

Policy incoherence as a barrier to sustainable industrial transformation in the Chinese furniture industry

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Abstract

Under the 15th Five-Year Plan, the Chinese furniture industry is undergoing a major shift toward smart and green development. This study asks how standardization pressures under the 15th Five-Year Plan are translated into firm-level transformation, and why coordinated upgrading fails. Data were collected through semi-structured interviews with nine stakeholders between August and September 2026. Grounded theory analysis of interview transcripts coding identified 158 concepts, 23 subcategories and 5 main categories. This study builds a framework in which institutional fragmentation leads to capability differentiation and then to path stratification, with the barriers arising at the end of this chain feeding back into and sustaining the fragmentation that produced them. The Chinese furniture industry faces dual pressure from domestic policy requirements and international standard barriers. Standardization produces capability differentiation between leading firms and small and medium-sized enterprises. The core barrier is a conflict between fire safety and environmental standards. Fire safety authorities require workshop windows to open for smoke extraction, while environmental authorities require the same workshops to stay sealed. These findings provide empirical evidence of the policy incoherence that SDG 17.14 seeks to address. They show that fragmented institutional arrangements constrain progress on sustainable industrial upgrading, even where firms possess both the willingness and the technical means to comply. The study also suggests a way to resolve this conflict. The study contributes to understanding how institutional design shapes the feasibility of sustainability transformation in traditional manufacturing sectors.

1. Introduction

Chinese manufacturing is shifting from large-scale expansion to quality improvement, and standardization has become central to that shift. The 15th Five-Year Plan raises standardization to a strategic goal [1]. This changes standardization from a quality management tool into a core element of industry competition [2]. However, standardization comes with a full upgrade of mandatory environmental standards [3]. This creates dual pressure for traditional manufacturing. Firms are expected to pursue green transformation and to meet increasingly strict compliance requirements at the same time [4]. For the furniture sector, the Plan sets out requirements for smart and green manufacturing, backed by mandatory national standards. These requirements reach into the design of production facilities and the daily operation of the shop floor. The Chinese furniture industry is not a marginalized sector but a microcosm of the country's traditional manufacturing transformation. Yet it faces both traditional manufacturing dilemmas and unique transformation challenges [5]. For example, industrial clustering is strong in this sector. Clustering brings advantages such as complete supply chain support and technology spillover. However, it also leads to transformation difficulties. Firms competing on price within a cluster have little room to invest in standardization. Geographic concentration also makes it administratively convenient for regulators to suspend production across an entire area at once [6]. A second challenge is heavy export dependence: international markets require strict environmental certification, while domestic consumers are unwilling to pay a premium for higher standards [7]. This gap between international requirements and domestic willingness to pay raises production costs.

However, existing literature pays very little attention to the furniture industry, which is out of proportion to its economic weight in China. Standardization is not only a regulatory instrument, but also a mechanism through which sustainability commitments are translated into enforceable requirements at the production front line [3]. Although SDG 17.14 calls for enhanced policy coherence for sustainable development, empirical evidence on what such incoherence looks like inside a traditional manufacturing sector remains limited [8]. The Chinese furniture industry offers a case in which these tensions can be observed directly, because its transformation requires firms to retrofit production processes with cleaner technologies (SDG 9.4), to reduce waste and improve resource efficiency across the product life cycle (SDG 12.2, 12.5), to secure safe working environments for an ageing shop-floor workforce (SDG 8.8), and to draw on sustainably managed timber and bamboo resources (SDG 15.2). These goals are pursued by separate administrative departments [9], and whether their requirements are mutually compatible at the point of production has not been examined. This study examines that question empirically and considers how institutional design at the national level (SDG 16.6) bears on the feasibility of sectoral sustainability targets.

Three gaps emerge from existing research. The first is an empirical gap. Research on environmental enforcement in China concentrates on the vertical relationship between central and local government [6]. What a firm faces when several departments impose technically incompatible requirements on the same stage of production has not been examined. The second is a contextual gap. Existing work on regulatory fragmentation has not been applied to the Chinese system of governance [9]. The third is a methodological gap. Large-sample quantitative work relies on disclosure data from listed companies and therefore does not reach the small and medium-sized firms that make up the bulk of this sector. The fragmentation of standards as firms experience it can be reached only through qualitative data [10]. Therefore, this study focuses on three core research questions:

RQ1: Under the 15th Five-Year Plan, what standardization pressures does the Chinese furniture industry face?

RQ2: How do different stakeholders respond to standardization-driven transformation, and what differences exist in their transformation paths?

RQ3: What are the fundamental barriers that prevent stakeholders from achieving standardization transformation together?

To answer these questions, this study draws on semi-structured interviews with stakeholders across the sector. It develops a three-layer framework linking institutional fragmentation, capability differentiation and path stratification. Within this framework, the institutional environment, firm capabilities, and transformation pathways form a sequential chain, with each link establishing the preconditions for the next. Fundamental obstacles encountered during this process feed back into the institutional environment, reproducing the very fragmentation that originally gave rise to them. Consequently, the framework exhibits both sequentially along the primary chain and recursiveness at the foundational

level. The study findings address SDG 17.14 by demonstrating how institutional design choices at the sectoral level constrain progress on SDG 9 and SDG 12.

2. Literature Review

2.1 The Chinese furniture industry and its transformation pressures

The Chinese furniture sector is resource-intensive and labor-intensive, entry barriers are low, the industrial structure is highly fragmented, and micro and small firms dominate [11]. Chinese manufacturers depend substantially on imported timber, which leaves margins directly exposed to movements in raw material prices [12]. Studies have shown that a considerable share of the timber entering production is converted into residue, and that the associated costs represent a continuing charge against turnover [13]. As environmental requirements have tightened, adoption of eco-efficiency measures in Chinese traditional manufacturing has nonetheless been slow, owing to limited awareness of environmental impact, poor understanding of the applicable regulations, a shortage of staff able to identify and apply improvement technologies, and restricted access to green credit [4]. Traditional wood processing in the sector has been characterized as low in standardization, highly fragmented and limited in automation [14]. This diagnosis places standardization at the center of any account of how the industry might upgrade, yet the mechanisms through which standards reshape firm behavior have rarely been examined directly.

2.2 Theory and firm responses to environmental requirements

Research on how traditional manufacturing firms respond to environmental requirements has drawn heavily on institutional theory [15]. The theory holds that organizations act under three forms of institutional pressure: coercive pressure, mimetic pressure, and normative pressure [15]. In Chinese traditional manufacturing, the coercive pressure carries most of the explanatory weight [6], because standardization and green transformation are driven from the top down through binding law, mandatory standards and regulatory incentives rather than through voluntary industry norms. Regulatory requirements transmitted through supply chains push firms to build environmental capability, and firms holding more institutional resources are better able to absorb new institutional demands [16] and turn them into competitive advantage [17]. At the same time, institutional pressure on its own does not account for the variation observed in how firms change. Explanations have been sought in firm characteristics and managerial interpretation. This literature treats institutional pressure as a force acting in one direction varying in intensity but not in direction. What has received far less attention is the possibility that the institutional pressures reaching a firm are not mutually consistent. Institutional isomorphism theory predicts that organizations in the same field will become similar when they face the same pressures [15]. This prediction rests on one condition. Coercive pressure must be internally consistent, so that a firm can comply if it responds fully [18]. That condition does not hold when several

legitimate authorities impose requirements on the same production process that cannot all be met [19]. Compliance then becomes impossible to achieve. Under this condition, firms differ not in their willingness to comply, but in their ability to manage conflicting requirements [20].

