CHASING THE DRAGON'S TAIL – KEEPING TRACK OF CERAMIC TILE QUALITY IN CHINA

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1. INTRODUCTION

China is the major ceramic tile producer in the world, contributing at least 47% of global production [1]. More than 1 billion sqm of tiles are exported globally per annum, accounting for more than 40% of globally exported ceramic tiles [2-3]. Due to its immense production capability, China is an important global consumer of ceramic raw materials, such as glazes, frits, pigments and inks, manufacturing equipment and other services and solutions. Furthermore, local producers of these ceramic materials and manufacturing equipment, such as machinery, digital printers and ceramics inks, continuously strive to export their products to the world [4].

Therefore, in the eyes of global industry participants that provide products and solutions in the region, keeping track of trends in the ceramic tile industry in China is of significant importance. To fulfil this requirement, there are two main hurdles. Firstly, the Chinese ceramic tile industry is complex and dynamically evolving. Production processes and technologies differ across different tile types; substantial differences exist across production regions; and, moreover, new types of products and designs are continually developed and introduced to end-users [5]. Secondly, there is paucity of longitudinal (time-based) detailed empirical data available to facilitate deep analysis [6-8]. Available industry data is mostly high-level and lacks granularity; also, anecdotal interpretations abound but typically lack rigour and reliability. These hurdles pose difficulties in analysing product quality trends in China ceramics.

This longitudinal, empirical study attempts to address these hurdles. It aims to track ceramic tile quality produced in China, including production methods and market aspects through a structured, field research-based approach, complemented by sample acquisition and laboratory testing, mainly compositional analysis of various layers (XRF), optical properties (CIELAB) and other specific tests. This study commenced in 2012 and is now an annual research exercise, allowing longitudinal comparison of results. No other study of Chinese ceramic tile quality has so far been undertaken at such an extensive, longitudinal level.

In this report, an overview of the methodology, key results and insights are provided. For example, substantial shifts in tile type preferences are underway, both in production and consumer demand, influenced by changing technological and processing capabilities. Overall, quality trends in the ceramic tiles produced in China are improving, although rates of change vary between production regions. Furthermore, key product quality issues are discussed, including problems with some product types highly favoured by Chinese consumers, which if addressed could facilitate preference for these products.

2. METHODOLOGY

The methodology adopted in this study is a structured empirical approach, a combination of qualitative and quantitative methods. The steps are summarised below, in Figure 1.

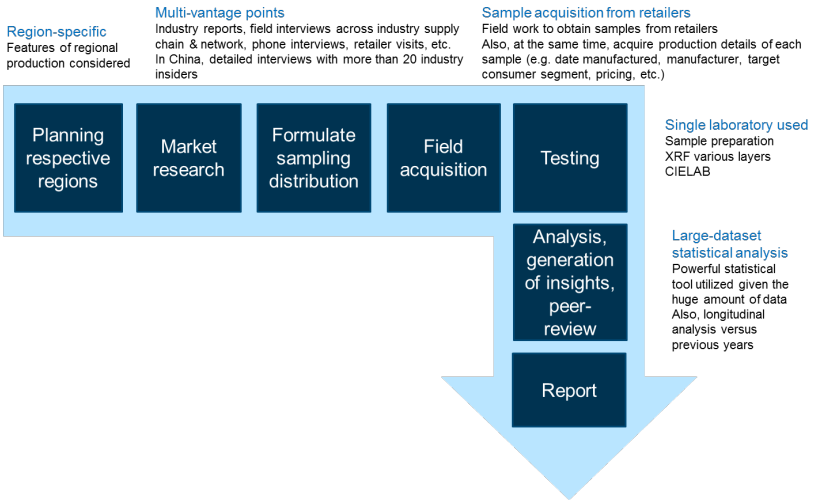


Figure 1. *Summary of research methodology*

Firstly, empirical data is acquired through field market research, which consists of multiple field-based, face-to-face semi-structured interviews and visist to major ceramic tile retail 'mega-markets.' This is undertaken in China's major production and ceramic consumption provinces. To minimise bias, this process is undertaken by a team of four to five independent, Beijing-based, independent Chinese industry consultants. At this stage, the following objectives are pursued: understand the current ceramic tile markets across several major provinces, determine market share of various tile categories and emerging trends in products, determine product designs and production technologies.

