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# Macroeconomic drivers affecting the foundry industry in South Africa

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**Background:** The problem addressed in the study reported on in this article is the decline of South Africa's foundry industry. This industry is valuable in terms of job creation and a sustainable competitive advantage (SCA) strategy is required to sustain the industry in South Africa.

**Aim:** With the dearth of research on sustainability of the foundry industry, the research comprised three objectives; namely, to identify from literature the macroeconomic drivers, to empirically identify critical macroeconomic drivers, and to make recommendations on strategies for enhancing SCA for foundries in South Africa.

**Setting:** The study was conducted during 2022 within the foundry industry in South Africa. Foundry representatives from foundries located in all nine provinces of South Africa were invited to participate in the study.

**Method:** The study adopted an explanatory sequential mixed-methods methodology, initially employing a quantitative approach, and subsequently applying a qualitative approach to ascertain the most influential macroeconomic drivers. Quantitative data analysis entailed descriptive methods, while the qualitative phase involved thematic analysis.

**Conclusion:** The study contributes by identifying the macroeconomic drivers that can be used by industry leaders in the formulation of strategies for SCA within the African context.

**Contribution:** The study contributes by identifying the macroeconomic drivers that can be used by industry leaders in the formulation of strategies for SCA.

**Keywords:** foundry industry; sustainable competitive advantage; macroeconomic drivers, macroeconomic, South Africa.

## Introduction

According to Makgetla (2021), the coronavirus disease 2019 (COVID-19) pandemic, high unemployment levels and lack of investment within the manufacturing sector have contributed to the macroeconomic imbalances that have negatively impacted the South African economy. This has resulted in a decline in manufacturing activities within various sectors, including mining and quarrying (Mnguni & Simbanegavi 2020; Statistics South Africa 2023). The number of voluntary and involuntary liquidations of South African companies went up by 18.9% in the first quarter of 2021 (Statistics South Africa 2023), directly or indirectly contributing to the current official unemployment rate of 32.9% (Statistics South Africa 2023). These statistics paint a grim picture of the economy and efforts to understand the dynamics leading to the closures of companies as well as developing strategies that may curtail the further loss of jobs have become even more urgent.

An industry that can substantially contribute towards job creation is the foundry industry (Phiri, Tolmay & Van Schalkwyk 2023). The metal foundry industry in South Africa is key in the supply of castings used predominantly in the manufacturing sector which includes the mining and automotive industries and has been faced with several challenges which have either resulted in the downsizing and/or closure of foundry companies (Phiri et al. 2023; Statistics South Africa 2023).

The number of foundries in South Africa decreased from 450 in the 1980s to 213 in 2003 (Jardine 2015) and further down to 123 in 2020 (Lochner et al. 2020), significantly contributing to upstream and downstream unemployment levels. The issue cited in this study is the closure of more than 42% of all metal foundries in South Africa, according to statistics from 2003, as a result of the industry's economic situation (Jardine 2015; Lochner et al. 2020).

Extant research posits that firms that possess a sustainable competitive advantage (SCA) are better positioned to overcome both the micro- and macroeconomic challenges that could result in firm closures (Ferro de Guimaraes, Severo & Maia de Vasconcelos 2017). Wang (2021:1) suggests that a better comprehension of SCA is crucial for firms that seek 'consistent growth'. Although factors internal to the firm (micro-economic factors) can influence competitiveness (Phiri et al. 2023), research has also shown that the macroeconomic factors are also critical in 'facilitating or impeding the firm's ability to compete' (Siudek & Zawojska 2014:102–103). A strategic core concern for management should be understanding how a firm's macroeconomic conditions affect its long-term competitiveness (Phiri et al. 2023). The study reported in this paper focuses on the macroeconomic factors influencing the sustainable competitiveness of foundries in South Africa and as a delimitation, the microeconomic drivers will not be addressed in this article.

Previous research (Jardine 2015; Lochner et al. 2020) identifies a lack of competitiveness as one of the primary reasons for the closure of South African foundries. These studies, however, do not critically identify and differentiate between the important and critical macroeconomic drivers enhancing foundry competitiveness nor do they discuss how these could be assimilated into SCA strategy formulation. By highlighting the primary macroeconomic factors that strengthen sustained competitive advantage, this paper seeks to close this gap, specifically for the South African foundry industry. With these drivers identified, foundries will be able to formulate macroeconomic driver-targeted strategies that will enhance competitiveness and prevent further closure of South African foundries.

A thorough review of the literature has revealed that the scant research on the foundry industry either examines entire quality management concerns (Boikanyo & Heyns 2019), the management of waste (Iloh, Fanourakis & Ogra 2019), energy consumption (Energy Intensive Users Group of Southern Africa 2017; Haraldsson & Johansson 2019; Rasmeni & Pan 2014 ), or foundry production efficiencies (Srivastava, Tiwari & Singh 2020). Research on the impact of macroeconomic factors on sustainable competitiveness is scarce (Phiri et al. 2023).

