as a case study. The benefits of FDI by the French company LAFARGE were measured by conducting a comparison before and after investment. To do so, information held in archival records and documents before and after the LAFARGE investment were reviewed, analysed and triangulated with the secondary literature.

The findings show a remarkable growth in production after the rehabilitation of the first and second production lines following the LAFARGE investment, together with a significant decrease in costs, with KCMC benefitting from economies of scale. In addition, sales increased notably, with a considerable increase in the areas of market location, plus three new types of cement and a ready mixed concrete were added to the product portfolio to strengthen market position.

This research contributes to the literature published on the benefits of investment into companies in developing countries such as Iraq. The practical contribution of this study is the increased awareness of the potential improvement of not only the cement industry in Iraq, but the lessening of oil dependency for the country, and the potential increased revenues for the government.

Keywords: FDI, privatization, investment, cement, Iraq.

1. Introduction

1.1. General Background

To increase and sustain economic development in any country, it is essential to expand infrastructure. Such expansion needs a robust construction industry with good quality construction materials such as concrete, which has a particular importance among these materials (Al-Taee and Al-Jalaby 2009). Concrete is considered the most used material in the world (after water) and its manufacture depends mainly on cement (Hason et al. 2020). Cement manufacturing in Iraq, based on Al-Taee and Al-Jalaby (2009), is

considered one of the strongest and oldest domestic industries that have an impact on national economic prosperity. Such an impact might be due to the direct relationship with the works of urban renaissance in terms of establishing different projects such as housing / residential complexes. Hason et al. (2020) stated that, according to the plans drawn up by the public and private sectors, the cement industry in Iraq is gradually growing. Annually, Iraqi factories can produce 32 million tons of cement. Furthermore, this is currently being increased through more plants being constructed with works in progress. The cement industry in Iraq is based in 18 different government factories distributed across different places in the country, and more than 5 private sector factories. It is worth noting that since 2014, because of political unrest, military operations, economic issues and financial austerity, most of the factories have been suspended (Hason et al. 2020).

The Karbala Cement Manufacturing Company (KCMC), which is the case study examined in this research, is one of the factories that supply central and southern Iraq with different kinds of cement. This plant was built in 1981 by Krupp Polysius, from Germany. Its first trial operation was in 1984 with investment from the Iraqi central government of that time and the plant is located on the border between Karbala and Al Anbar provinces. The factory was damaged and neglected during the ensuing wars and considerable social reform which has happened since then in Iraq. To rehabilitate and operate the factory again, in 2010, the KCMC contracted LAFARGE on a 15 year lease deal and the rehabilitation process began with the first production line being completed in March 2015 and the second line put into production in 2016 (Sinoma (Suzhou) Construction Co. 2016). To highlight the investment experience in the KCMC, this research studies the comparison before and after investment, in terms of production quantity, costs, sales, type, market location, and quality of production. This research

adopts a case study approach with the unit of analysis being the FDI into KCMC by LAFARGE. To triangulate the findings, and thus enhance the validity of the study, different documents and archival records have been reviewed. Documents such as statistics, reports, studies, legislation, and follow-up data have been gathered directly from the KCMC to further understand and evaluate the differences before and after the LAFARGE investment. By conducting this comparison, such an experience can demonstrate the positive impact on the construction industry in general, and the cement industry in particular. The increased economic efficiency achieved in the KCMC could provide a test case for other companies and ultimately promote economic growth and stability for Iraq.

It has been acknowledged that efficiency and profitability in both competitive and monopolistic sectors can be increased with the introduction of privatization (Sheshinski and López-Calva 2003). Mahmoud (1992) agrees with this view adding that privatization can bring significant net gains to society. He also emphasizes the importance of winning public support, which can help to make the privatization program successful, and the management of privatized companies must fully support the program and devote a large part of its time and effort in preparing for privatization.

Iraq has suffered in the last two decades, in terms of economic stability (Mohammed MJ 2009), and the negative repercussions of the post war period; these have had a clear impact on industry development, with an increase in economic and social suffering in Iraqi society. These imbalances may be mainly attributed to the poor performance of public sector institutions and their failure to advance the national economy. Therefore, it is important to find ways and procedures that achieve the desired advancement process. This paper contends that privatization is one such way to advance the national economy. Privatization of certain sectors would potentially be a catalyst for

increased investment and would contribute to achieving comprehensive economic reform and increasing economic growth rates. In agreement with this argument, Alakraa (2015) stated that because the Iraqi economy is considered a 'rentier' or one-sided economy, depending on up to 95% on oil revenues, it is important to consider privatization and investment as a solution to protect, stabilize and strengthen the economy. Therefore, this research gives a significant insight into the nature of the LAFARGE experience and, in doing so, provides an academic contribution to the scarce literature in this field. In addition, this paper provides a practical contribution, in demonstrating the benefits to Government decision makers of welcoming privatization and FDI to strengthen the construction industry in Iraq, and ultimately, to stabilize and strengthen the Iraqi economy.