2.3 Standards as China's primary instrument for green transformation

European countries rely on market-based instruments and voluntary certification [3], whereas China relies on mandatory standards and administrative enforcement [1]. This difference means that the effect of a standard in the Chinese context depends on the process of enforcement itself, rather than on whether firms choose to adopt it. The Circular Economy Promotion Law, enacted in 2009, marks an important point in the development of China's green transformation policy [21]. Made in China 2025 named green manufacturing as one of its principal tasks, and successive Five-Year Plans have raised the standing of sustainable development in industrial policy [22]. The revised Standardization Law, in force since 2018, established five categories of standard: national, industry, local, group and enterprise [1]. For the upgrading of traditional industries, the Fifteenth Five-Year Plan requires that national standards take a leading role, supported by digital and green technologies and by constraints from environmental and safety regulation. Earlier research divides environmental policy instruments into three groups: command-and-control, market-based, and information instruments [23]. A technical requirement in a standard translates directly into investment decisions and operating procedures at firm level, whereas an environmental tax requires the capacity to collect revenue, and emissions trading requires pollution rights to be defined in law and a market infrastructure to be built [24]. This helps explain why China pursues the greening of traditional manufacturing through standard setting rather than price signals, particularly in sectors that are fragmented and dominated by small and medium-sized firms [25]. It also means that the way standards drive change in firms is engineering in nature rather than economic [3].

2.4 Vertical enforcement and horizontal fragmentation in Chinese environmental regulation

Environmental policy in China is made centrally and implemented by local government, but implementation has long been difficult [26]. The underlying reason is that local governments have little incentive to give priority to environmental issues [27]. Growth in GDP carries more weight than other measures in the evaluation system, which pushes local governments to pursue economic growth even at the expense of the environment [28]. Earlier research introduced the concept of blunt force regulation, which refers to the forced closure or demolition of factories [6]. Blunt force regulation has two defining features. The first is that restrictions are applied across the board, without distinguishing whether a firm complies. The second is that officials are authorized to use extreme measures so that action takes effect immediately. The primary aim of blunt force regulation is not to make firms observe emission standards but to overcome principal and agent problems within the bureaucracy. Because closure or demolition is immediately visible, higher levels can verify what local officials have done and make the threat of punishment credible. Empirical results show that cities with lower fiscal revenue are more likely

to face blunt force regulation [6]. Campaign style governance, of which central environmental protection inspection is the main example, reduced air pollution in the short term, but its longer-term effect is selective. Once the inspection teams left, only the pollutants that are easiest to detect and that attract the most public complaints continued to decline, and the effect was weaker where ties between local government and business were close [29]. Because compliant and non-compliant firms face the risk of sudden closure, observing the law does not in itself protect a firm [30]. Firms therefore face routine supervision and campaign style rectification at the same time, and the mixed signals make it hard for them to judge how to respond and how to protect long-term investment [30]. Meeting a standard requires a firm to invest before any return appears, and where enforcement is inconsistent the willingness to invest weakens.

The research discussed so far concerns the vertical relationship between central and local government. A separate body of work examines the horizontal dispersion of regulatory authority. In the Chinese context, this form of power dispersion has long been theorized within the framework of fragmented authoritarianism [31]. Regulatory fragmentation refers to a situation in which several agencies oversee the same issue [9]. Systematic evidence shows that fragmentation raises compliance costs for firms, lowers productivity, deters new firms from entering an industry, and increases the propensity of small firms to exit. These negative effects do not stem from duplication of regulatory requirements. They stem from inconsistency between the requirements set by different agencies, and they weaken markedly where agencies coordinate their rule making [9]. The concept has so far been tested on US federal regulation and on data from listed companies. Whether comparable consequences arise in China's system of mandatory standards has not been examined. The question matters because Chinese standards are enforced administratively rather than adopted voluntarily, so a firm facing requirements from several departments at the same stage of production cannot resolve the conflict by choosing which to follow.

3. Materials and Methods

3.1 Research Design Overview

This study examines how standardization drives transformation in the Chinese furniture industry under the 15th Five-Year Plan. A qualitative design was adopted for three reasons. First, standardization-driven transformation under the 15th Five-Year Plan is a new phenomenon, and it calls for exploratory rather than confirmatory research [9; 29]. Second, the transformation involves how different parties respond, which paths they take, and where their interests conflict. These are difficult to capture through quantitative data. Semi-structured interviews can show both what happens and why actors do what they do [10]. Third, the mechanisms of interest lie at a level that existing measures do not reach, and they can be reconstructed only from the accounts of those who experience them [10]. Grounded theory was therefore chosen as the methodological foundation [32]. The analysis proceeded through three stages: open coding, axial coding, and selective coding. Concepts were drawn from the raw interview data, grouped into subcategories, and then classified into main categories. On this basis, the study builds a

model linking institutional fragmentation, capability differentiation, and path stratification, grounded in how the Chinese furniture industry operates. Figure 1 sets out the data collection and analysis process.

3.2 Participants and Recruitment

The 15th Five-Year Plan period features mandatory standard upgrades and stronger policy enforcement, which provides an ideal setting for observing how standardization operates. The sampling criteria include five aspects: stakeholder diversity [11], transformation stage diversity, industry focus [33], organizational size [34], and accessibility and cooperation [35]. For stakeholder diversity, the study covers government agencies, industry associations, companies, and front-line workers to capture the multi-party perspective of standardization transformation. For transformation stage diversity, the study selects companies at different standardization maturity levels, including early adopters and gradual adopters. For industry focus, the study concentrates on the Chinese furniture industry to control the industry variable while enabling deep contextual understanding. For organizational size, the study includes leading firms and small and medium-sized enterprises to examine capability differentiation in standardization transformation. For accessibility and cooperation, participants had to be willing to take part and to provide detailed accounts of their own experience. The recruitment started with the researcher's professional network in the furniture industry to make initial contact. Then the researcher relied on industry associations for recommendations. The associations introduced member companies, which gave access to firms that would otherwise have been difficult to reach. Snowball sampling was used [35], where participants recommended other informed individuals. However, the recruitment faced challenges. For example, industry associations initially preferred to recommend model companies rather than struggling ones. The researcher responded by emphasizing confidentiality commitments and the policy contribution of the research [36] and requesting diverse company cases. For contacting government officials, complete anonymity was provided. For managers with limited time, the researcher used flexible interview scheduling and streamlined interviews. Recruitment continued until saturation was reached, with the final two interviews producing no new concepts or subcategories. Table 1 summarizes the profile of the nine participants.

Table 1
Profile of interview participants

ID	Stakeholder type	Role	Region	Organization	Experience in the sector (years)
I1	Enterprise (small)	Legal representative	Hebei	Solid wood furniture	10
I2	Industry association	Secretary-General	Hebei	Panel furniture association	10
I3	Industry association/ Enterprise	General Manager; Executive President of the association	Hebei	Furniture brand operation	25
I4	Enterprise (large)	Sales President and designer	Hebei	Custom furniture	18
I5	Enterprise (large)	Group General Manager	Henan	Custom furniture	21
I6	Enterprise (medium)	Production employee	Hebei	Panel furniture	11
I7	Enterprise (listed)	Board Secretary	Guangdong	Custom furniture	6
I8	Enterprise (listed)	Head of regional operations	Hebei	Home furnishing retail	27
I9	Government	Official	Hebei	Environmental protection bureau	30
Notes: Participants are identified by codes (I1–I9) to preserve anonymity. Organization names are described by business type rather than by name. Firm size follows the classification standards for small and medium-sized enterprises issued by China's Ministry of Industry and Information Technology.					