Studies that have attempted to investigate competitiveness have invariably neglected the issue of sustainability of competitive advantage in favour of a single micro or macroeconomic cause (Phiri et al. 2023). Hence, there is a scarcity of research on SCA versus macroeconomic causes that is the focus of this study.

This paper reports on research undertaken in the South African foundry industry. The research objectives were three-tiered. The first objective was to identify from literature the critical macroeconomic drivers for SCA pertinent to the foundry industry. The second objective was to benchmark the perceptions of stakeholders within the foundry industry on SCA against the macroeconomic drivers identified from literature. The third objective was to make recommendations on strategies to enhance the SCA for foundries in South Africa, with the aim of mitigating against firm closures within this industry.

# Literature review

This section provides a background and competitiveness challenges faced by the South Africa foundry industry and the macroeconomic drivers for SCA.

## The South African foundry industry

The ferrous, non-ferrous, investment and high-pressure die casting foundries are among the four primary segments that make up the South African foundry industry (World Foundry Organisation 2018). These sectors serve various industries namely, mining (32%), automotive (25%), manufacturing (24%), railways (9%), agriculture (3%), infrastructure (2%) and others (5%) (South African Institute of Foundrymen [SAIF] 2015) and contribute up to 65% to the country's gross domestic product (SAIF 2015).

Despite the significance of this sector, studies have revealed that between 2003 and 2020, the number of foundries decreased significantly (Table 1) owing to various challenges that impact on foundry competitiveness. Table 1 provides an

**TABLE 1:** The number of metal foundries in South Africa.

| Province | Number of foundries (2003)‡ | Number of foundries (2007)‡ | Number of foundries (2015)‡ | Number of foundries (2020)§ | Percentage of foundries per province based on 2020 numbers |
|---|---|---|---|---|---|
| Gauteng | 110 | 108 | 114 | 84 | 63 |
| KwaZulu-Natal | 20 | 26 | 20 | 16 | 12 |
| Western Cape | 26 | 16 | 14 | 10 | 7 |
| Eastern Cape | 16 | 10 | 8 | 4 | 3 |
| Free State | 10 | 7 | 5 | 4 | 3 |
| North West | 10 | 9 | 4 | 1 | 1 |
| Northern Cape | 6 | 3 | 3 | 3 | 2 |
| Mpumalanga | 15 | 15 | 2 | 1 | 1 |
| **Total** | **213** | **194** | **170** | **123†** | - |

†, The total number of foundries (123) excluded foundry companies that were confirmed to be in the processes of finalising the modalities of company closure when the study by Lochner P., Kellerman, L., Adams, A., Abed, R. & Taylor, A., 2020, *Environmental compliance and performance improvement for the foundry industry in South Africa. Phase 1: Status Quo Assessment*, Final Report v3. CSIR Report: Phase 1: Status Quo Assessment. 3. was conducted.

‡, SAIF 2015; §, Lochner et al. 2020.

indication of the number of operational metal foundries between 2003 and 2020. The closure of industries such as foundries has directly and indirectly contributed to the rising unemployment levels in the country (National Economic Development and Labour Council 2023; National Foundry Technology Network Annual Report [NFTN] 2020) and this situation has been worsened by the COVID-19 pandemic which has led to the contraction of many economies (Department of Employment and Labour 2023) and subsequent loss of investment opportunities.

As shown in Table 1, the number of foundries dropped by over 42% between 2003 and 2020, with all provinces showing a reduction in the numbers of foundries. Several competitiveness challenges have been identified as contributing to the closure of foundries that will be addressed in the next section.

## Competitiveness challenges faced by South African foundries

According to literary sources, macroeconomic factors such as import leakages, rising energy prices, an unstable energy supply, high compliance costs for environmental regulations, high transport and logistics costs, an excessive reliance on a small number of clients and suppliers and low investment are to blame for the closure of foundries in South Africa (Lochner et al. 2020).

The capacity of foundries to remain competitive both locally and worldwide is impacted by macroeconomic factors as they limit production efficiency and market expansion potential. The identification of drivers for sustainable competitiveness and the subsequent development of strategies that promote competitiveness remain key to mitigating against foundry closures. The following section provides an indication of macro drivers identified from literature as influencing sustainable competitiveness for the foundry industry.

## Sustainable competitive advantage

Sustainable competitive advantage of an industry is a blueprint for strategy formulation, with the aim of enhancing an organisation's competitiveness and sustainability. Therefore, SCA is seen as the overarching attribute that provides organisations with the capabilities to outperform the competition. From a combination of various definitions, SCA is defined by Phiri (2022) as:

> [*A*] pro-business superiority strategy that allows a company to out-compete rivals by offering goods and/or services to customers in a manner that is difficult to replicate within the same window period of incessant advantage. (p. 56)

Numerous macro- and microeconomic factors contribute towards SCA of an industry. The identification of the macro- and microeconomic drivers is crucial to achieve SCA and mitigate the risk to perish in a volatile economic environment (Krajnakova, Navickas & Kontautiene 2018). Hence, to strive towards SCA, foundry organisations should aim to (identify and) overcome challenges presented by micro- and macro-environments to achieve sustainability. However, as a delineation of the study, only the micro-economic factors will be presented.