1.2. Study Motivation

It is widely acknowledged that the Iraqi economy is heavily dependent on oil revenues, with estimates of up to 95% of GNP attributed to the oil market. This makes Iraq potentially vulnerable to volatility in the global oil market, which ultimately affects other sectors of the economy (Alakraa 2015; World Bank 2020). The collapse of oil prices in 2020, for example, caused considerable economic challenges (World Bank 2020), especially to the construction industry. The Iraqi government revenues, in April 2020, had been severely impacted due to the sharp fall in oil prices (70% compared to the start of the year). In the first 8 months of 2020, the Iraqi government revenues fell by 47.5% because of declining oil prices in the global market. According to Abdulhussein and Shibaani (2016), this fluctuation will ultimately affect the stability of different sectors in Iraq, particularly the construction industry. Therefore, privatization and FDI in such sectors offers the opportunity to lessen this dependency on oil revenues and ultimately provide more economic stability in Iraq. One of these opportunities can

be seen in the experience of FDI into the KCMC by the French company, LAFARGE. By shedding light on this successful experience, foreign investors might be encouraged to take the opportunity to invest in Iraq's cement industry, as it can be considered a positive outcome for all concerned.

To highlight the successful experience of investment and privatization in Iraq's cement industry, it is helpful to conduct a comparison study before and after FDI into KCMC in terms of quantities, costs, sales, prices, types, market location, and quality of production for a time period 1993-2020. By doing so, awareness can be raised between decision makers and key officials about potential reasons for this success, as it gives an insight on long-term historical records of KCMC and this could be used as a test case for future opportunities.

1.3. Aim and Objectives

This study aims to focus on the benefits of FDI and privatization in the Iraqi cement industry, through considering the investment of LAFARG into the KCMC as a case study. This aim will be achieved through the following study objectives:

(1) To review the concept and significance of privatization as well as providing insight into the Iraqi cement industry.
(2) To investigate and discuss long-term historical records from KCMC, using parametric (regression analysis) and non-parametric (Pettitt test and Mann-Kendall (M-K)) analysis of clinker and cement production (CLP and CP) and sales (S).
(3) To assess the production of both clinker and cement and the corresponding sales, prices and costs, market location, types and quality of the produced cement, before and after the FDI.

(4) To provide insight into the new types of cement and a ready mixed concrete that were added to the LAFARG product portfolio. To shed light on the environmental benefits of producing Karasta cement as well as the expansion of the production covering area.

The research is divided into several sections as follows: the introduction section, which has highlighted the justification and rationale for this paper. A comprehensive literature review is presented, on the extant published works on the concept of privatization, its main goals, and the Iraqi cement industry. Then the following section explains the methodological steps taken in this study. Section four demonstrates the comparison before and after the privatization experience in the KCMC, and finally the conclusions, which summarize the main outcomes of the research.

2. Literature Review

2.1. Privatization

According to Mohammed MJ (2009), the Iraqi economy suffers from imbalances in the economic structure, and its negative repercussions have had a clear impact on the development process and the increase in economic and social suffering in Iraqi society. These imbalances may be mainly attributed to the poor performance of public sector institutions and their failure to advance the national economy. Therefore, it is important to find ways and procedures that achieve the desired advancement process. One of these ways is privatization, as it is one of the effective policies in achieving comprehensive economic reform and increasing economic growth rates, therefore the proper and complete application of privatization processes in the Iraqi economy may lead to positive results.

Further, according to Kwak (2002) because of delegating public duties to private sectors may constrain deficit-generating government spending, privatization has become a global trend.

Privatization can be defined as "the transfer of ownership of state-owned objects to private property entities under certain conditions to ensure their effective use and to solve goals and tasks that serve the interests of society" (Valijonov 2022). In a broader concept, privatization is defined by Boroujeni and Asgari (2014) as the "transfer of ownership and management of the governmental sector to the private sector, which includes managerial and leasing contracts".

Sheshinski and López-Calva (2003) confirmed that, in both developed and developing economies, privatization is considered a key component of structural reform programs. Such programs aim to foster economic growth and achieve higher microeconomic efficiency, as well as lessen public sector borrowing requirements by the removal of unnecessary subsidies (Sheshinski and López-Calva 2003). Schoenberg and Parke (2006) included different reasons why governments turn to privatization; namely, cost reduction, desire to transfer risk from the public sector to the private sector, a new source of revenue, the desire for a higher level of service, the flexibility provided by the private sector, a need for greater expertise, and finally the timeframe with which a project needs to be completed. Valijonov (2022) listed six main goals and objectives of privatization as follows:

- Production efficiency can be increased in enterprises being privatized;
- Increasing different forms of enterprises based on private property creates an environment of free competition in the economy;
- A group of owners can be formed in the society, additional funds can be attracted to solve social issues;
- New technologies and modern management principles can be introduced;

- Competitiveness of the enterprise can be increased in domestic and foreign markets;
- Financial burden on the state can be reduced by eliminating subsidies to the state enterprise.