Secondly, a more detailed, highly defined, tile product categorisation system is utilised to achieve greater accuracy in longitudinal observations. Please refer to Figure 2 for a summary of categories. In contrast, available industry statistical data only uses high-level generic categorisation. For instance, porcelain tile annual production volumes are available publicly but this number encompasses all types of porcelain tiles, such as polished unglazed polycrystalline, polished soluble-salt, glazed, rustic and microlite/crystal jade, which are lumped in one dominant category. In 2013, for example, 67% of Chinese ceramic tile production was categorised broadly as 'porcelain' [6-7]. Such a broad categorisation does not facilitate evaluation of product quality nor trends within the porcelain sub-categories. Therefore, one of the main deliverables of the market research is to formulate the detailed sampling plan using sub-categories for porcelain tile products.

Thirdly, using the results from the market research, hundreds of ceramic tile samples that closely mimic the tile distribution types are acquired across the main consumption and production regions. In 2014, for instance, more than 400 Chinese ceramic samples were acquired from four key producing regions – Guangdong, Shandong, Sichuan and Fujian. Acquisition was undertaken by the same independent team of Chinese industry consultants.

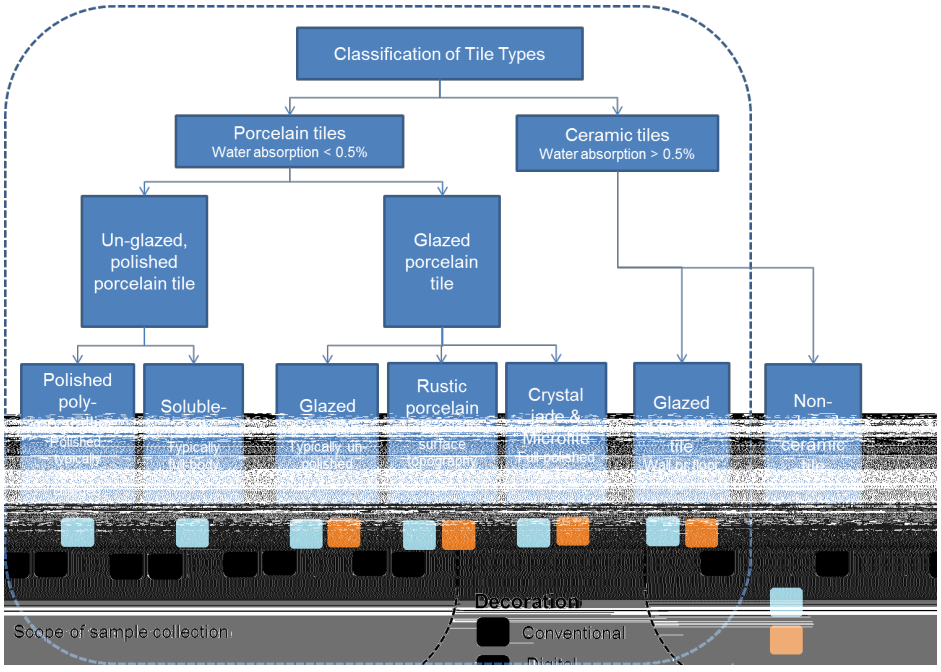


Figure 2. *Summary of ceramic tile categories adopted in this study*

3. DISCUSSION OF RESULTS

3.1. CHANGE IN CERAMIC TILE PRODUCT MIX: DRIVEN BY DIGITAL PRINTING

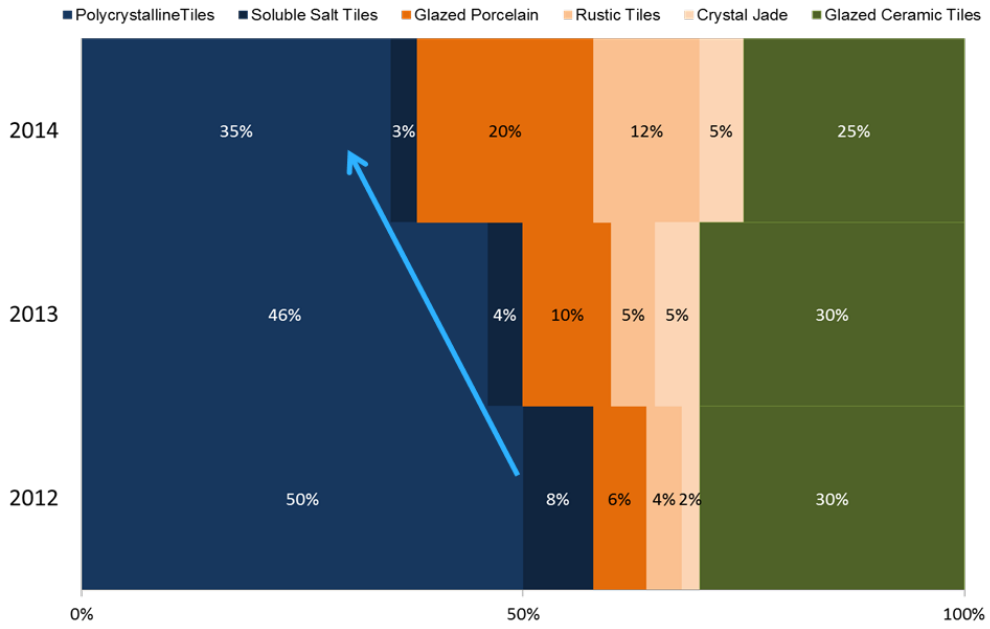


Figure 4. *China ceramic tile industry's product Mix, 2012-2014*

(Source: Iluka China Ceramic Market Study, 2014/2015)

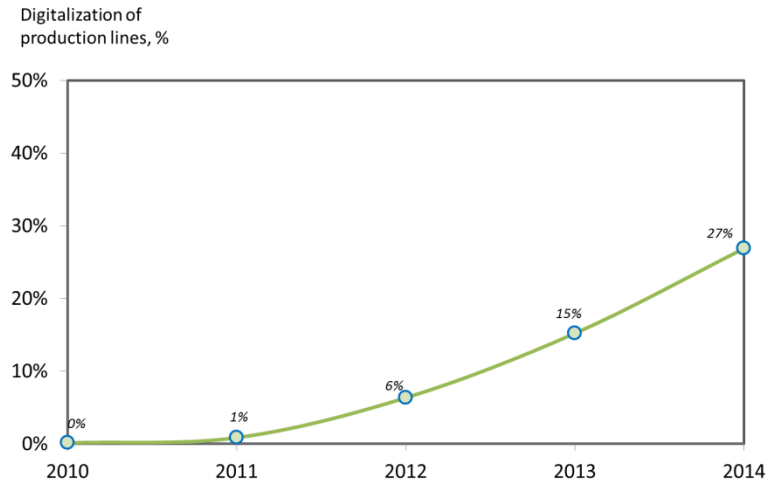