The research reported in this paper will focus only on macroeconomic drivers that are addressed in the next section.

## Macroeconomic drivers

Macroeconomic drivers refer to elements that the firm has limited influence over and that are external to its internal business environment while Krajnakova, Navickas and in line with this, Kontautiene (2018) assert that these drivers consist of external influences that impact a firm's ability to compete. Understanding the macroeconomic factors that are unique to the South African foundry sector will give rise to measures that will improve long-term competitive advantage.

A literature search was undertaken to identify the macroeconomic drivers that affect an organisation's business environment. The identification of critical macroeconomic drivers is the first objective of the research. Table 2 provides a summary of the macroeconomic drivers identified from literature as affecting the foundry industry.

As indicated in Table 2, the macroeconomic drivers identified from literature range from: (1) energy costs (and energy availability), (2) geographical location, (3) industry entry and exit barriers, (4) customer bargaining power, (5) government

**TABLE 2:** Sustainable competitive advantage classification of macroeconomic drivers.

| Macroeconomic drivers | Sustainable competitive advantage driver classification | | | | |
|---|---|---|---|---|---|
| | Assets and/or resources | Processes | Firm's performance | Supporting and related industries and clusters | Institutions and government policies |
| 1. The market perception of the foundry company | X | - | - | - | - |
| 2. Geographical location | X | - | - | - | - |
| 3. The availability of substitutes for casting products | - | - | X | - | - |
| 4. Customer bargaining power | - | - | - | X | - |
| 5. The number of foundry companies in South Africa | - | - | - | X | - |
| 6. Regulatory instruments (import tariffs, import quotas) | - | - | - | - | X |
| 7. Government incentives (subsidies) | - | - | - | - | X |
| 8. Industry entry and exit barriers | - | - | - | - | X |
| 9. Localisation (local content enforcement) | - | - | - | - | X |
| 10. Energy costs (and energy availability) | - | - | - | - | X |

incentives (subsidies), (6) market perception (brand loyalty) of the foundry company, (7) localisation (local content enforcement), (8) regulatory instruments (import tariffs, import quotas), (9) the number of foundry companies in South Africa, and (10) the availability of substitutes for casting products.

Siudek and Zawojska (2014) suggest classifying the drivers for SCA into five categories in order to provide a more systematic method of analysing the ones that have been found, namely: (1) assets (resources), (2) processes, (3) firm performance, (4) supporting and related industries and clusters as well as (5) institutions and government policies. Table 2 provides the study's macroeconomic driver classifications according to these categories.

Using the condensed classification (Table 2), the drivers were then tested during both the quantitative and qualitative phases of the study in order to enhance reliability and credibility issues. The following section discusses the research method for this research reported on in this paper.

## Research method

By identifying the macroeconomic factors (from literature and by means of testing) that can improve the South African foundry industry's sustained competitiveness, the research seeks to add to the existing body of knowledge. After the identification process, the macroeconomic drivers were then tested using statistical and thematic analysis to determine which ones, industry experts believed to be the most critical.

The research followed an explanatory sequential mixed methods approach (Creswell 2014). This strategy involves gathering and analysing quantitative data, then using the results to guide the gathering and analysis of qualitative data using a 'building method' of integration (Toyon 2021). Integrating data from the two separate strands ensured the qualitative data could be utilised to further explain questions emanating from the quantitative phase in order to better understand and obtain in-depth knowledge of the phenomenon under study (Creswell 2014).

A mixed methods approach also provides the benefit of triangulation which entails the use of different approaches in order to provide researchers with a more refined understanding of a study phenomenon (Aguilar-Solano 2020) thereby enhancing the mutual corroboration of the findings and increasing the study's credibility (Schoonenboom & Johnson 2017).

In developing the research instrument (Table 3) the following steps adopted from Bordeianu and Morosan-Danila (2013) were followed. These included: (1) determining the purpose of the study, (2) reviewing existing literature, (3) generating the research instrument, (4) content validity evaluation, (5) pilot testing of the research instrument, (6) construct validity evaluation, (7) reliability testing of the instrument, (8) reviewing of the instrument, and (9) obtaining ethical clearance to conduct the study.

The National Foundry and Technology Network's (NFTN) foundry industry database was used to compile contact details for potential participants for this study. The NFTN database comprised the details of 196 representatives from 95 foundries located in different South African provinces. This database included individuals who, in their various roles, were connected to the foundry industry by virtue of having worked there, being currently employed or offering consultancy services to the industry. Participants in the study included foundry owners, managerial and non-managerial staff, as well as those recognised as industry experts. Non-managerial employees included individuals from procurement, project work, sales and marketing, technical, quality and manufacturing departments who were deemed to have a fair understanding of competitiveness issues within the industry and were thus included using census sampling (quantitative phase) which allowed every member of the population to be given a fair chance of participation (Collins, Onwuegbuzie & Jiao 2006). All participants were deemed to have extensive years of experience in the foundry industry and were therefore deemed well-qualified to comment on questions relating to the foundry industry. Purposive sampling was used in the qualitative phase. This allowed the