Prior to Valijonov (2022), Boubakri et al. (2009) had listed the benefits of FDI and privatization, stating that FDI can offer new managerial skills, new technologies, improvements in capital inflows from fundraising, and improved corporate governance. Therefore, an environment in which privatization of inefficient firms can be provided to governments, plus making the environment more prone to competition. Privatization programs that are investment-friendly may therefore attract foreign investors, and this could have the potential to turn around inefficient firms.

2.2. Iraqi cement industry

Based on the work of Al-Janabi (2012), the cement industry is considered one of the major manufacturing industries in Iraq that started in the middle of the twentieth century. This is because Iraq is characterized by the availability of the necessary factors of such production. The Iraqi cement industry witnessed, through the successive political regimes in the country, a series of actions that either contributed to enhancing its journey or negatively affected it; expressing the philosophy of the ruling regime. Since the economic development process in Iraq requires the advancement of the industrial sector in general and the cement industry in particular, attention in this industry came about because of its direct impact on the economic development of the country.

Limited secondary literature has been published on the Iraqi cement industry (Al-Obaidy 2010; Al-Janabi 2012; Alakraa 2015; Awxti and Ali 2022; Rostam and Hussain 2022) but only one among them has dealt with FDI in Iraq, Alakraa (2015).

Al-Obaidy (2010) sheds light on the nature and development trends in the manufacture of cement in the Kubaisa cement plant for the period (1996-2009) and then evaluates the efficiency of the plant in order to identify problems and difficulties faced in the manufacturing process and how to address them. Al-Janabi (2012), on the other hand, attempted to achieve optimal economic conditions in the Kufa Cement factory by maximizing production and minimizing costs to reach the optimum profits through formulating an economic model. The model was drafted according to scientific flexible methods, subject to change and response to updates stemming from practical reality based on data obtained from historical records for the period (2008 - 2010). Moreover, Alakraa (2015) took the KCMC as a model to show the development of cement production in the plant after FDI, and the most important obstacles that faced the privatization process in this plant and the possible ways to overcome them. The study discusses the historical data (1993-2010) by using the Minitab 16 software program. It reveals that despite the issuance of legislations that encourage FDI, the investment atmosphere in Iraq was unattractive due to security and political instability in the first place, and the instability of the country's macroeconomic policies.

Additionally, an investigation was conducted by Mahmood (2019) about the sources of growth of the Iraqi cement industry as a whole and the technological improvement implemented in this industry between 1990 and 2014. An econometric model was built by using the SPSS program, the ordinary least squares (OLS), multiple regression, and enforcement methods. According to the results of this investigation, the main sources of growth of the Iraqi cement industry are labour and capital improvements; the technological improvement did not contribute influentially to better performance. This is because the Iraqi cement industry does not keep pace with the technological development that is happening on a global level as it still relies on

traditional methods (Mahmood 2019). Rostam and Hussain (2022), on the other hand, analyzed the Bazian cement factory's annual reports financially and economically between 2008-2020 to conduct an efficiency evaluation of economic performance of this factory. They found that such performance was not stable during this period because of poor security, military and health conditions in the region at that time. Another study on the Bazian Cement Factory conducted by Awxti and Ali (2022), was conducted to evaluate this factory. By doing so, obstacles facing this factory can be identified and diagnosed as well as mechanisms can be suggested to address such obstacles in order to encourage and attract local and foreign investment. The study reveals that the existing factory will contribute to filling the local need and reducing costs in the local market despite the poor infrastructure and administrative and political obstacles facing investors. Further, because of obstacles, problems and lack of transparency in financial management facing the development of industrial sectors, Iraq did not have any rank within the global ranking of cement production; despite the presence of great economic resources such as raw materials for cement production, oil, and others.

From the above, it can be concluded that there are limited studies that have been conducted on the Iraqi cement industry. The majority of them agreed that the poor security and political situation besides instability of the country's macroeconomic policies have negative consequences on the Iraqi cement industry. Further, there is scarce literature that deals with FDI in this context (Awxti and Ali 2022). Only Alakraa (2015) has touched on such an investment but without making any comparison before and after investment. Therefore, to fill this knowledge gap this research intends to conduct a comparison before and after the LAFARGE investment case. Thus, the novelty of this study lies in conducting such a comparison.

3. Methodology

3.1. Methodological Design

To provide some insight into the FDI of KCMC, a case study approach has been used in this study. A single holistic case study design is taken with the unit of analysis being the FDI of KCMC by LAFARGE in order to gain an in-depth understanding of such an important phenomenon. KCMC was identified in the scope of the study because it is the most successful FDI experience in Iraq's cement industry, reaching 110% production capacity compared with others such as the Al Muthanna Cement Plant, the Kirkuk Cement Plant, the Kubaisa Cement Plant, the Al Qa'im Cement Plant, and the Falluja Cement Plant. They faced difficulties mainly because of the unstable security situation in the western regions of Iraq but they got back to work and slightly recovered (Investment Department 2007; Iraqi Cement Media 2022; Ministry of Industry and Minerals 2022). Therefore, the KCMC is unique in its success among other opportunities in Iraq's cement industry; and as Yin (2014) stated, a single case study is appropriate for a critical, unusual, common, revelatory or longitudinal case.