For many years, porcelain tile has been the dominant tile broad category produced and sold in China [5, 6-9]. Traditionally, polished porcelain tile—a major sub-category of porcelain tile—has been the dominant product. For instance, in Qualicer 2008, this was underlined by Huang [5]. In recent years, however, this study found rapid change in China's ceramic tile product mix, particularly within the sub-categories under 'porcelain tiles.' Figure 4 shows the summary of inputs obtained from visits, interviews and market reviews.

In 2012, within the various sub-categories of porcelain tiles, the most dominant type was polished porcelain tile—it accounted for 58% of total ceramic tiles produced in China. However, in 2013-2014, its dominance rapidly deteriorated. In 2013, its market share reduced to 50% (a 14% deterioration in market share); and in 2014, it reduced further to 38% (a further 21% deterioration).

Under the polished porcelain category, both the sub-categories of polycrystalline and soluble-salt tiles reduced their market shares substantially from 2012 to 2014: by 30% and 63%, respectively. Polished polycrystalline tile still represents substantial portion of the Chinese production, albeit the overall trend shows rapid decline. On the other hand, among Chinese tile buyers and producers,

soluble salt polished porcelain is considered old design and low-quality. In recent years, this product category has been positioned for the lowest tiered cities and lowest-price buyer segments. Hence, the chart indicates an obvious trend—that this product category faces almost complete demise in the short to medium term.

What drove this substantial erosion in market shares of these traditionally popular products? Figure 5 shows that the period 2012-2014 corresponded to the rapid adoption of ceramic digital printers by tile producers. In 2012, the digitalisation of China's ceramic production lines was about 6%; in 2014, it substantially increased to approximately 27%.