3.3 Data Collection

Before the interviews, the researcher visited three furniture manufacturing sites to become familiar with production conditions. No observation notes were made, and the visits were not coded as data. Data collection was conducted between August and September 2026, following ethical approval granted on 7 August 2026 (UM.TNC(P&I)/UMREC/2/6226). All nine interviews took place within this period. This study used semi-structured interviews because of the balance between standardization and flexibility. The interview guide covered information from four aspects: basic information, policy awareness, experience, and expectations [37]. Basic information included participant background. Policy awareness covered understanding of the 14th and 15th Five-Year Plans, channels for obtaining policy information, and standardization awareness. Experience included standardization implementation experience, green transformation experience, and smart manufacturing experience. Expectations included expectations for industry standardization development and government expectations. Interviews were conducted face to

face at participants' workplaces, which allowed the researcher to observe production conditions and helped participants speak comfortably. Interviews lasted approximately 45 minutes. Before the interviews, all participants were shown the research ethics approval documentation and briefed on the research purpose, procedures, voluntary nature of participation, confidentiality, and how their data would be used. Verbal informed consent was then obtained from each participant, including consent for audio recording. The audio recordings were transcribed within 24 hours of the interviews to ensure accuracy. After each interview, the researcher wrote reflective notes recording the atmosphere of the interview, participants' reactions, and the researcher's own assumptions and responses [36]. Transcripts were returned to participants for accuracy verification [38]. Given the potential sensitivity of the topic, the researcher watched for signs of discomfort and adjusted questioning accordingly [36]. Participants were told that data would be anonymized and no judgments would be made about participants' answers.

3.4 Data Analysis

Data analysis followed a three-level coding framework: open coding, axial coding, and selective coding. The purpose of open coding is to break down interview transcripts into units. Initial concepts were identified through line-by-line analysis [39] [32]. After becoming familiar with the raw data [40], the study interview texts were coded by line and abstracted them into higher level concepts. The open coding process produced 158 initial concepts. Axial coding aims to identify the logic between concepts and organize them into subcategories [32]. This process yielded 23 subcategories. For example, concepts related to environmental standards and fire safety standards were grouped into government policy and environmental standard construction. A paradigm model was used to identify relationships between subcategories through conditions, context, actions, and consequences. The subcategories were organized into 5 main categories which are macro level, meso level, micro level, transformation paths, and fundamental barriers. Selective coding integrates all main categories into a coherent theoretical framework and develops a storyline [37]. This finally produced a model linking institutional fragmentation, capability differentiation and path stratification. The interviews were conducted and transcribed in Chinese, and the transcripts were subsequently coded. Excerpts cited in the text were translated into English by the first author. The original Chinese transcripts are available from the corresponding author upon reasonable request.

3.5 Trustworthiness of the study

This study adopted a grounded theory approach in which the quality of the analysis rests on the transparency and traceability of the interpretive process. Trustworthiness was established through the framework addressing credibility, dependability, confirmability and transferability [41].

3.5.1 Credibility

Two strategies were used to ensure that the findings reflect what participants said [41]. The first was member checking [38]. All nine transcripts were returned to the participants after transcription. Each participant was asked to confirm that the text accurately recorded what they had said, and to point out

any wording that might identify them. Only transcripts confirmed in this way were used for coding. All nine participants confirmed their transcripts without requesting changes. The second was the diversity of sources within the interview data [42]. Participants were drawn from government, an industry association, firms of different sizes, and front-line production staff, so that accounts of the same regulatory requirements could be compared across positions. Key factual statements made in the interviews were checked against publicly available policy documents and mandatory standards issued at national and provincial levels. Where no second source confirmed a statement, it was presented as the participant's own view rather than as evidence of fact.

3.5.2 Dependability

Coding was carried out by the first author. To test whether the coding manual could be applied by researchers who had not taken part in the analysis, two rounds of independent auditing were conducted [41]. The auditors were two doctoral researchers trained in qualitative research, working on qualitative interviewing and coding analysis. Neither took part in the interviews or the initial coding, and neither was an author of this paper [43]. Each auditor received the coding manual and a stratified random subsample, presented in random order and without the first author's own classifications. The auditors worked alone and did not discuss the task with the authors or with each other. The first round showed that the boundaries between subcategories were not defined clearly enough, with differences falling mainly between policy content and enforcement action, and between demand-side and supply-side statements. The operational definitions were therefore revised and decision rules across categories were added. In the second round, the remaining differences concentrated on a small number of concepts. These concepts showed both where a problem was located and how the transformation was unfolding, so either classification could be justified. For these concepts, the final placement was decided by the research team in discussion, according to which aspect the participant emphasized.

3.5.3 Confirmability

During coding, the researcher remained alert to own assumptions and was careful not to impose the framing of existing policy documents on what participants had said [41]. The reflective notes written after each interview were consulted during coding, to check that interpretations followed from what participants said rather than from expectations formed beforehand [36]. All initial concepts, the interview statements they were drawn from, and their assignment to subcategories and main categories are set out in Supplementary Tables.

3.5.4 Transferability

The study provides a thick description of the research setting [41]. This covers the type of organization, the level of post and the size of firm for each participant. Participants came from four groups: government departments, an industry association, large, medium and small enterprises, and front-line production staff. Seven participants were based in Hebei, with one each in Henan and Guangdong. The concentration in Hebei should be considered when judging how far the findings apply elsewhere. The two participants based outside Hebei described the same conflict between fire safety and environmental

requirements, which suggests that the pattern is not confined to a single province. This information allows readers to judge how far the findings apply to other furniture clusters or to other traditional manufacturing sectors.

3.6 Limitation of the methodology

Data were collected from nine participants, seven of whom are based in Hebei Province. Local enforcement practices differ across furniture clusters in China, and the patterns identified here may not extend to other regions without modification. The study is confined to furniture manufacturing, and the data were collected at a single point in time, at the start of the 15th Five-Year Plan period. How firms adjust their responses as the policy period unfolds was not examined. The study relies on interview data alone. Site visits were made but were not systematically documented. Future research combining interviews with structured observation or archival records would allow the mechanisms identified here to be examined from more than one angle. Despite these limitations, the study offers a perspective that is rarely taken in research on standardization. Interviews across government, industry associations, firms of different sizes and front-line production staff allow the same regulatory requirements to be seen from several positions at once, and the conflicts that emerge between them are difficult to observe from any single vantage point.

4. Results

Three-level coding produced 158 initial concepts, which were grouped into 23 subcategories and 5 main categories. This shows the multi-level mechanisms and perspectives of standardization driven transformation toward smart and green development in the Chinese furniture industry under the 15th Five-Year Plan. Table 2 sets out the composition of each main category, together with the number of subcategories and concepts it contains. The full list of concepts and their assignment to subcategories is provided in Supplementary Tables. These categories are not independent of one another. Institutional conditions at the national level shape firm capabilities, which in turn determine the transformation paths available to enterprises. The fundamental obstacle, however, does not lie at a later stage of this sequence; rather, it originates from the very same state of institutional fragmentation found at the chain's starting point and ultimately feeds back into it. Consequently, even as the transformation progresses, the problems inherent in this chain cannot resolve themselves. But stand in a sequence in which each shapes the next. Institutional conditions at the national level shape firm capabilities, which in turn determine the transformation pathways available to firms. Figure 2 illustrates the framework.

Domestic policy pressure and international standard barriers combine into a dual compliance burden, which reaches firms through a fragmented institutional structure. Meeting these requirements demands investment in several dimensions at the same time. This raises the threshold for transformation and separates firms according to the resources they already hold, and operational constraints on the shop floor reinforce this separation further. The outcome is not industry-wide upgrading but five stratified transformation paths. Underlying all four levels are fundamental barriers that no single actor can resolve. These barriers feed back into the macro level and sustain the fragmentation that produced them.

Table 2
Main Categories, Subcategories, and Concepts Derived from Grounded Theory Analysis

Main Category	No. of Subcategories	List of Subcategories	No. of Concepts
Macro Level	6	Government policy and environmental standards; Industry evolution and structural changes; Government supervision and enforcement; Market environment and demand; International environment; Resource environment	59
Meso Level	4	Corporate strategy and management; Supply chain management; Corporate governance; Technology upgrade	25
Micro Level	5	Production management; Human resource challenges; Cost pressure; Talent and capability; Quality control	30
Transformation Paths	5	Lean manufacturing evolution; Circular economy transformation; Digital transformation; Industry transformation and upgrading; Business model transformation	26
Fundamental Barriers	3	Lack of standard system; Policy implementation problems; Fundamental conflict between fire safety and environmental protection	18

4.1 Macro Level: Institutional Environment and Policy Pressure

The macro level includes 6 subcategories and 59 concepts. It captures the main national institutional environment and related policy pressures facing the furniture manufacturing industry. This section focuses mainly on the two most critical subcategories that directly drive transformation pressure. These are government policy and environmental standards, and international environment. Pressure from both domestic and international sources together creates dual compliance pressure for Chinese furniture industry. The remaining four are listed in Supplementary Table.