Based on Saunders et al. (2016) and Yin (2014), a gathering of archival and current documents as empirical research field data is accepted as being important. Therefore, primary data were collected from KCMC and these data were triangulated to enhance the robustness of the study. Long-term historical records of KCMC's production quantity, sales, costs, prices, types, market location, and quality certificates from 1993-2020 together with secondary data including academic journal papers, theses, and grey literature were used in this study.

The considered datasets have been divided into a baseline period dataset (pre-investment, 1993-2010) and LAFARGE period dataset (post-investment, 2010-2020). By doing so, a clear insight can be offered to show the trend of such data before and after the direct investment. Consequently, the findings are extremely useful in

demonstrating the benefits of FDI, increasing the usability of this study. To make the findings more robust, triangulation with related literature has been conducted despite the limitations in terms of scarcity of such literature.

In order to articulate the logical steps taken throughout this study, the research methodological framework of the study has been demonstrated as a flow chart with the purpose of summarizing the procedures used, as expressed in Figure 1.

[Figure 1 near here]

Figure 1 Research Methodological Framework

3.2. Case Study Background

The Karbala Cement Manufacturing Company (KCMC) is one of many cement plants of the General Company for Southern Cement that belongs to the Ministry of Industry and Minerals. The plant is located in the Karbala Governorate in the south of Iraq, approximately 90 kilometres from Karbala City. It was built by the German firm Krupp Polysius A.G in 1981, and the plant was operated by Krupp Polysius between 1985 and 1990. The plant is based on the dry method of production and consists of two clinker production lines. It produced sulphate resisting cement at a designed capacity of 1960 000 ton clinker/year and 2000 000 ton Cement/year (Investment Department 2007). The plant operation is automated, being controlled by computer, and has advanced quality control systems compared to other Iraqi cement plants. It is considered that KCMC is the only factory in Iraq that provides the sulphate resisting cement to the market (Alakraa 2015).

Due to damage (caused by an air raid) to the central control system and the fuel station in particular, the plant was shut-down in 1991. Following on from this, the poor finances combined with the trade embargo led to low-quality materials and equipment being used. This was exacerbated by poor maintenance of the facility which caused a decrease in the production capacity. Therefore, there was a necessity to rehabilitate and modernize the plant with new cement industry technology, in order to bring the plant up to its design capacity (Investment Department 2007; Alakraa 2015). Between 2000 and 2002, with two production lines operating, the plant was more successful, (Alakraa 2015), however, the plant was subjected to an air strike in 2003, which affected all aspects of the economic activities of the plant, and as a result, poor productivity led to the Ministry of Industry and Minerals offering the plant up for investment as there was no other option given the obsolescence of the machinery and equipment at that time.

KCMC is one of the government investments received from the French company (LAFARGE) through a lease contract with the Iraqi government, in 2010, for a period of 15 years. The plant was rehabilitated with its production lines during the first two years to reach design production capacity. In 2011, LAFARGE developed and rehabilitated the first production line of the plant, and the production capacity reached 500000 ton/ year, prior to that time it had been 200000 ton/ year (Alakraa 2015).

The second production line was in the process of being rehabilitated by Krupp Polysius, and it was the first contractor for LAFARGE. The second line was still not fully operational until the end of 2014 due to the security situation in western Karbala, then after the security stability was established in the region at the beginning of 2015, the factory resumed its work in rehabilitating the second line along with Krupp Polysius (Alakraa 2015).

3.3. Analysis of Trends and Change Points

To identify trends in time-series, there are various parametric and non-parametric approaches (Mohammed R and Scholz 2017). Although the parametric tests are more influential compared to the non-parametric ones, these need normally distributed datasets. The considered time-series often do not satisfy the normality constraints as shown in Table 1. Concerning the non-normal distribution characteristics of datasets utilized in the current research, widespread distribution-free or non-parametric techniques (Pettitt test and Mann–Kendall (M–K) analysis) were applied to identify the variations of CLP, CP, and the corresponding S in KCMC. The former test was used to detect sudden changes in the average level, whereas the latter test was applied to detect monotonic trends or slow trends as explained by Das and Banerjee (2021). It is widely known that these two tests are the most convenient statistical methods for time series data (Das and Banerjee 2021). A brief description of these two tests can be found below.

The Mann–Kendall (M-K) analysis was considered, firstly, for trend finding in the considered datasets. The M–K analysis is a distribution-free technique for evaluating if there is a monotonic upward or downward trend of the considered parameter over time (Seibert and Vis 2012). A monotonic downward (upward) trend indicates that the parameter consistently decreases (increases) during the studied time period. However, the trend might or might not be linear. The M–K analysis can be applied instead of a parametric linear regression test, which can be used to analyze if the slope of the computed linear regression line is different from zero. The regression test requires that the residuals from the fitted regression line are normally distributed. Such an assumption is not required by the M–K test, which is a non-parametric distribution-

free test. More information on these tests can be found in (Seibert and Vis 2012; Robaa and AL-Barazanji 2013).