Source: Ceramic Town Weekly [4], Iluka research

Figure 5. *Digitalisation of China's ceramic tiles production, 2010-2014*

Quite clearly, Chinese digitally-printed, porcelain tile products with surface glazing were embraced so well by end-consumers that in a span a two years, the market share of glazed porcelain products increased by more than three-fold, from 12% in 2012 to 37% in 2014. The sub-categories included here are the glazed porcelain, rustic porcelain and microlite/crystal jade porcelain tiles. Of these, the highest growth came from glazed porcelain, which benefited from more varied, higher definition and more attractive aesthetics of the final products. Its market share grew from 6% in 2012 to 20% in 2014, an increase of more than three times. Hence, the rapid growth in market of the glazed porcelain tiles was achieved at the expense of the market share of the polished, unglazed porcelain tiles.

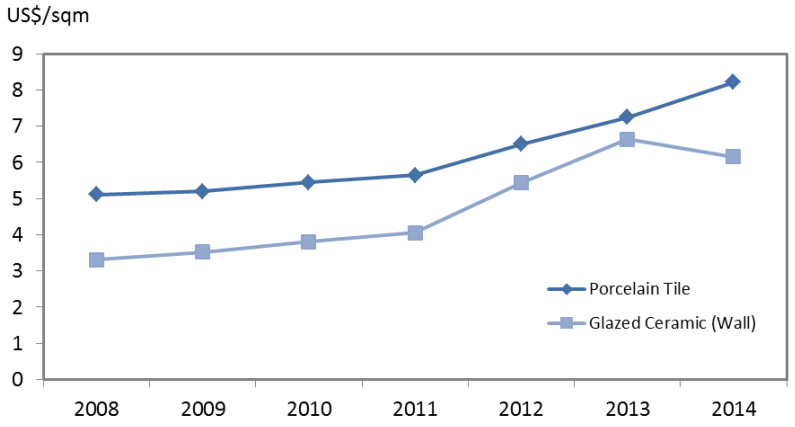
Despite the rapid increase of glazed porcelain and adoption of digital printing, Figure 4 shows that considerable amount of unglazed porcelain production still remains—so, presents a possible area for digitalisation. By end-2014, a total market share of 38% is still produced using polycrystalline and soluble-salt porcelain. For tile producers, it is possible to convert these product lines to glazed porcelain—however, it will depend on many factors, including factors internal to every tile producer (e.g. financial justification, factory configuration and market positioning) and external (e.g. competition, market dynamics, financing) [5]. The results from this study present an indication of how much opportunity for digitalisation is still there. Ceramic machinery and materials providers could then plan possible approaches to encourage conversion of production lines to digital decoration.

3.2. CHINESE TILE QUALITY – OVERALL POSITIVE TRAJECTORY

To evaluate the overall quality aspects of the Chinese tile production, there are many methods that could be used. In this study, two indirect measures were used: (a) unit average product price to determine if greater higher-quality products are sold by the industry; and (b) compositional indicator of a known recognized material—in this case zirconium silicate—used by Chinese tile producers for generating higher-quality tile products.

In the past years, China has emerged as a major global exporter of ceramic tiles. In 2014, it exported 1.1 billion sqm of tile products, representing more than 40% of world tile exports [2-3]. Internally this represented about 10% of its annual ceramic tile production. Figure 6 shows the average realised price of Chinese tile exports [6-8]. Porcelain tile achieved annual increases from 2008 to 2014. In 2014, average price realised was approximately 13% higher than previous year. Glazed ceramic tiles, on the other hand, also exhibited the same trajectory as porcelain tiles, except for 2014, when it slightly dipped by 7.4%. Moreover, based on 2014 industry statistical data, Guangdong—which is the prime production area of highest quality ceramic tiles in China—increased its export share to 77%[6]. In 2013, its contribution was lower (although also dominant) at 67% [7].

Based on these factors—higher achieved average export price and greater export contribution from Guangdong—it can be argued that the exported Chinese ceramic tile products in 2014 were of higher quality than previous periods.

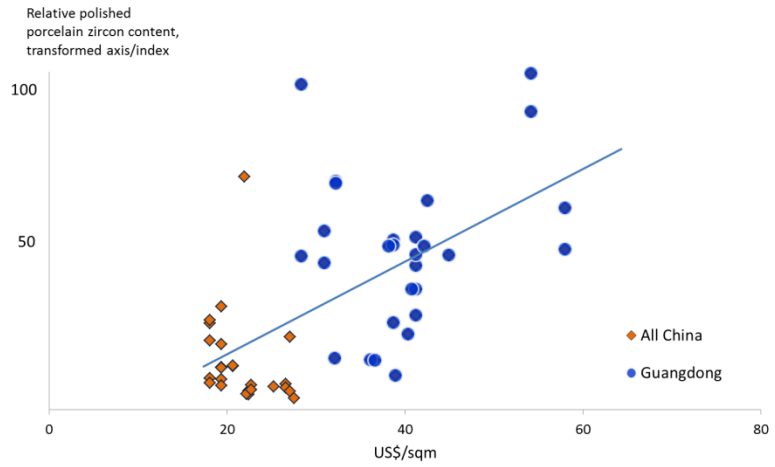


Source: China Building Ceramics & Sanitaryware Association (2015)