**TABLE 3:** Questionnaire for macroeconomic drivers.

| Number | Macro driver items | Scale | | | | | Literature sources |
|---|---|---|---|---|---|---|---|
| | | Not important at all | Slightly important | Moderately important | Very important | Extremely important | |
| 1 | Energy costs (and energy availability) | - | - | - | - | - | (CSIR 2019; Kutschke, Rese & Baier 2016) |
| 2 | Geographical location | - | - | - | - | - | (Atkinson 2017; Kutschke et al. 2016) |
| 3 | Industry entry and exit barriers | - | - | - | - | - | (Karakaya & Parayitam 2018; Ogaga & Joseph 2017) |
| 4 | Customer bargaining power | - | - | - | - | - | (Altuntas et al. 2014; Xue 2016) |
| 5 | Government incentives (subsidies) | - | - | - | - | - | (Mbatha 2018; Pakdeechoho & Sukhotu 2018; Songling et al. 2018) |
| 6 | The market perception of the foundry company | - | - | - | - | - | (Clare & Uddin 2019; Denoue & Saykiewicz 2009; Paul & Iuliana 2018) |
| 7 | Localisation (local content enforcement) | - | - | - | - | - | (Deringer et al. 2018; Neuman, Tissot & Mabrey 2017) |
| 8 | Regulatory instruments (import, tariffs, import quotas) | - | - | - | - | - | (Abbott & Singham 2016; Pakdeechoho & Sukhotu 2018; Songling et al. 2018) |
| 9 | The number of foundry companies in South Africa | - | - | - | - | - | (Hitt, Ireland & Hoskisson 2007) |
| 10 | The availability of substitutes for casting products | - | - | - | - | - | (Abbott & Singham 2016; Pakdeechoho & Sukhotu 2018) |

Note: Please see the full reference list of the article, Phiri, L., Dirkse van Schalkwyk, R. & Tolmay, A.S., 2024, 'Macroeconomic drivers affecting the foundry industry in *South Africa', South African Journal of Economic and Management Sciences* 27(1), a5323. https://doi.org/10.4102/sajems.v27i1.5323, for more information.

researchers to identify and interview individuals in top management positions as well as experts in the industry.

During the first phase (quantitative phase) of the study, questionnaires (Table 3) were e-mailed to all 196 respondents and using the findings from the quantitative phase, a set of interview questions were developed in preparation for the qualitative phase of the study. This was done to better comprehend the responses obtained in the first phase and to answer any questions that emerged from the examination of the quantitative data. Participants were asked to identify the prominent macroeconomic drivers for SCA within the South African foundry context. The questionnaires included questions specific to the 10 macroeconomic drivers identified from literature (Table 3).

A total of 12 industry experts participated in this second phase (qualitative phase) of the study. The participants were spread across six provinces which included Gauteng (five participants), Mpumalanga (two participants), Limpopo (one participant), Free State (one participant), Western Cape (one participant) and KwaZulu-Natal (two participants).

## Findings

A diverse demographic spread of individuals participated in the quantitative phase of the study, for instance, area of focus in the organisation as well as period of employment with their current company and within the foundry industry. Although the questionnaires were distributed to 196 participants, only 108 responses were obtained for analysis, which translated to a 55.1% response rate. The 108 responses comprised 66 management participants and 44 non-management participants. The missing responses were because of failure by the participants to return the questionnaires because of various reasons as well as incorrect or outdated email addresses that were still on the NFTN database.

Whilst the quantitative phase provided insight into how the respondents ranked all the macro drivers identified from literature, this information was insufficient to explain which drivers they thought were more crucial than the others and the reasoning behind their decisions. The qualitative phase provided a platform for the 'managerial and owner' participants to further expound on the reasons behind the choices made in the quantitative phase.

Whilst all 12 interviews were conducted, data saturation was attained after eight interviews. The responses from the final four interviewees appeared to restate the points made by the earlier participants, indicating that no new information was being obtained (Flick 2018). According to Guest, Bunce and Johnson (2006), prior to the data collection procedure, a researcher must decide on a numerical guideline for the number of interviews in order to appropriately budget and plan for the interviews. Guest et al. (2006) identified three elements considered crucial for the researcher to attain data saturation. These are indicated in Table 4.

**TABLE 4:** Data saturation elements for interviews.

| No. | Element | Description | How the study addressed the element |
|---|---|---|---|
| 1. | Interview structure | Similar set of questions asked | Semi-structured interviews were conducted using a schedule, which had a set of core questions informing the interviews (Phiri 2022). |
| 2. | Instrument content | Wide distribution of experience or domain of knowledge | The questions on the interview schedule were based on the participants' experiences and knowledge of the industry (Phiri 2022). |
| 3. | Participant homogeneity | Participants chosen accordingly to some common criteria | Purposive sampling was used to select participants who were leaders in the foundry industry (Phiri 2022). |

*Source*: Adapted from Guest, G., Bunce, A. & Johnson, L., 2006, 'How many interviews are enough?: An experiment with data saturation and variability', *Field Methods* 18(1), 59–82. https://doi.org/10.1177/1525822X05279903

Note: Please see the full reference list of the article, Phiri, L., Dirkse van Schalkwyk, R. & Tolmay, A.S., 2024, 'Macroeconomic drivers affecting the foundry industry in South Africa', *South African Journal of Economic and Management Sciences* 27(1), a5323. https://doi.org/10.4102/sajems.v27i1.5323, for more information.