The Mann–Kendall rank trend test statistic Z is based on the following equation (Pirnia et al. 2019):

$$Z=\begin{cases}\dfrac{S-1}{\sqrt{Var\,(S)}}, & \text{if } S>0\\ 0, & \text{if } S=0\\ \dfrac{S+1}{\sqrt{Var\,(S)}}, & \text{if } S<0\end{cases} \quad (1)$$

in which

$$S=\sum_{i=1}^{n-1}\sum_{j-i+1}^{n} \operatorname{sgn}(x_j - x_i) \quad (2)$$

$$\operatorname{Sgn}(\theta)\begin{cases}+1 & \theta>0\\ 0 & \theta=0\\ -1 & \theta<0\end{cases} \quad (3)$$

$$Var\,(S)=\frac{n\,(n-1)(2n+5)-\sum_t t\,(t-1)\,(2t+5)}{18} \quad (4)$$

Where the x_j and x_i are the sequential data values, n is the size of the dataset, n is the number of series in which there is minimum one recurring value, and t is the extent of any specified tie. A positive value for Z displays a rising development in the time-series, while a (- ve) value illustrates a declining trend. For $|Z|>1.96$ and $|Z|>2.575$, there is a significant trend at the 0.05 and 0.01 confidence levels, respectively (Pirnia et al. 2019).

Secondly, the Pettitt (1979) test, which is commonly used to identify a single change-point, has been applied. The Pettitt test interpretation is as follows:

H_0: Data are homogeneous;

H_a: There is a date at which there is a change in the data;

As the computed *p*-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H_0, and accept the alternative hypothesis H_a.

Change point identifications are considered as important in the analysis of the investment and its relations with the CLP, CP and S in KCMC for the purpose of investigating the impacts of LAFARGE. The Pettitt test is a distribution-free method to calculate the existing change points for the average of a time series, if the specific change time is unidentified. This analysis has been commonly applied to assess alterations in time series datasets. By using change point test and trend analysis, the considered datasets are divided into a baseline period dataset (pre-investment, 1993-2010) and LAFARGE period dataset (post-investment, 2010-2020).

4. Results and Discussion

4.1. Long-Term Data Change in Clinker and Cement Production with Corresponding Sales

The normality of the considered datasets was investigated with the Kolmogorov–Smirnov test as a main step before conducting change analysis using statistical techniques. The normally distributed variables are symmetric, unimodal, and asymptotic, and the mean, median, and mode are all equal. A normally distributed variable is perfectly symmetrical around its center. There is also only one mode, or peak, for a normally distributed parameter. Normal distributions are continuous and have tails that are asymptotic, which means that they approach but never touch the x-

axis. Accordingly, CLP, CP and S datasets do not follow a normal distribution at a significance level *p-value* of 0.05, as shown in Table 1.

Table 1 Statistical Characteristics and Sales of Clinker and Cement Production

[Table 1 near here]

[Figure 2 near here]

Figure 2 Long-term Values and Sales of Clinker & Cement Production: 1993 to 2020

Annual average CLP, CP, and S were analyzed applying the M–K test to detect long-term trends for the time period between 1993 and 2020. Fig. 1 and Table 2 reveal that during the time period from 1993 to 2020 CLP, CP, and S displayed a significant rising trend (p-value < 0.05) in the annual average values.

Table 2 Mann-Kendall Trend / Two-Tailed Test of Clinker & Cement Production and Sales

[Table 2 near here]

Although the annual values of CLP, CP, and S exhibited a relatively stable development of about 2309.7, 4437.2, and 4513.4, respectively, during the pre-investment time-period, there were sudden increases in their annual values in 2001 and 2002, Figures 3a, 4a, and 5a. Many reasons are put forward for this increase, based on Alakraa (2015), namely the repair of much of the machinery and improvement of the plant's supply of fuel and electrical energy led to the two peak points in 2001 and 2002, Figures 3a, 4a, and 5a. However, the simple fluctuation in production capacity might be

due to the instability of the electrical energy supply, the aging machinery, and the dependence on the local market to maintain the plant due to the economic sanctions. Production declined during 2003 and 2004 caused by the fall of the regime in the country and the economic turmoil that ensued (Alakraa 2015). However, Alakraa (2015) conducted an analysis for only annual growth rate of clinker and cement production between 1993and 2010, without any comparison pre and post FDI.