4.1.1 Domestic policy and environmental standards

Standards for the furniture manufacturing sector had been tightening before the 15th Five-Year Plan period began. In November 2023 the National Development and Reform Commission issued the bamboo-for-plastic initiative as a guide for green development, and the mandatory national standard GB 18584 – 2024. This standard was released in June 2024 and will officially come into effect in July 2025. It consolidates and replaces two previous standards, extending mandatory limits on hazardous substances from specific material categories to all furniture products. Additionally, the standard introduces a limit for total volatile organic compounds alongside existing requirements. From the effective date, products that do not comply with the standard may not be manufactured, sold, or imported.

I7 stated: "The furniture industry is working hard to achieve green development. As a major country, it contributes to global sustainable development from an industry perspective. The furniture industry will shift from scale expansion to quality improvement in the 15th Five-Year Plan stage. The industry pursues smart and green development. This reflects national industrial upgrading that is implemented at the company level. Whole-house smart systems depend on unified technical protocols, modular product systems, and standards that allow systems to communicate and connect with each other."

These requirements change how production facilities are designed and operated. However, the advancement of standardization is weakened by systematic fragmentation.

I2 stated: "A typical case of policy fragmentation is the conflict between fire safety and environmental standards." And I4 also stated: "Government policy has serious blanket shutdown problems. In winter, at year-end, and when major national conferences are held, production companies in Hebei are required to completely shut down. This makes the policy treat symptoms but not root causes. It is also not practical. It completely ignores company differences."

Fragmentation also shows up in how requirements are enforced. One participant described the conflict between fire safety and environmental standards as a typical case of policy fragmentation. This conflict is examined in following section.

4.1.2 International environment and standard barriers

In the competitive international environment, Chinese furniture companies face constantly upgraded standard barriers and dual compliance dilemmas.

I2 stated: "For exports, European and American countries have simple design requirements. But they have high requirements for raw materials, environmental performance, and process quality. Each country requires pre-export inspection and post-arrival inspection. If products do not meet standards, they will be returned." Meanwhile, I3 stated: "China is gradually approaching world lean standards, and under trade war, Chinese companies can directly build factories in raw material origin locations to solve the product origin problem. Mexico can be considered. This approach of using location to meet standards also reflects the weaknesses in Chinese companies' international competitiveness and their difficult survival space."

This process of approaching international standards is most obvious in leading companies.

I7 stated: "The company became one of the drafting organizations for the new national standard and received a work certificate. It leads green and healthy home sustainable development with high standards and shapes a new environmental pattern for the industry."

Domestic and international requirements reach firms as a single compliance burden, and how firms absorb it depends on the resources they already hold.

4.2 Meso Level: Corporate Strategy and Operational Capability

The meso level includes 4 subcategories and 25 concepts. It reflects the degree of strategic response and operational capability differences in the Chinese furniture manufacturing industry. At the meso level, this study examines two types of responses. One is strategic responses of leading firms driven by resource advantages. The other is passive strategic responses of SMEs under resource constraints. Leading firms rely on their advantages in capital, resources, technology, and talent. They transform standardization pressure into strategic development opportunities.

4.2.1 Active strategy of leading firms

For strategic planning, leading firms treat standardization as an opportunity for strategic repositioning.

I7 stated: "Chinese leading companies are moving into smart home development. They are transforming from custom furniture companies into smart living solution providers. They provide one-stop smart solutions for scenarios and use artificial intelligence and domestic internet of things technology as the core and build complete smart ecosystem platforms."

For supply chain management, leading firms also use their market position to extend standards requirements to their upstream and downstream partners.

I4 stated: "Upstream and downstream companies must have environmental proof that meets regulations. Companies also need to shift from product thinking to downstream user thinking."

However, implementing forward-looking strategies requires continuous investment across several dimensions.

I5 reviewed the company's investment history and stated: "After 2007, software systems began to be used. Costs are multi-dimensional such as talent costs, error costs, time costs, production and operation costs, and so on."

4.2.2 Passive strategy of small and medium-sized enterprises

In contrast, SMEs are in a passive position constrained by the resources they already hold. Compliance itself absorbs a substantial share of what they can spend.

I1 stated: "The government requires us to carry out self-inspection, for example on fire equipment. But operating fully according to what the government requires produces high costs. Installing the environmental system cost around a hundred thousand yuan."

Because compliance leaves little margin, how far a firm can go beyond it depends largely on external support.

I2 stated: "How far a firm goes with lean manufacturing depends to some extent on how much the state subsidizes it and how strongly upgrading is encouraged. On insurance and work injury, firms provide protection only at the minimum level the government requires."

Once a transformation involves manufacturing equipment, the barrier to entry rises sharply. Even mid-sized enterprises that have already invested in automation view cost as a primary constraint.

I6 stated: "After years of development and reform, our company was the first to introduce international advanced fully automated production lines. But the machinery cost is nearly one million yuan. Artificial Intelligence can indeed help design products precisely. But the cost is high."

These accumulating differences have led to a divergence in industrial structure.

I2 stated: "Factories are polarizing. Very large plants become comprehensive, while small ones become narrow and specialized. Large plants pay much more attention to digitalization."

4.2.3 Governance structure as a soft standard

Standardization pressure extends beyond production processes to the governance structures through which firms make and execute decisions. A company's governance structure determines whether external standards can be translated into internally enforceable procedures, yet the distribution of this capability is uneven.

I8 stated: "Standardization drives not only production and technology upgrading, but also the upgrading of a firm's governance capability."

In the 15th Five-Year Plan stage, competition is no longer confined to products or channels but extends to governance capability, decision-making mechanisms and execution efficiency. A board structure that complies with corporate law and regulatory requirements forms the foundation for sound corporate decision-making, while the independent director system embodies the institutional standards of listed company governance. Newly appointed directors are expected to possess expertise in relevant fields, such as furniture retail, digital transformation, supply chain management, capital operations, and legal compliance.

I8 stated: "Governance structure is a soft standard that provides organizational support for firms pursuing digital transformation and new retail models. "

Interview data also indicate that stability is a condition for transformation. Departing directors continue to hold shares and take positions in subsidiaries to ensure strategic continuity, and the firm treats transformation as gradual organizational adjustment rather than radical overhaul.

I8 called: " transforming within stability and innovating within regulation."

This type of prudent, governance-led transformation can only be achieved by enterprises that already possess the requisite institutional capabilities.

4.2.4 Technology upgrade as a differentiator

Technological upgrades represent the most significant material manifestation of disparities in capabilities. Advanced equipment and digital infrastructure are concentrated among enterprises capable of absorbing the associated capital and technical requirements; this trend will further widen the gap in development trajectories between industry leaders and SMEs.

I6 stated: "Following years of industry development and reform, our company took the lead in introducing state-of-the-art, fully automated production lines." I2 noted: "Large-scale factories place a much higher priority on digitalization."

4.3 Micro Level: Production and Operation Challenges

The micro level includes 5 subcategories and 30 concepts. This section focuses on the two subcategories that bear most directly on firms' capacity to implement standardization: human resource challenges and talent and capability. Interview results indicate that even enterprises with the willingness to transform and the necessary resources face severe constraints at the shop-floor level.