Figure 7. *Average export price of Chinese ceramic tiles*

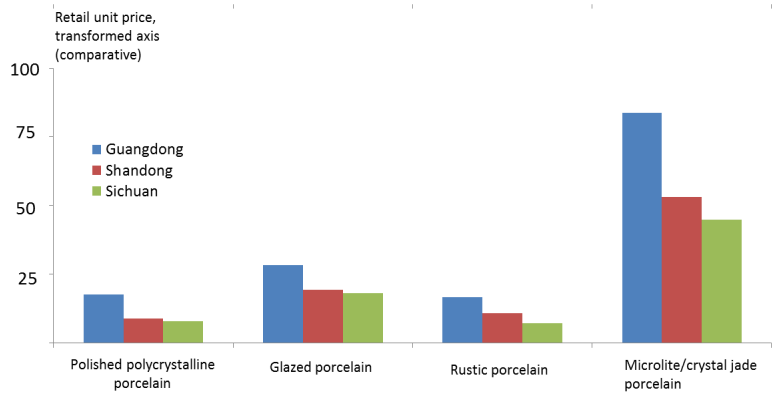
Using zircon as an indirect measure for ceramic tile quality in China is grounded on the following points:

- In Chinese polished porcelain tiles, the study found that the greater the zircon silicate used in tile formulation the greater the selling price. Figure 8 shows this trend/correlation (R-square=0.37).
- In that same chart, it also highlights the greater focus of Guangdong's ceramic products towards higher-quality segments. This underlines further the dominance of the Guangdong ceramic industry as the premier production region in China, leading in volumes produced (accounting for approximately 24.4% of China's production in 2014) and volumes/value exported (77% in 2014) [2, 6].
- Moreover, Guangdong also leads in unit pricing across all ceramic tile categories (see Figure 9)—this emanates from its greater focus on higher-quality products. Most of China's 'Famous Brands' in ceramics are produced in Guangdong.
- Hence, for polished porcelain tiles, quality trends could reasonably be tracked by looking at the zirconium silicate content.
- In glazed porcelain tiles, on the other hand, zirconium silicate in glaze appear as a weak indicator of quality when comparing products for different consumer segments—but useful when comparing the quality between production provinces and keeping track of quality of products positioned for higher-quality segments. Figure 10 shows that among the tile producing provinces, Guangdong leads in using zirconium silicate and in obtaining higher unit price for their glazed porcelain products. Shandong and Sichuan, on the other hand, appear to use lesser amounts of zirconium silicate in their decoration and obtains lower product pricing.



Source: Iluka China Ceramic Market Study, 2014/2015

Figure 8. *Relative zircon content in polished porcelain tiles vs. retail price*



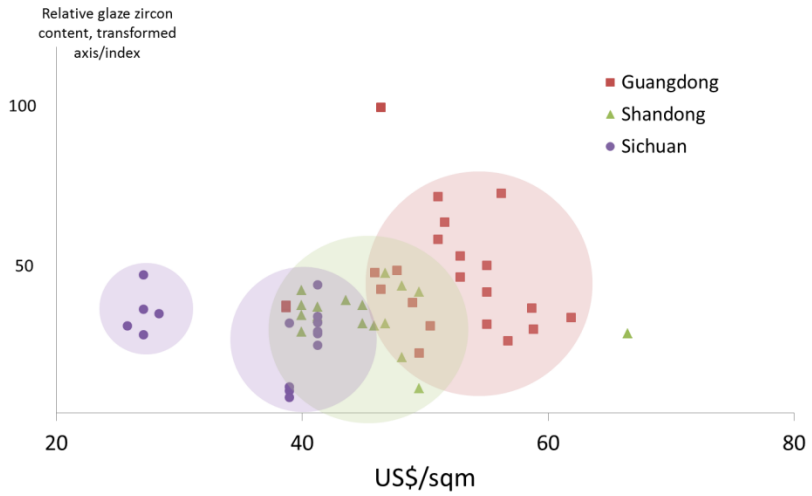
Source: Statistical mean, more than 950 tile samples (2012-2014)