[Figure 3 near here]

Figure 3 Development Trend Analysis of Clinker Production showing Pre-investment (in a) 1993-2010 & Post-investment (in b) 2010-2020

[Figure 4 near here]

Figure 4 Development Trend Analysis of Cement Production showing Pre-investment (in a) 1993-2010) & Post-investment (in b) 2010-2020

[Figure 5 near here]

Figure 5 Development Trend Analysis of Sales showing Pre-investment (in a) (1993-2010) & Post-investment (in b) (2010-2020)

During the time-period from 2010 to 2020, (the post-investment time-period), the CLP, CP, and S trend shows a tangible increase starting from 2011 and 2012 due to the new investment. After that, the trend displayed a remarkable increase especially after the first production line was fully operational in 2015, completed by the Sinoma (Suzhou) Construction Company. Furthermore, when the second production line was

fully operational in 2016 the trend rose significantly. In 2018, because of the delay in conducting maintenance due to the deteriorating security situation in Iraq, the trend slightly decreased, but then peaked in 2019 due to a change of computer system, plus enrolling operators onto different training courses both inside and outside Iraq. Similarly, in Pakistan, due to technological progress after deregulation and privatization, Ghulam and Jaffry (2015) study showed a desired positive effect on productivity growth. Such an improvement might have been because of improved economic conditions, more political stability and a competitive industry. In support of this, Okten and Arin (2006) found that privatized Turkish cement plants improve their productive efficiency through work force reductions by using a longitudinal data set of Turkish cement plants. The quality of the Nigerian Cement industry's performance also has improved remarkably due to the significant impact of corporate governance (Gombe and Aliero 2021). On the contrary, based on Al-Taani (2013), Jordanian Cement Factories Company's (JCFC) operating performance and profit have not been seriously affected by privatization. Further, Saygili and Taymaz (2001) find that Turkish privatized plants did not have any significant improvement in their technical efficiency.

Figures 6 and 7 reveal that the outcomes display that the annual values of the time series were heterogeneous, indicating a significant alteration in the mean pre- and post- investment point, which is specified by the Pettitt test. The figures confirm that there is an evident change in the average of the production pre- and post- investment (2010). Accordingly, 2010 is seen as a revolution point for the evaluated time series, which reflects the impact of the LAFARGE investment into the KCMC.

[Figure 6 near here]

Figure 6 Pettitt Test Analysis showing Annual values and Trends Developments of Clinker Production for the time-period between 1993 and 2020 (mu1=annual average of the time-period from 1993 to 2010, pre-investment and mu2=annual average of the time-period from 2010 to 2020, post- investment)

[Figure 7 near here]

Figure 7 Pettitt Test Analysis showing Annual Values and Trends Developments of Cement Production for the time-period between 1993 and 2020 (mu1=annual average of the time-period from 1993 to 2010, pre- investment and mu2=annual average of the time-period from 2010 to 2020, post- investment)

4.2. Price and Cost

Table 3 shows that there was a significant decrease in cement production price and cost which is considered one of the benefits of the FDI as the lower the price the higher the demand for the product. Similarly, in the Turkish cement industry, both cement prices and the relative inflation rate were decreased because of privatization. Cement prices decreased by 32% due to the shift from public ownership to private ownership (Okten and Arin 2006). In sharp contrast to most of the earlier studies (La Porta and López-de-Silanes 1999; Saal and Parker 2001), they found that privatization leads to higher prices. On the other hand, according to Al-Taani (2013), privatization of the Jordanian Cement Factories Company (JCFC) led to other financial advantages such as, improved investments, debt reduction, liquidity improvement, and a decline in overstaffing despite the fact that privatization in such companies did not seriously affect their operating performance and profit. Interestingly, the Nigerian Cement industry's profitability pre and post privatization had remarkable resistance because of

543 macroeconomic environment instability and a weak private sector (Gombe and Aliero
544 2021). In the Turkish cement industry, Okten and Arin (2006) highlighted an important
545 point regarding plants privatized to foreign buyers: they stated that the positive effect of
546 privatization on investment is enhanced for plants privatized to foreign buyers
547 compared with plants privatized to domestic buyers

548

549 Table 3 Annual Values of Price & Cost of Cement Production Pre- and Post-investment
550
551 [Table 3 near here]
552

553

554 [Figure 8 near here]
555 Figure 8 Annual Mean Values of Price & Cost of Cement Production Pre- and Post-
556 investment
557
558 Figure 8 illustrates the annual values (bar chart) of the price and cost of cement
559 production in the KCMC as well as the corresponding values of the annual average
560 values of the price and cost of cement production during pre- and post-investment time
561 periods. It can be clearly seen that there is a decrease in the annual average values of
562 both the price (55%) and cost (45%) of cement production during the post-investment
563 time period. This reduction could be the result of the notable rise in the production of
564 cement in the post-investment time-period, which in turn will reduce the fixed cost as
565 economies of scale are maximized. Such a decline in costs had positive economic
566 consequences for KCMC in particular, and for the Iraqi people in general.

567 Figure 8 also shows that there has been a noticeable difference between the
568 annual values of (line dotted chart) price and cost, with maximum variations of nearly

37.41 IQD/ton in 2002 and 26.93 IQD/ton in 2019, during the time-periods of pre- and post-investment, respectively. There has also been a minor change in the annual values of the considered parameters between 2010 to 2016 during the post-investment time-period. However, after 2016 there was a sudden rise in the annual values of both price and cost. This is one of the most important benefits because it provides a good indication about the decreased amount of fixed cost during the post-investment period.