4.3.1 Workforce ageing and capability substitution

The ageing of front-line workers is a serious problem in the furniture manufacturing industry. Participants proposed two diametrically opposed explanations: harsh workshop environments reduced the supply of young workers, whereas automation lowered the demand for labor. The latter was not a constraint but rather a response to the former, applicable only to enterprises that had already invested in

automated production lines. Consequently, an aging population posed the most severe constraint on firms least capable of substituting capital for labor, thereby reinforcing the disparities in firm capabilities observed at the meso-level.

I2 stated: "The furniture production workshop environment is poor, so there are fewer employees. Young employees are decreasing and workers over 55 are many, so ageing is serious. This may also be because companies now have automated equipment that replaces manual labor, which also reduces the number of employees".

4.3.2 Gaps in technical talent

Research findings at the micro level also indicate that the transition to standardization is constrained by a shortage of technical talent, which directly affects enterprises' ability to implement standardization requirements. These findings at the micro level reveal that standardization transformation difficulties are not only about money, but they are also about structural shortage of human resources, and gaps in technical capability.

I4 points out: "Relevant personnel need to possess environmental awareness and a sense of responsibility, be familiar with eco-friendly materials, master green production technologies, and understand environmental protection standards."

4.4 Transformation Paths: Five Differentiated Levels

The transformation paths include 5 subcategories and 26 concepts. They show how institutional fragmentation and capability differentiation produce stratified responses to standardization pressure. These pathways do not stem from voluntary choices but are the product of the interplay between regulatory requirements and the existing resources of enterprises. Consequently, firms with varying levels of capability adopt transformation paths that differ in nature, further exacerbating the polarization observed at the meso-level.

4.4.1 Identifying Transformation Paths

This study identifies five transformation paths driven by standardization in the furniture industry. These paths are not voluntary choices but emerge from the interaction between regulatory requirements and company capability. Table 3 outlines the technical requirements, funding needs, and key constraints for each pathway.

Path 1: Lean manufacturing. Lean manufacturing is a goal pursued by enterprises. However, transitioning to automated production requires an investment exceeding one million yuan which a sum that far surpasses the annual profits of small enterprises. Interview data reveals that the progress of this transformation relies entirely on government subsidies.

As interviewee noted, "How far a company can advance on the path of lean production depends, to a certain extent, on the scale of state subsidies."

This situation creates a subsidy lock-in effect, making policy continuity a critical bottleneck for development.

Path 2: Circular economy transformation. The transition to a circular economy directly addresses environmental standards through waste recycling. However, the implementation process faces two structural obstacles: the difficulty of obtaining legal qualifications for waste recycling and regulatory conflicts.

Path 3: Digital transformation. Smart systems depend on unified technical protocols, modular product systems, and standards for system communication. These capabilities are primarily concentrated among industry leaders with well-established research and development departments. For SMEs attempting to pursue Path 3 success is often elusive due to the prohibitive costs of acquiring talent and a lack of technical infrastructure. Consequently, Path 3 is effectively restricted to industry leaders.

Path 4: Industry transformation upgrading. Industrial upgrading has driven an expansion in the scope of certification which extending from individual materials to entire spatial environments that means marking a shift from a singular focus on formaldehyde compliance to a comprehensive system encompassing indoor air quality, humidity, and health standards. This transition necessitates the harmonization of standards overseen by different government agencies, each with its own independent enforcement mechanisms, across fields such as environmental protection, materials, manufacturing processes, and spatial health. The challenges involved in achieving such coordination are institutional rather than technical, stemming from a lack of communication and collaboration among agencies, as well as divergent verification methods. Only enterprises with dedicated environmental management departments are equipped to navigate this complex landscape.

Path 5: Business model transformation. The transformation of business models is driving companies to shift toward integrated marketing. This path faces a fundamental paradox: the need for standardization in delivering comprehensive solutions clashes with customer preferences for mass customization. Resolving this contradiction requires AI-driven decision-making systems and exceptional organizational agility capabilities possessed by only a few enterprises.

As interviewee noted, "Achieving standardization while simultaneously meeting personalized needs is, in itself, a paradox." Across the entire industry, perhaps only one or two companies can successfully navigate this path.

Table 3
Five transformation paths characteristics and constraints

Pathway	Technical Requirement	Capital Investment	Talent Demand	Primary Constraints	Typical Firm Size
Path 1: Lean Manufacturing	Medium	Medium	Medium	Subsidy dependence Workforce aging	All sizes
Path 2: Circular Economy	Medium-High	Medium-High	Medium-High	Fire safety and environmental conflict Waste treatment costs and licensing	Medium or Large
Path 3: Digital Transformation	High	High	High	System integration costs Technical talent shortage	Leading firms
Path 4: Industry Upgrading	High	High	High	Multi-standard coordination Spatial health evaluation systems	Leading firms
Path 5: Business Model Innovation	Very High	Very High	Very High	Reconciling standardization with mass customization	Top-tier firms
Note: Capital investment estimates derived from interview statements. These are indicative ranges based on participant reports rather than systematic financial data					

4.4.2 Path Hierarchy and Capability Matching

These five paths are not parallel; they form a clear hierarchy based on capability requirement. Path 1 is the necessary path for all companies. Paths 2 and 3 are directions that medium capability companies can choose. Paths 4 and 5 are directions that leading firms can choose. While industry leaders can simultaneously explore multiple development paths, small enterprises are often confined to a single trajectory. Structural obstacles such as an aging workforce, talent shortages, high equipment costs, and institutional conflicts make it difficult for small enterprises to break free from this predicament, leaving them trapped in a state of path lock-in. Consequently, the transition toward standardization does not represent a uniform upgrade for the entire industry but rather a process of divergence. So only leading enterprises possess the capacity to navigate and resolve these institutional conflicts. Figure 3 illustrates the hierarchical structure of this study, revealing how capability requirements escalate across the five pathways and how institutional fragmentation creates an insurmountable chasm between leading firms pursuing deep transformation and small enterprises focused on basic compliance.

4.5 Fundamental Barriers: Deep Conflicts from Institutional Fragmentation

This level includes 3 subcategories and 18 concepts. It reveals the deep institutional conflicts that obstruct standardization implementation. During interviews, one contradiction was repeatedly mentioned: an irreconcilable opposition between fire safety and environmental protection standards. This contradiction is not only a technical problem but a structural manifestation of institutional fragmentation. The two departments operate independently with incompatible mandates, creating requirements that firms cannot satisfy simultaneously. This conflict exemplifies how fragmented governance undermines the transformation pathways identified.

4.5.1 Fundamental Opposition Between Fire Safety and Environmental Standards

The biggest dilemma for the furniture industry is the fundamental opposition between the goals of fire department and environmental protection agency standard. This is not a coordination problem but a fundamental institutional conflict.

I2 stated: "Fire departments and environmental protection agency have conflicts. For example, the workshop window issue. If windows are open, the environmental protection agency considers it unorganized emissions. If windows are closed, fire departments consider it a fire hazard." I9 provided an explanation: "According to fire department requirements, production workshops must have natural smoke exhaust windows to enable personnel evacuation during fires. Completely opposite, the environmental protection agency insists that workshops must be sealed to maintain negative pressure. All waste gas must be collected and discharged only after purification. This requires workshops to be completely sealed with no unorganized emissions. "

This contradiction manifests as an endless loop of opening and closing windows. Facing opposing requirements from two departments, companies fall into a violation dilemma. The two departments do not communicate. Large companies can use relationships to find leaders for coordination. Small companies can only rely on luck. This fundamental contradiction directly prevents firms from pursuing circular economy (Path 2) and industry upgrading (Path 4) transformation. It reflects deeper problems of institutional fragmentation: multiple departments operate independently with different assessment indicators. Technically these two departments standard are not impossible to coordinate. For example, Electric smoke exhaust windows can open automatically when a fire alarm is triggered, while remaining sealed during normal operations. However, achieving this coordinated functionality requires communication among the relevant departments.