Figure 9. *Relative unit price of various ceramic tile product categories*

- Usage of zirconium silicate, considered in China as the best-performing economic material for imparting opacification and optical properties for various layers in the decoration (e.g. engobe, opaque frits, digital glaze and colours), tend to be used in greater amounts as products are positioned for higher priced, higher-quality products.
- Figure 11 shows that the trend profile of zirconium silicate usage differs across various tile categories. Notably, for tile products with glazing, the zirconium silicate content shows a 'floor' or minima; on the other hand, those without glazing, notably polished porcelain tiles, no 'floor' is displayed—it can go down from high levels to any value towards zero.
- Hence, as a possible indicator for quality level of glazed products, zirconium silicate content may be used for products aimed for higher-quality segments. For lower-quality segments, it may be considered as a weak indicator, due to the observed 'floor' of zirconium silicate content in glazed products (i.e. minima, rather than zero). Essentially, what this means is that zirconium silicate is needed in virtually all cases of glazed products, including those positioned for lowest-quality segments.

In summary, therefore, the following is established:

  - in polished porcelain tiles, zirconium silicate content is a good indicator of quality;
  - in glazed products—such as glazed porcelain, rustic porcelain and microlite/crystal—zirconium silicate content is a reasonable indicator for tracking the quality of products aimed at higher-quality segments.



Source: Dataset, Iluka China Ceramic Market Study, 2014/2015

Figure 10. *Relative ZrSiO4 content in glaze, glazed porcelain tiles*

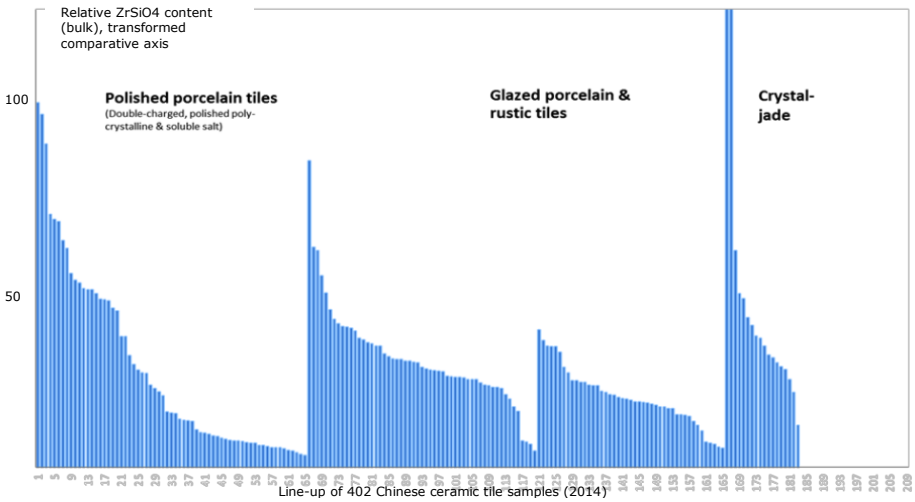
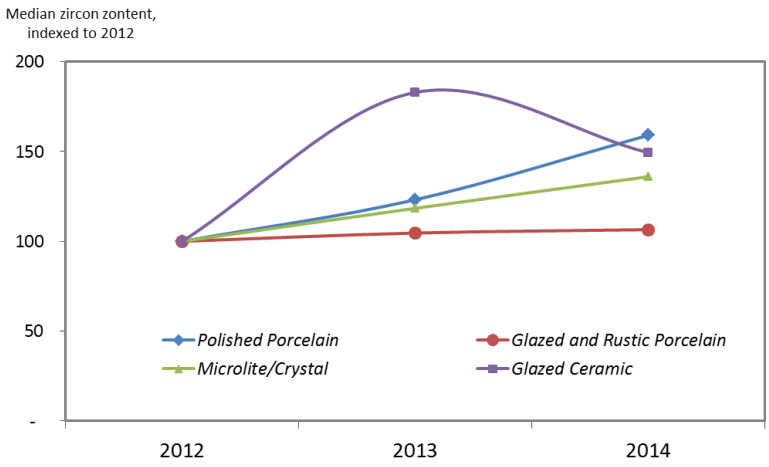