4.3. Types of Cement Produced

The product portfolio range was also diversified following FDI in terms of types of Cement Production. Three new types of cement were added to the list of the cement types of the factory in addition to ready mixed concrete.

Table 4 Types of Cement Production for Pre- and Post-investment

[Table 4 near here]

4.4. Production Areas

The covering area of production has been expanded from four governorates (Kerbala, Baghdad, Babil, and Al-Najaf), Figure 9, into ten governorates (Wassit, Al-Qadissiya, Al-Muthanna, Thi Qar, and Al-Basrah), Figure 10.

[Figure 9 near here]

Figure 9 Area of Production for Pre-investment time-period

[Figure 10 near here]

Figure 10 Area of Production for Post-investment time-period

4.5. Quality of Cement Production

Chemical and physical tests are undertaken for assessing the quality of different types of cement used in construction. According to the existing information of weekly quality certificates for Portland limestone cement CEM II/ A-L 42.5 R, the chemical properties included sulfate content, magnesium oxide and chloride content. Whereas the physical properties involved the fineness, initial and final setting times, soundness and compressive strength. Overall, the produced Portland limestone cement CEM II/ A-L 42.5 R for the period 31 Jan to 6 Feb 2021 and the produced once for the period 7 Feb to 13 Feb 2021 experienced a similar trend regarding the chemical and physical properties. The test results showed that these two cements had favorable chemical and physical properties according to the limitations of specifications, excluding that the former type had minimal compressive strength at 2 days of age (21.6 MPa) and the latter cement had the maximal sulfate content (2.44).

Regarding the ordinary Portland cement -CEM I52.5 N, the tested chemical properties were loss on ignition, non-soluble substances, sulfate content, magnesium oxide and chloride content. In addition, the fineness test, initial and final setting time tests, soundness and compressive strength tests were used to evaluate the physical properties. The existing information in the weekly quality certificates of such cement produced were for two periods: for the period 31 Jan to 6 Feb 2021 and for the period 7 Feb to 13 Feb 2021. The test results showed affirmative results in accordance with the limitations of specifications, both in the measured chemical and physical properties excluding the latter cement that had the minimal compressive strength at 28 days of age (52.7 MPa).

The other type of cement is sulphate resisting Portland cement CEM I 42.5 R - SR3.5, similar to the previous type of cement, the chemical properties have been

evaluated with respect to the loss on ignition, non-soluble substances, sulfate content, magnesium oxide and chloride content. The physical properties on the other hand are the fineness, the initial and final setting times, soundness and compressive strength. The test results were consistent with the limitations of specifications for cement produced for two periods, for the period 31 Jan to 6 Feb 2021 and for the period 7 Feb to 13 Feb 2021. A number of studies were conducted to perform a quality assessment for the manufactured cement to be sure of the cement's composition with the standards for use. Comparative quality assessments were performed on cement grades used in Nigeria to evaluate the durability and quality of concrete produced with the cement used (Olonade et al. 2015). It was found that there is a fall in the predicted results of the compressive strength of different cement brands. The difference in cement quality can be attributed to the variation in the properties of the raw materials, kiln temperatures, and fineness upon grinding. In order to develop the quality control and assurance of the produced cement, a compositional analysis of cement products from various manufacturers have been compared in many countries (Ahn et al. 2004; Bani 2011; Stajanča and Eštoková 2012; Almabrok and Khashin 2019), and the results of these studies reported conformity with international standards. An investigation of the consumption of various cement brands available in the Pokhara Metropolitan city was conducted. The cement suppliers' data and field data were collected. The various brands of cement in use at the site were checked by field survey and analysis was performed using SPSS software to study the association between cement preference and the price of cement. The obtained results showed increasing trends in cement consumption in different construction sectors, whereas, the preference of suppliers of cement was not found to be associated with the price of cement (Banstola et al. 2021). It is worth noting that all the aforementioned

studies have not assessed the quality of different types of cement in light of privatization, making this study unique in its assessment.

4.6. Environmental Benefits of Producing Karasta Cement

Concrete is considered as the most important building material in the construction industry owing to availability of its raw materials and it combining good mechanical properties and durability. Portland cement is the key constituent binding material used in concrete production; however, it is also the major contributor of greenhouse gas emissions. In fact, it has been reported that the cement industry is responsible for 5% of global anthropogenic CO2 emissions. As a consequence of global warming and pollution, there are growing demands for the manufacture of environmentally friendly cement with the use of less clinker in the composite cement production process. The KCMC has adopted policies to manufacture such environmentally friendly cement. The resulting cement (clinker-reduced cement), referred to as Karasta cement, has been used for concrete in different applications. The outcomes of manufacturing this cement have been enhanced by blending appropriate amounts of suitable additives to replace the clinker to about 25-30 %. It should also be noted that the development of eco-friendly cement by means of re-using waste that has previously had considerable negative effects on the ecosystem and living conditions is fairly common. Many studies (Benjeddou et al. 2020; Costa and Ribeiro 2020; Evode et al. 2021) have focused on re-using waste to attain more environmental efficiency in their applicable materials. A study was conducted by Kim et al. (2018), which involved manufacturing eco-friendly cement by using recyclable inorganic construction wastes. The results of analysis revealed that the development of recycled cement is theoretically possible. Abdelzaher (2023) reported that eco-white cement can be developed by partially substituted white cement with ultrafine demolition waste and nano plastic waste. The results showed that