In line with the recommendations by Guest et al. (2006) questions were asked to all participants during the interview process (as during the quantitative phase). The questions asked covered all 10 macroeconomic drivers identified from literature and all the participants interviewed had some level of experience working in the foundry industry.

## Data analysis: Quantitative phase

The quantitative phase of the study revealed that there were no significant group differences between the different levels of participants (management and non-management) on their perspectives of the macroeconomic drivers and SCA.

The Mann–Whitney *U* test was undertaken for the most prominent macro drivers for SCA. Assets and resources ($U = 1250.50$, $p = 0.387$), availability of substitutes for casting products ($U = 1352.50$, $p = 0.821$), institutions and government policies ($U = 1295$, $p = 0.563$), and supporting industries and clusters ($U = 1309.50$, $p = 0.624$) were submitted. The Mann–Whitney *U* test showed that there was no significant difference between the management and non-management views regarding the influence of the macro drivers identified on SCA.

The second objective was to benchmark the perceptions of stakeholders within the foundry industry on SCA against the macroeconomic drivers identified from literature. It was therefore crucial to rank the drivers (items) according to their perceived level of importance. As indicated in Table 3, 10 macro drivers were identified for testing within the South African context and these included: (1) market perception of the foundry company, (2) geographical location, (3) the number of foundry companies in South Africa, (4) customer bargaining power, (5) the availability of substitutes for casting products, (6) regulatory instruments, (7) government incentives, (8) industry entry and exit barriers, (9) localisation or local content enforcement and (10) energy costs.

Subsequent to the statistical analysis of the quantitative responses, the items in rank order for the quantitative phase were as indicated in Table 5.

The perceived top five macroeconomic drivers were identified as: (1) energy costs (and energy availability), (2) localisation (local content enforcement), (3) availability of substitutes for casting products, (4) government incentives (subsidies), and (5) regulatory instruments (import tariffs, import quotas) (Table 5). As indicated, energy costs had the highest mean (4.44) followed by localisation or local content enforcement (4.06), availability of substitutes for casting products (3.93), government incentives (3.92) and regulatory instruments (3.91). Geographical location had the lowest mean value of 3.33 followed by the number of foundry companies (3.43), and industry entry and exit barriers (3.55).

The macroeconomic drivers with lower item mean values were considered as being less important than those with high item means. An analysis of the item standard deviations revealed that most of the values were greater than 1, showing that there was a divergence of views on the importance of the macroeconomic drivers in enhancing SCA. Whilst geographical location had the lowest item mean value, it had the highest standard deviation value of 1.253, which showed a polarisation of views regarding the importance of this macroeconomic driver. On the other hand, there appeared to be a convergence of views regarding the importance of energy costs as a driver enhancing SCA with the lowest item showing a standard deviation value of 0.715. Other macroeconomic drivers with relatively low item standard deviation values included government incentives (0.948) and localisation (0.979).

The identification of the critical drivers for SCA was key for this study, as without these, SCA would be difficult to achieve for the South African foundries. When responding to the question regarding the three macroeconomic drivers that the respondents believed were (most) critical in enhancing foundry SCA, it was interesting to note that 10 different were identified by the 108 respondents as 'critical' and that the ranking of the critical drivers did not necessarily correspond with the ranking of the critical drivers. Whilst the energy costs macroeconomic driver was identified as the most critical, it ranked second on the level of criticality. On the other hand, the regulatory instruments macroeconomic driver was identified as the third most critical driver, yet it was ranked the fifth most critical driver.

In summary, the quantitative phase identified: (1) energy costs (and energy availability), (2) localisation (local content enforcement), and (3) the availability of substitutes for casting products as the three most critical macroeconomic drivers enhancing SCA for the foundry industry.

**TABLE 5:** Rank order for the macroeconomic drivers after quantitative phase.

| Rank | Item | Mean | SD |
|---|---|---|---|
| 1 | Energy costs (and energy availability) | 4.44 | 0.72 |
| 2 | Localisation (local content enforcement) | 4.06 | 0.98 |
| 3 | The availability of substitutes for casting products | 3.93 | 1.05 |
| 4 | Government incentives (subsidies) | 3.92 | 0.95 |
| 5 | Regulatory instruments (import tariffs, import quotas) | 3.91 | 1.00 |
| 6 | Customer bargaining power | 3.61 | 1.18 |
| 7 | The market perception of the foundry company | 3.59 | 1.22 |
| 8 | Industry entry and exit barriers | 3.55 | 1.15 |
| 9 | The number of foundry companies in South Africa | 3.43 | 1.05 |
| 10 | Geographical location | 3.33 | 1.25 |

SD, standard deviation.