I2 stated: "We hope the country establishes a standard system and creates an objective standard scoring system. National standards, industry standards, local standards, and enterprise standards create extreme confusion. The fire department checks according to one set of standards. The environmental protection

agency checks according to another. We do not know which one to follow. What is really needed is an integrated and coordinated standardization system." Meanwhile, I9 stated: "Departments should share information with each other to avoid companies being exhausted responding to inspections and provide clear unified rectification paths. Company personnel most expect that the national level can coordinate overall and establish a comprehensive standard."

4.5.2 System Conflicts and Reform Needs

Fundamental barriers persist even where leading firms achieved transformation results. The fire safety and environmental protection level conflict remain unsolved. Standard coordination mechanisms are missing, and standardization system fragmentation continues. Coordination costs under multi-dimensional constraints rise. There is a need for integrated multi-standard coordination systems. Besides fire safety and environmental protection conflicts, blanket policy problems further increase transformation difficulty.

I7 stated: "The transformation process needs a more complete standard system. Environmental standards, material standards, process standards, and spatial health evaluation standards need coordination." I4 stated: "Industry differentiation is intensifying. For example, the gap between leading firms and SMEs expands. Supply chain disruption risks and employment pressure increase."

These institutional conflicts have led to polarization. Due to the continued fragmentation of standardization frameworks and inconsistent implementation, small enterprises remain locked into Path 1, whereas leading enterprises advance through multiple pathways. This polarization is not a temporary phenomenon but a structural one. In the absence of coordination mechanisms at the national level and with persistent institutional conflicts, this dual industrial landscape will endure.

I2 stated: "Factories will show polarization. Super large factories appear with comprehensive characteristics and focus more on digitalization and smart systems. Small factories appear with small but excellent and specialized characteristics."

5. Discussion

This study examines how standardization drives transformation in the Chinese furniture industry under the 15th Five-Year Plan. The finding is that institutional fragmentation creates a high transformation threshold, producing path polarization rather than industry-wide upgrading. This section addresses the three research questions and compares findings with previous research on standardization, institutional barriers, and sectoral sustainability transformation.

5.1 RQ1: Under the 15th Five-Year Plan, what standardization pressures does Chinese furniture industry face?

This study finds that the Chinese furniture industry faces dual standardization pressure from domestic and international sources, each imposing distinct technical and economic requirements.

Domestically, the 15th Five-Year Plan has elevated standardization to a strategic industrial policy tool, establishing mandatory technical standards that fundamentally alter the design and operational processes of production facilities. Internationally, key export markets have established stringent environmental and material standards as mandatory conditions for market access. These two types of pressure operate independently, preventing enterprises from resolving conflicts through the balancing of priorities and instead forcing them to contend with both pressures simultaneously [44]. Consequently, this dual pressure is not merely additive rather, it collectively raises the technological and economic thresholds for enterprise transformation [19].

At the domestic level, the 15th Five-Year Plan mandates that Chinese furniture industry pursue development through intelligent, green, and high-end transformation, aiming to shift the focus toward quality improvement. This transition is enforced through mandatory standards. For instance, GB 18584 – 2024 tightens limits on hazardous substances. Relevant regulations extend their scope from specific material categories to all furniture products and stipulate that compliance is a prerequisite for production and sales. Such requirements do not exist in isolation, while meeting these regulations, enterprises must also comply with various other requirements established and enforced by different competent authorities [45]. For enterprises that do not yet meet these compliance benchmarks, satisfying requirements simultaneously demands financial investment and technical capabilities far exceeding what is needed for upgrades in a single area. Such requirements raise the transformation threshold as enterprises must simultaneously invest across multiple technical fronts rather than sequentially upgrade single dimensions. At the international level, markets in Europe and the United States treat compliance as a mandatory condition for market access, failure to pass inspections results in product returns and the loss of access rights. Consequently, these requirements act as compulsory constraints rather than mere optional preferences [46]. In contrast, domestic consumers are relatively price-sensitive and reluctant to pay a premium for eco-friendly attributes [7]. This compels export-oriented enterprises to invest significant resources in developing high-standard capabilities that are not required in the domestic market, whereas enterprises focused on domestic sales struggle to make investments of a similar scale due to cost pressures. Ultimately, this has led to a divergence in the capability development paths of export-oriented and domestic-oriented manufacturers.

This dual pressure that stemming from mandatory domestic upgrades and stringent export market requirements has created a situation where standardization is no longer merely a tool for quality management. It has become a strategic differentiator that distinguishes enterprises based on their capabilities. Within the framework of the Sustainable Development Goals (SDGs), these dual pressures should theoretically reinforce one another. Domestic policies SDG 17.14 (aimed at enhancing policy coherence for sustainable development) and international market demands are jointly driving progress toward SDG 12.2 (promoting responsible stewardship of the Earth's raw materials) and SDG 12.5 (reducing total waste generation). However, as this study reveals, because these pressures operate

through separate governance channels and lack coordination mechanisms [47], they often result in compounded compliance costs rather than generating a unified, coherent signal [9]. Enterprises are compelled to navigate multiple parallel sets of requirements simultaneously, each with its own distinct verification methods and timelines.

5.2 RQ2: How do different stakeholders respond to standardization-driven transformation and what differences exist in their transformation paths?

This study finds that the four stakeholder groups interviewed respond in markedly different ways to the same pressures for standardization. These divergent responses stem from differences in existing capability accumulation, institutional standing, and strategic autonomy, rather than from differences in intent or perception.

Enterprises adopt varying strategies based on differences in their resources, the paths taken by industry leaders and SMEs differ in nature rather than merely in degree. Neither regulators nor industry associations drive this transformation process. Front-line employees, meanwhile, have no strategic agency whatsoever, their situation is entirely contingent upon the path their employers can take. These disparities do not stem from subjective preferences but are determined by the actual capabilities and circumstances of each party. The demand for coordination from above does not come only from the enterprises bearing compliance costs. Government departments and industry associations alike describe an integrated standard system and interdepartmental information sharing as conditions that would have to be established at a higher level. Regulators position their own role as guarding a baseline that can be supervised and enforced, not as leading the formulation of standards. This self-positioning changes the nature of the fragmentation problem: it is not a complaint about costs voiced by the regulated, but a structural constraint acknowledged jointly by the regulated, by intermediary organizations, and by the front-line regulatory departments themselves. This is precisely where cross-stakeholder interviewing earns its value. Viewed from different positions, the same requirement reveals not a conflict of interests, but the absence of any party situated to resolve it [9]. The difference between enterprises lies not in willingness to transform but in whether accumulated capability can support the required investment. The capability of leading firms is the product of accumulation over time [48]. From the initial introduction of software systems to equipment renewal at scale, to the integration of front-end and back-end manufacturing, and finally to the full deployment of automated production lines, this process spans more than a decade, with each step built upon the one before it. Such firms are therefore able to sustain simultaneous investment across multiple dimensions, to convert standardization pressure into strategic repositioning, and to extend standard requirements upstream and downstream along their supply chains. SMEs face a different situation. Compliance alone absorbs the greater part of their disposable resources, and how far they can carry transformation depends largely on the scale of external subsidy [49]. This is not conservatism in choice but the absence of any margin that can be compressed. Once the gap has opened it is difficult to close, and the outcome is not the exit of smaller firms from the market but a divergence in industrial structure: large plants move toward comprehensive operations with greater emphasis on digitalization, while small plants turn toward narrow specialization.

Front-line workers have no strategy available to them in this process; their position is determined by which path their employer can take. In firms that have completed automation investment this appears as the displacement of posts by equipment, and in those that have not, as working conditions that resist improvement and a continuing outflow of younger labor [50].

This divergence in industrial structure bears directly on the realization of the SDGs within the furniture industry. Sustainable industrial transformation is concentrated among enterprises that already possess capital, technology, and human resources. Aggregate progress under SDG 9 (building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation) therefore conceals disparities within the industry and sits uneasily with SDG 9.3 (increasing the access of small-scale industrial enterprises to financial services and integrating them into value chains and markets) [51]. At the same time, SMEs carry the greater part of employment in this sector, and the structural risk created when their transformation stalls bear on SDG 8.5 (achieving full and productive employment and decent work for all, with equal pay for work of equal value). The transformation threshold has risen beyond the reach of most firms not simply because the standards are demanding, but because the requirements cannot be satisfied at the same time. This directs the question to a further level: why such mutually incompatible requirements persist, and why no party can remove them.