Figure 11. *Relative zirconium silicate content in various ceramic tile products*

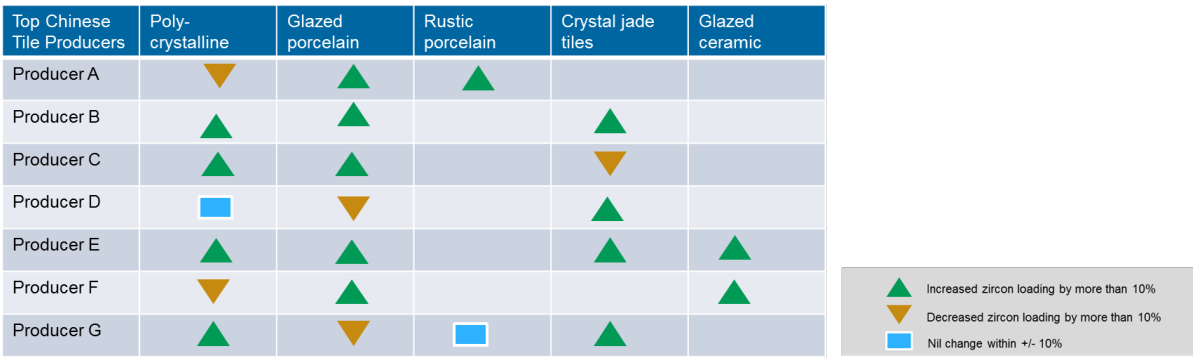
Using zirconium silicate content as a possible indicator for ceramic tile quality in China, what trends in ceramic tile quality could then be observed in recent years?

- Figure 12 shows that over the period 2012-2014, the median quality of most product categories—polished porcelain, glazed porcelain, rustic porcelain and microlite/crystal—has increased.
- Glazed ceramic, however, showed an increase from 2012 to 2013, but decreased between 2013 and 2014 (approximately half the magnitude of the increase in 2012 to 2013).
- Among the top producers in China—by volume and brand popularity—comparison of the zirconium silicate usage between 2013 and 2014 shows an overall increase across most product categories. This is shown in Figure 13. Examples of the leading and popular producers are Dong Peng, New Zhongyuan and Mona Lisa, among others.
- The top producers are widely recognised in the industry as the trend setters for new and future designs in China. The rest of the industry players typically monitor and follow the trends set by the top producers.
- What this means is that overall, the Chinese ceramic industry in recent years has continually displayed increasing quality of its ceramic tile products.
- Moreover, this is expected to continue in the next few years, as the trend-setting top producers/brands exhibit higher unit usage of quality decorative materials (e.g. zirconium silicate) to develop and produce the industry-leading products in China.



Source: Dataset, Iluka China Ceramic Market Study, 2014

Figure 12. *Relative zirconium silicate content in various Chinese ceramic tile products*



Source: Dataset, Iluka China Ceramic Market Study, 2014

Figure 13. Zirconium silicate usage by top Chinese tile producers (2014 vs. 2013)

4. CONLUSION AND INSIGHTS

This study has established that China's ceramic tile product mix has rapidly changed, mainly driven by the rapid adoption of digital printing. Despite this widespread adoption, however, substantial opportunities still exist for conversion into digital decoration. Production of full-polished polycrystalline porcelain tiles is still substantial and therefore offers opportunitiess for possible conversion into digital decoration.

Overall, the Chinese ceramic industry continually displays increasing quality of its ceramic tile products.

- This appears to be recognised by international buyers as the average price of tile exports from China has continually increased every year.
- In this study, Zirconium silicate content was established as a reasonable, indirect indicator for quality—in the period 2012 to 2014, most tile categories were observed to exhibit increasing zircon content.
- Guangdong province, where leading Chinese producers and brands are based, leads the industry in defining new designs, export market share, pricing and product quality across the various tile categories.
- Positive trajectory in Chinese tile quality is expected to continue in the next few years, as the trend-setting, leading producers exhibit higher unit usage of quality decorative materials to develop and produce the industry-leading products in China.

Increasing quality of Chinese tile products provides opportunities for firms offering ceramic technology, machinery, materials and services.

Finally, this study demonstrates that to form accurate views on trends in a complex and dynamic industry such as the Chinese ceramic tile industry, a rigorous methodology, that involves detailed product categorisation, mixed methods (qualitative/quantitative) and adherence to triangulation principles, is required.

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