The qualitative phase followed the quantitative phase and provided an opportunity for an in-depth understanding of these discrepancies together with providing clarity on the motivation for selecting the top three macro drivers critical to the industry SCA.

## Data analysis: Qualitative phase

The qualitative research phase followed the quantitative phase through thematic analysis. The top management of foundries were targeted with the aim of undertaking an in-depth interview process as well as guidance from literature. The interviewees were asked to identify the most critical macro drivers and motivate why. The qualitative phase can be used to enhance perceptions and comprehension of the research phenomenon under study (Onwuegbuzie & Leech 2007). The researchers employed a strategy that combined 'prolonged engagement and richness of data' to ensure improved credibility of the data-collection process (Roller & Lavrakas 2015).

A pilot study was conducted with seven participants to ensure the questions were clear and unambiguous, after which the interviews were conducted. In order to increase the rigour of the qualitative process, consideration was given to the four criteria for determining trustworthiness in qualitative research. These included ensuring credibility, dependability, transferability and confirmability (Anney 2014; De Jonckheere & Vaughn 2019). The interviewees were questioned about the significance of macroeconomic drivers and asked to rank these according to their level of importance.

Coding was used during the qualitative data analysis stage to pinpoint themes in accordance with the methodology proposed by Braun, Clarke and Weate (2016). After the transcription process, qualitative data were reviewed several times to ensure understanding of the content, followed by the coding process, and succinct labels were generated to identify the most critical features of the data (Braun et al. 2016). The codes identified were collated in preparation for theme generation and interpretation. Dependability was addressed through the utilisation of a code-recode approach where the data were coded twice (Anney 2014). The two sets of coded data were then compared to determine whether there were any differences or not (Anney 2014).

The top five macroeconomic drivers identified in this phase as critical for enhancing SCA for South African foundries included: (1) energy costs (and energy availability), (2) localisation (local content enforcement), (3) government incentives (subsidies), (4) the availability of substitutes, and (5) industry entry and exit barriers. These drivers are reported in Table 6.

As shown in Table 6, whilst there were varying levels of agreement on which macroeconomic drivers are critical in

**TABLE 6:** Important macro drivers for the South African foundry sustainable competitive advantage (qualitative phase).

| Item Number | Macro drivers for sustainable competitive advantage | Participants | | | | | | | | | | | | Frequency | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | |
| 1 | Energy costs (and energy availability) | X | X | X | X | X | X | X | X | X | X | X | X | 12 | 1 |
| 7 | Localisation (local content enforcement) | X | X | X | X | X | X | X | X | X | X | X | X | 12 | 1 |
| 5 | Government incentives (subsidies) | - | X | - | X | X | X | X | X | X | X | X | - | 9 | 3 |
| 10 | The availability of substitutes for casting products | X | - | X | X | - | X | - | X | X | X | X | - | 8 | 4 |
| 3 | Industry entry and exit barriers | X | - | - | - | X | X | - | X | - | - | X | X | 6 | 5 |
| 8 | Regulatory instruments (import tariffs, import quotas) | X | - | X | - | - | X | - | - | - | - | X | - | 4 | 6 |
| 2 | Geographical location | - | - | - | X | - | X | - | - | - | - | - | X | 3 | 7 |
| 4 | Customer bargaining power | X | X | - | X | - | - | - | - | - | - | - | - | 3 | 7 |
| 6 | Market perception (brand loyalty) of the foundry company | X | X | X | - | - | - | - | - | - | - | - | - | 3 | 7 |
| 9 | The number of foundry companies in South Africa | - | X | - | - | - | - | X | - | - | - | - | - | 2 | 10 |

enhancing the SCA for foundries in South Africa, all participants were in full agreement on the level of importance of energy costs (and energy availability) and localisation (local content enforcement) as drivers for SCA.

The study identified: (1) energy costs (and energy availability), (2) localisation (local content enforcement), (3) government incentives (subsidies), and (4) regulatory instruments (import tariffs, import quotas) as the most critical drivers enhancing SCA.

A further step during the two research phases required participants to select macroeconomic drivers which they believed were critical (without which SCA could not be achieved) for enhancing SCA for South African foundries. As there was agreement amongst participants regarding the importance of localisation and energy costs (and availability), these macroeconomic drivers were thus identified as the most prominent for both the quantitative and qualitative research phases. This meant that these were the most critical macroeconomic drivers enhancing the SCA for the South African foundry industry.

# Discussion

The problem raised in this paper is the decline of South Africa's foundry industry as a result of foundry closures because of various economic factors. The number of foundries in South Africa has reduced from 213 in 2003 to 123 in 2020 owing to the several micro- and macroeconomic challenges facing the industry which negatively affect foundry company competitiveness (Jardine 2015).

The research aimed to search for possible solutions to the problem through an explanatory sequential mixed methods approach. The first objective was to identify from literature the critical macroeconomic drivers for SCA pertinent to the foundry industry (Table 3). The second objective was to benchmark the perceptions of stakeholders within the foundry industry on SCA against the macroeconomic drivers identified from literature. The third objective was to make recommendations on strategies to enhance the SCA for foundries in South Africa. This study focused on identifying and exploring the macroeconomic drivers deemed critical in enhancing the SCA for foundries.