5.3 RQ3: What are the fundamental barriers that prevent multiple parties from achieving standardization transformation together?

This study reveals a recurring conflict between fire safety and environmental standards, which participants identify as a core obstacle to achieving a coordinated, standardized transformation. The root of this conflict lies in the independent functional requirements of the respective departments rather than in technical incompatibility.

This conflict is a prime example of institutional fragmentation within the standardization landscape rather than a technical issue. It stems from the incompatibility of the two departments' performance objectives at the institutional design level: the fire department prioritizes the safety of life and property, while the environmental department focuses on pollution control [52]. Operating independently, each department's requirements are legitimate within its own mandate, yet they prove impossible to satisfy simultaneously when applied to the same workshop [8]. Prior work on this sector has indicated that institutional barriers and a lack of policy support are the primary external constraints facing the transformation of this sector [10]. However, such studies often treat institutional barriers as given conditions without clarifying their underlying causes. This study posits that the phenomenon stems from the fact that when various departments independently set performance targets, the resulting requirements often lack coordination at the implementation level. Institutional fragmentation manifests in two ways at the implementation level. First, there is a lack of integration mechanisms during the standard-setting process. Fire safety standards and environmental standards are managed by separate departments with uncoordinated formulation processes, no systematic cross-departmental integration

mechanism has been established [31], inter-departmental collaboration networks are difficult to sustain, and institutional support remains limited [52]. Consequently, enterprises find themselves caught between two sets of standards, unable to determine which takes precedence. Second, implementation is characterized by a one-size-fits-all approach. Fragmentation makes it difficult for regulators to adopt differentiated measures based on the actual circumstances of individual enterprises, leading them instead to impose uniform, region-wide mandates. During winter, the end of the year, or periods when major conferences are held, manufacturing enterprises in the region are required to halt production entirely, regardless of whether they meet compliance standards. While such measures yield immediate results and facilitate oversight by higher authorities, they fail to address the underlying production conditions that generate emissions, thereby treating the symptoms rather than the root cause [6]. The result is that even after enterprises have made the required investments, they still cannot secure stable production prospects based on their compliance. The premise of isomorphism theory that adequate compliance-oriented responses lead to convergence fails to hold true in this instance and this explains why identical pressures for standardization did not result in industry convergence [19].

This study provides empirical insights into Sustainable Development Goal 17.14 (enhancing policy coherence for sustainable development). Policy incoherence stems not from poor inter-departmental communication, but rather from the structural nature of the institutional arrangement of sectoral accountability [47]. Each department acts legitimately within its own mandate; conflicts arise at the intersections areas that fall outside the specific purview of any single party. The interview data cited earlier confirms this. Because no entity is tasked with resolving these conflicts, they persist over the long term. The relationship between these obstacles and the institutional environment is not unidirectional; while fragmentation generates obstacles, their persistence, in turn, perpetuates that fragmentation. Consequently, the fragmentation observed in the furniture industry is self-sustaining rather than a transitional phenomenon of the transformation period; this explains why standardization has led to industrial divergence rather than industry-wide upgrading.

6. Conclusion

6.1 Summary

This study focuses on the mechanism of standardization-driven transformation in Chinese furniture industry under the 15th Five-Year Plan. The study collects data through interviews with 9 stakeholders. It uses grounded theory for data analysis. The study identifies 158 concepts, 23 subcategories, and 5 main categories. It systematically answers three core research questions.

For standardization pressure, this study finds that Chinese furniture industry faces dual institutional pressure from domestic and international. At the domestic level, the plan translates policy direction into concrete action through mandatory standards, requiring enterprises to make simultaneous investments across multiple technical dimensions. At the international level, major export markets impose environmental and material standards as mandatory conditions for market access. In contrast, domestic

consumers are unwilling to pay a premium for products with comparable performance, leading export-oriented and domestically focused enterprises to pursue vastly different paths of capability development.

For multi-party responses and transformation paths, this study identifies 5 transformation paths that differ in kind rather than in degree. Corporate responses vary depending on differences in existing capability accumulation, regulators and associations view coordination as an element that must be provided at a higher level, whereas front line employees find themselves without any available strategies.

For core contradictions and fundamental barriers, this study identifies the fundamental conflict between fire safety and environmental protection as the core barrier that hinders multi-party coordinated development. The deep reason is that departments operate independently and have different assessment indicators. When viewed against the SDGs, these findings indicate that the critical bottleneck constraining the industry's sustainable development lies in institutional coordination rather than technical capability. The conflict between fire safety and environmental protection is an instance of the policy incoherence that SDG 17.14 addresses, rooted in assessment criteria that are set separately across sectors. Because retrofitting and upgrading have driven intra-industry differentiation rather than widespread technological adoption, progress toward SDG 9.4 masks a widening gap between leading enterprises and SMEs, thereby impacting SDGs 9.3 and 8.5. Circular economy pathways aligned with SDGs 12.2 and 12.5 are similarly hindered by institutional conflicts. Consequently, interventions targeting SDGs 9 and 12 within traditional manufacturing are unlikely to achieve optimal results unless SDG 17.14 is treated as prerequisites.

6.2 Implications

6.2.1 Theoretical implications

First, this study extends institutional fragmentation theory from the macro policy level to specific standardization implementation mechanisms. And this study also revises the predictions regarding convergence found in institutional isomorphism theory. Isomorphism presupposes internal consistency in institutional requirements. This indicates that the divergence stems not from the standards themselves, but from assessment objectives established independently at the level of institutional design. Requirements that are legitimate within the scope of their respective departmental mandates become irreconcilable once put into practice. Through the case of fire safety and environmental protection standard conflicts, it reveals the fundamental opposition between multi-department goals.

Second, this study forms a three-layer analysis framework of institution-capability differentiation- path transformation path. It provides a relevant theoretical framework for standard-driven industrial transformation.

Third, existing research on institutional fragmentation tends to view it as an external condition imposed by regulators upon the regulated which a perspective that presupposes the regulator stands outside the

structure and retains the capacity to adjust it. This study revises that assumption, positing instead that fragmentation constrains various actors along the governance chain, including the very departments nominally responsible for enforcing relevant standards. Viewed from this angle, fragmentation is no longer merely an action taken by one party against another; this explains why the phenomenon persists rather than dissipating on its own over time.

6.2.2 Practical and policy implications

Standardization transformation in the Chinese furniture industry needs coordination among government, industry associations, and companies to achieve systematic reform rather than action by any single party.

At the government level, this study points to three measures. The first is to integrate national standards, local standards, and enterprise standards into a single system so that firms are not left to judge which requirement takes precedence. Second, implement differentiated policy support and provide capability building assistance for SMEs whose transformation depth currently depends on the scale of external subsidy. Third, the simple blanket shutdowns approach of region-wide production halts should be abandoned in favor of differentiated regulation based on whether enterprises meet relevant standards. Under the current model, even after enterprises have made the necessary investments, they cannot translate their compliance efforts into a stable expectation of being authorized to produce and this undermines their willingness to invest from the very outset. The conflict between fire safety and environmental requirements arises because both are treated as permanent states rather than conditional ones. The two states are exclusive in time, but they are not incompatible in principle. What is lacking is not a technical solution, but rather an institutional mechanism that enables both parties to agree on a common basis for assessment. Establishing such a mechanism falls outside the purview of any single department; consequently, it must be implemented at a higher level.