a blend of white cement and such waste materials improved the workability, possessed energy saving qualities, and enhanced the sustainability of raw materials in addition to the reduction in the construction budget. From the above, it can be concluded that manufacturing environmentally friendly cement has become a global trend to lessen the greenhouse gas emissions and therefore ultimately preserve the environment.

4.7. Developing Ready-Mix Concrete

The selection of proper components in their relative amounts with the intention of producing concrete of the desired strength, durability and workability is termed mix design concrete. Mix design is a primary aspect of buildings performance. The physical and mechanical properties of the concrete are affected by the relative quantities and properties of its components. Thus, the proportion between different constitutive materials has to be designed properly. The KCMC has developed mix design procedures to produce a ready-mix concrete, which is batched for delivery from a central plant instead of being mixed at the job site. The ready mix-concrete was used in different applications in the Karbala Province. The benefits of adopting ready mix concrete are that a better quality concrete can be assured, a reduced labour cost and time is required for construction, and it is more environmentally friendly as the air and noise pollution at the job site is reduced. From an economic point of view, the KCMC provides a ready-made concrete mix on post-paid instalments in addition to cash payment. Such various payment methods are offered to reduce the economic pressure on citizens.

Unfortunately, there is a scarcity of studies dealing with FDI in the Iraqi cement industry, except for (Alakraa (2015)) study. However, this study did not make any comparisons before and after FDI in terms of production quantity, costs, sales, prices, types, market location and quality of production. This study, therefore, is unique in its results.

5. Conclusions

The cement industry plays a key role in supporting and providing the infrastructure projects necessary for economic development and stability in Iraq. Therefore, it is critical for the country's development plans. The KCMC is considered one of the cement factories in Iraq that support this development with its considerable production capacity of two million tons of cement per year. The plant has been subjected to various barriers since 1991, the war and economic sanctions to name but two, yet despite this it has continued cement production, albeit on a limited scale at times through the studied time period. However, since the LAFARGE investment, and following significant rehabilitation, all the economic indicators have recovered, and the plant is successful. This has provided work continuity, increased production capacity, and stability. Therefore, to investigate the aforementioned benefits of FDI by the French company LAFARGE, this research has focused on the KCMC through conducting a comparison before and after investment, in terms of production quantity, costs, sales, prices, types, market location and quality of production. The primary data were collected through reviewing information held in archival records and documents before and after the LAFARGE investment, in order to analyze and then triangulate them with the secondary literature, thus providing a robust study.

The study findings reveal that the LAFARGE investment experience is successful because all the economic indicators have recovered, reaching 110% production capacity, and all have different benefits. These benefits are due to operational efficiencies through the operation of two fully functioning production lines, improved sales, increased markets into ten governorates, lower costs, and an increased product portfolio with the three new types of cement and a ready mixed concrete.

5.1. Research Contributions and Implications

The findings that have emerged from this study could potentially increase the speed of decision making in this matter to encourage FDI and thus enhance competition in the future and raise additional revenue for the government. Furthermore, the findings could potentially raise awareness between decision makers and key officials and increase confidence in making such decisions. This could ultimately have a positive outcome in serving Iraq's cement industry in the future. From an academic perspective, although there is extensive literature on FDI studies in the world, there is a dearth of literature in the context of Iraq. Therefore, this paper provides a contribution to the scarce literature currently published on the subject of FDI opportunities in Iraq. Moreover, this research helps to provide insight into the dynamic of FDI in the Iraqi cement industry, besides offering ideas for lines of further inquiry, thereby further enriching the knowledge of FDI opportunities in the cement industry.

Accordingly, it can be seen that FDI into the KCMC had significant benefits, such as providing the local market with the required cement with standard characteristics at low prices, providing the local market with raw materials for construction, the use of modern technology and the impact on workers' skills, and ultimately providing economic stability for the plant. Besides that, enhancing production efficiency and reducing production costs will increase the level of resilience of society by improving their purchasing power. Furthermore, social issues could be potentially solved by attracting additional funds and by introducing modern management principles and new technologies.

5.2. Research Limitations

The main limitations of this study are the lack of secondary data that are related to the research topic in terms of statistical data and information specifically conducted on FDI

in Iraq. Further, there were difficulties in obtaining some laboratory test results regarding the quality of different types of cement for the period (pre-investment, 1993-2010).

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7. Declaration of Interest Statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

8. Data Availability Statement

The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

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