The study identified: (1) energy costs (and energy availability), (2) localisation (local content enforcement), (3) the availability of substitutes for casting products, (4) government incentives (subsidies), (5) regulatory instruments (import tariffs, import quotas), and (6) industry entry and exit barriers as the most critical macroeconomic drivers. There was consensus in the identification of energy costs and localisation as the most critical macroeconomic drivers influencing the sustainable competitiveness for the foundry industry.

Energy costs (and energy availability) were found to be key in influencing SCA. This ranked as most critical for both the quantitative and qualitative phase. During the qualitative phase, the participants generally agreed that the cost of energy (electricity and gas) was high, which made it challenging for foundry businesses to control their costs and provide competitive pricing to their consumers (Phiri 2022). Rasmeni and Pan (2014) point out that when compared to the global average, South African foundries consumed significantly more energy while the 'uncertainty regarding electricity pricing and supply is a disincentive to investment' and has a detrimental effect on South African industries' ability to compete. The increase in electricity costs and the unreliability of supply continue to dampen economic activities across different sectors with mining, manufacturing, agriculture and construction looking set to be worst affected in the long run (National Treasury 2022).

The adoption and implementation of local content regulations (localisation) was also found to be a key driver in improving SCA. Local content regulations (localisation) ranked second in both the quantitative and qualitative phases. This protectionism strategy was in response to the government's regulation mandating that state-owned businesses get a specific proportion of their casting needs from local foundries. Participants could provide their own views on the quantitative drivers and stated that this driver, if well 'policed' and monitored, would help revive the ailing industry and prevent more company closures. According to Seyfullayev (2020:123), the enforcement of localisation policies is a 'double-edged sword' because of its ability to protect and help revive local industries, but at the same time, dissuade 'healthy' competition from other sectors and encourage 'laziness' for protected companies.

Regulatory instruments were found to influence the level of foreign competition into South Africa. The study found that the strengthening of trading regulations on castings and related products had an impact on promoting local foundries, by protecting them from the influx of castings from foreign competition (ranked no 5 in Table 4 and ranked no 6 in Table 6). However, because of less stringent regulatory enforcement, foreign foundries were able to sell their casting goods in South Africa with ease, placing them in direct rivalry with local foundries.

The availability of substitutes for casting products was identified as a driver that plays a critical role in determining the competitiveness of local foundries (ranked no 3 in Table 5 and ranked no 4 in Table 6). Porter (2016) and Kaningu, Warue and Munga (2017) identified the availability of substitute products as a threat to the competitiveness of firms. Substitute products such as forgings, fabrications, the use of three-dimensional (3D) printing, and the use of alternative materials present threats to the foundry industry.

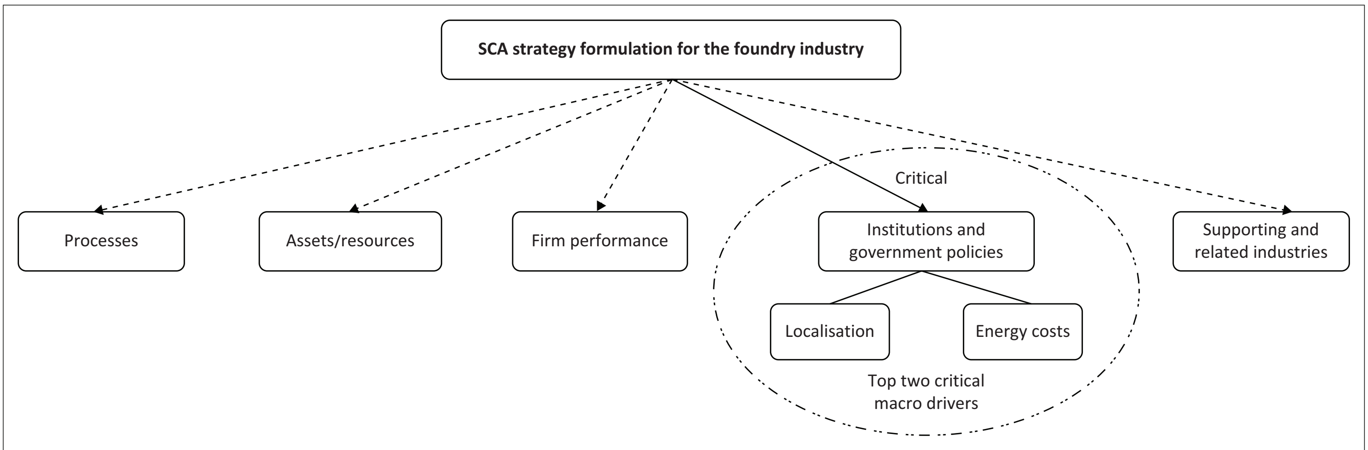
The SCA of the South African foundry industry was found to be positively impacted by government incentives or subsidies (ranked no 4 in Table 5 and ranked no 3 in Table 6). The mentioned government incentives relate to a reduction in taxes paid by the foundries, a provision of loans or financial assistance at favourable interest rates, as well as the provision of services that provide foundry companies with an edge over foreign competition. The injection of financial assistance into the industry as well as the promotion of initiatives, such as the industrialists' incentive scheme, also enhance firm competitiveness.