At the industry and association level, leading firms should be encouraged to participate in national standard development and transform standardization capability into industry leadership. Industry associations should facilitate resource sharing with industrial clusters and serves as a communication channel between enterprises and the government; relaying difficulties encountered during implementation while reducing information asymmetry during the transformation process. However, the various associations themselves view coordination as a condition that must be provided from the top down. Consequently, their role is one of gathering and conveying information rather than adjudication.

At the company level, transformation paths are determined by capability rather than freely chosen. Leading firms can choose complete transformation. Medium sized companies can choose selective transformation. Small companies can choose a single transformation path. Companies should emphasize talent training and capability building. They should develop solutions for the aging workforce problem. They should balance short term and long-term costs and benefits. Although upfront investment costs are huge, long-term benefits will be reflected in market share and other aspects. Companies

should work with industrial clusters and industry associations to reduce information asymmetry and avoid transformation risks.

6.3 Limitations and Future Research Directions

This study has four limitations which are sample limitations, single industry limitations, cross-sectional research limitations, and methodological limitations.

For sample limitations, the nine respondents in this study mainly concentrate in North China. There may be regional bias. The intensity of environmental and fire safety enforcement differs from that in other regions so the severity of the conflicts observed here may not extend directly elsewhere. The interviewed company types do not include micro family workshop enterprises and resource constraints are likely more severe.

For single industry limitations, this study only focuses on the furniture industry in traditional industries. However, the commonality and specificity in other industries need related verification.

For cross-sectional research limitations, data were collected at a single point during the early implementation of the 15th Five-Year Plan. The study does not dynamically track the trajectory of company responses to policies.

For methodological limitations, the grounded theory method used in this study is suitable for exploratory research. However, the delineation of category boundaries rests on researcher judgement. Two rounds of independent audit, yet a different research team working from the same material might arrive at a different category structure.

Based on the above research limitations, this study proposes the following future research directions. First, expand the sample and conduct cross regional comparison research. Future research can expand to different Chinese regions. Second, conduct cross industry comparison research to verify whether fire safety and environmental protection contradictions have cross industry commonality. For example, research can examine conflicts between hygiene and quality inspection in the food industry. Or research can study conflicts between safety construction and environmental standards in the chemical industry. Finally, use a longitudinal research design. Or use large-scale questionnaire surveys to verify the causal relationship between institutional fragmentation and standardization implementation.

Declarations

Ethics approval

The study was conducted in accordance with the Declaration of Helsinki and approved by the Research Ethics Committee (Non-Medical) of Universiti Malaya (protocol code UM.TNC(P&I)/UMREC/2/6226, approved on 7 August 2026). All data collection took place after this approval date.

Clinical trial number

Not Applicable.

Consent to participate

Verbal informed consent, including consent for audio recording, was obtained from all participants prior to the interviews. Participants were shown the ethics approval documentation and briefed on the purpose of the research, the voluntary nature of participation, confidentiality, and how their data would be used. Verbal rather than written consent was approved by the ethics committee given the low-risk nature of the study and participants' concerns about identifiability in a policy-sensitive context.

Consent to publish

Not Applicable.

Competing interests

The authors declare no conflicts of interest.

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Author Contribution

D.J.L. and S.Z. conceptualised the study and designed the research methodology. D.J.L. conducted the investigation, collected and curated the interview data, performed the formal analysis, and wrote the main manuscript text. S.Z. reviewed and edited the manuscript, administered the project, and guided the whole process. S.Z. and C.W.T. supervised the study. All authors reviewed and approved the final manuscript.

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Data Availability

The datasets generated and analysed during the current study are not publicly available due to confidentiality agreements with interview participants, but are available from the corresponding author on reasonable request.

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Figures

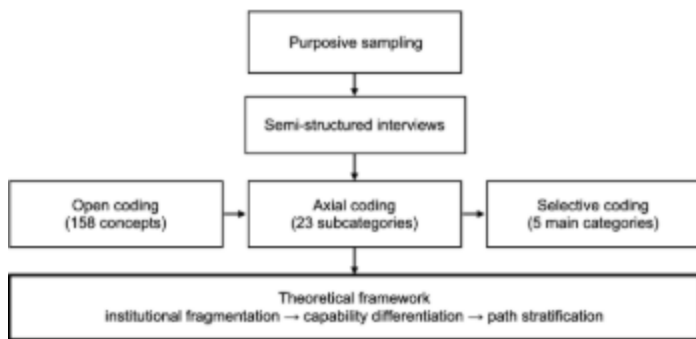


Figure 1

Data collection and analysis process

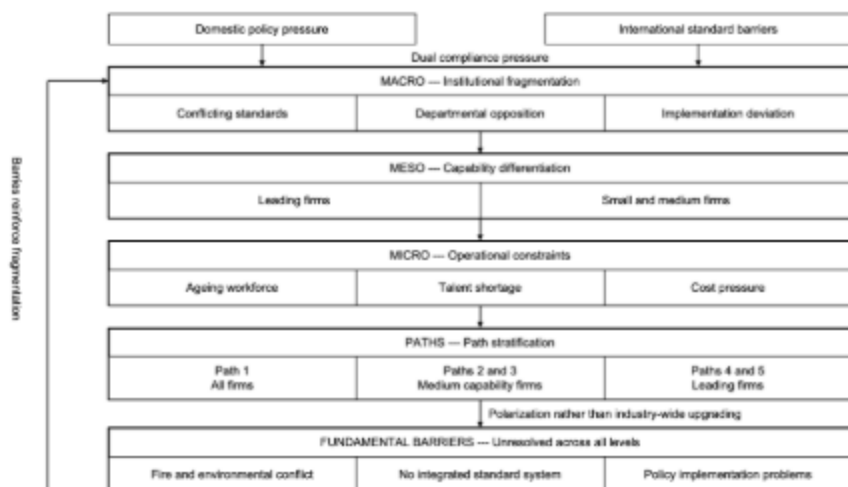


Figure 2

The institutional fragmentation capability differentiation path stratification framework

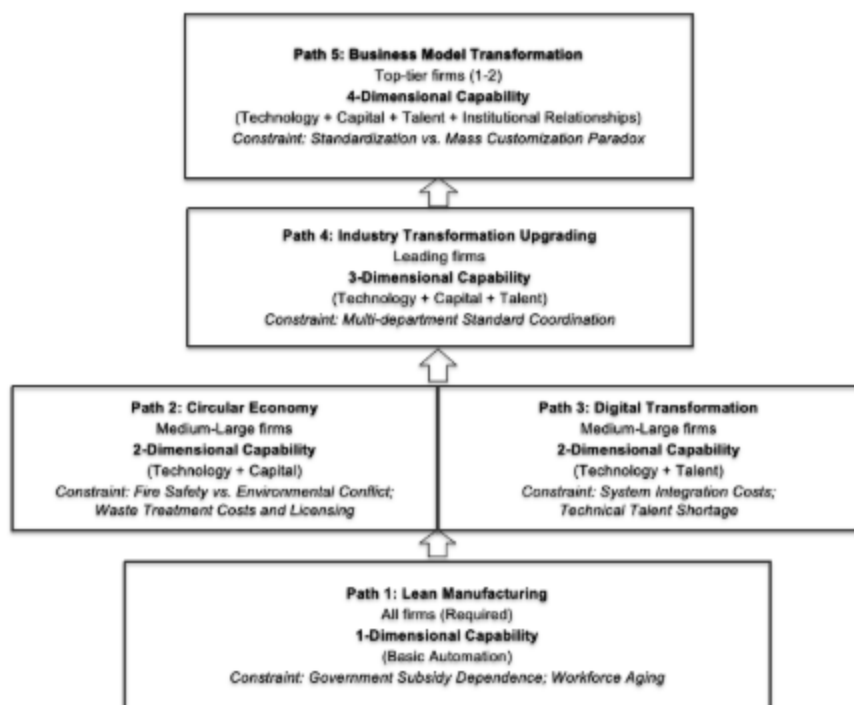


Figure 3

Capability Requirements and Transformation Path Hierarchy

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