Industry entry and exit barriers were also identified as a critical macroeconomic driver enhancing SCA in South Africa (ranked no 8 in Table 5 and ranked no 5 in Table 6). Islami et al. (2019) argue that industry entry and exit barriers have both favourable and unfavourable effects on both incumbent and non-incumbent businesses. Through the qualitative research, the study found that huge capital investment requirements were a major barrier for 'new' entrants into the industry (ranked 5 in Table 6). The costs of complying with legal regulations and purchasing production equipment were found to be barriers to the establishment of new local foundry enterprises in South Africa. The study also discovered that exit barriers did not prevent foundry businesses from closing, which helped to explain why there was an increase in the number of foundry businesses closing and 'exiting the industry'. This resulted in a situation where very few, if any, new foundry companies were 'entering' the industry and, yet there was a high number 'exiting' the industry because of the different economic challenges.

Based on the five SCA classifications recommended by Siudek and Zawojska (2014) (Table 2), the top two critical macroeconomic drivers can be classified under the institutions and government policies construct as localisation and energy costs (Figure 1). The frequency of these two drivers are both above 12 whilst the frequency of the other drivers are 9, 8, 6, 3, and 2 respectively (Table 6).

In summary, it is deemed crucial for the South African foundry industry to design and comply with a SCA strategy with the associated institutions and government policy driver. Energy costs, localisation, industry entry and exit barriers government incentives, regulatory instruments, and the availability of substitutes for casting products are critical macroeconomic drivers for SCA. Localisation and energy costs were the top two critical macroeconomic drivers without which, South African foundries would battle to attain SCA. During the qualitative research phase, respondents commented that the localisation and energy costs will directly influence financial competitiveness to enable the foundry industry to compete on a global basis.

The competitiveness of industries in South Africa is strongly influenced by a wide range of structural and environmental factors that affect the costs of production and trade. This includes policies, skills, access to well-priced and high-quality electricity, and the efficiency and cost of the logistics system. The country needs to speedily implement a wide




SCA, sustainable competitive advantage.

**FIGURE 1:** Sustainable competitive advantage strategy formulation based on critical drivers.

range of policies and projects that will help to create a growth environment that is solid and coherent. The government through collaborative efforts with institutions such as the NFTN and SAIF can play a crucial role in policy formulation and to enhance the competitiveness of the foundry industry.

## Conclusion

In order to improve SCA, the study reported in this paper offers insightful analysis of the macroeconomic factors influencing the South African foundry sector. The paper makes a substantial theoretical contribution as there is a dearth in literature relating to SCA in the foundry industry (Jardine 2015; Lochner et al. 2020). The macroeconomic drivers were identified from literature (Table 3) and a measurement instrument was then designed in order to test perceptions regarding the most prominent macroeconomic drivers (Table 3). It was determined after the quantitative and qualitative phases that the most critical macroeconomic drivers for the South African foundry industry are energy costs and localisation while government incentives (subsidies), availability of substitutes for casting products, regulatory instruments, and industry entry and exit barriers were also deemed critical.

The study further makes a significant managerial contribution. The study contributes by identifying the macroeconomic drivers that can be used by industry leaders in the formulation of strategies for SCA. The study also complements research in the field of business management by providing a comprehensive overview of the macroeconomic drivers that are critical to attaining sustainable competitiveness within the foundry industry, which no previous studies have attempted to do. The NFTN and SAIF play an important role to manage policy formulation in line with the most critical macroeconomic drivers and to enhance the competitiveness of the foundry industry.

Although the article makes these significant contributions, limitations do exist. The study was limited to South African foundries; thus, while the findings may be applicable to other developing nations, they may not necessarily be generalisable to the global foundry industry.

The article provides many opportunities for further research to expand insight into the SCA of the foundry industry. The study can be duplicated in other countries (emerging and developed) in order to determine the deviation or duplication of results. Additional stakeholders such as government policymakers could be included in future research to provide a more comprehensive perspective. Finally, a longitudinal study might provide more insight as it will be undertaken over a longer period to equalise industry fluctuations.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### Competing interests

The authors have declared that no competing interest exists.

### Authors’ contributions

Contribution of each author: L.P. (33.3%); R.D.V.S. (33.3%); and A.S.T. (33.3%).

### Ethical considerations

Ethical clearance to conduct this study was obtained from the University of South Africa and UNISA Research Ethics Review Committee No. (# 2020_CEMS_BM_100).

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### Data availability

Raw data are safely filed in confidentiality with the original researcher Dr L. Phiri. All information relating to respondents is anonymous. Data are not available in the public domain. Research complied with the ethical procedure of the University. Data can be provided on request from the corresponding author.

### Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.


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