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Social Area versus Private Space in Current Tehran Housing: A Case Study of District 9 Apartments

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This study examines the prioritization of collective versus individual space in current urban housing in Tehran, focusing on District 9. A quantitative analysis of interior floor plans assessed the distribution between social area (living room, dining room, salon) and private space (bedrooms). Despite excluding open kitchen, social area averaged approximately 45% of space compared to 25% for private bedrooms. Bedroom sizes frequently approached or fell below mandatory minimums, while social area occupied the largest proportion of space. This lack of emphasis on private space occurred not only in smaller units but also in many larger ones with more generous overall area. Other interior spaces such as bathroom were often limited to minimum area and positioned to enhance social area functionality. In units smaller than 75m², space distribution was more balanced due to adherence to mandatory regulations. However, in larger units, the tendency towards disproportionately larger social area was even more pronounced, with over half featuring only two bedrooms. The findings suggest that the preference for collective activities and family interactions significantly influences Iranian home design in District 9, as evidenced by prevalent large social area and comparatively smaller private space. This study underscores the need for residential designs that harmonize traditional Iranian values with modern privacy requirements.

Research Background

Housing as a Reflection of Societal and Urban Evolution

Historically, settlements have been influenced by the necessity to conform to societal standards and lifestyles.[1] The outside environment that humans create for themselves reflects their inner state.[2] It shows how social needs will build the living environment. Therefore, housing design and architectural changes have always depended on socio-cultural conditions and people's lifestyles. The rise in urbanization and increasing housing costs has imposed significant constraints on people, particularly in metropolitan areas. In densely populated cities like Tehran, the size of residential units and urban land plots is shrinking, restricting people's ability to choose housing that aligns with their cultural and social conditions. In

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1. Mahta Mirmoghtadaee, "Process of Housing Transformation in Iran," *Journal of Construction in Developing Countries* 14, no. 1 (2009): 69-80.

2. Seyyed Hossein Nasr, *Islamic Work Ethics in Traditional Islam in the Modern World* (Kegan Paul International, 1987).

addition to Tehran's high housing prices, the reduction in family size has driven a shift towards smaller homes.[3]

Iranian traditional houses were deeply influenced by the collective lifestyle and closely-knit social relationships that characterized Iranian society and family structures.[4] These homes embodied a rich architectural heritage, featuring diverse interior spaces and elaborate spatial configurations designed to accommodate the shared living of extended families. The spatial complexity of these homes reflected the communal nature of family interactions, where various areas were dedicated to distinct social and functional activities.

Research Focus and Question

Over time, shifts in lifestyle and family structures have led to the emergence of smaller residential units with significantly simplified spatial layouts. Modern homes lack the diversity and complexity of traditional Iranian houses, mirroring the broader transition from communal to individualized living. While some traces of traditional design principles persist in contemporary apartments, their presence has been greatly diminished. This shift in lifestyle has influenced the design and functionality of interior spaces within residential units. This study analyzed the internal layout of current housing in District 9 of Tehran. We focused on the *social area* and *private space* in the interior spaces of sampled residential units to determine whether the Iranian home continues to function as the central space for collective activities or has transformed into a purely private domain restricted to individual functions and interactions.

Definition of key terms: This study employs several key terms to frame its analysis of residential spaces in Tehran. *Current housing* refers to conventional and existing residential units in Tehran, which are widely recognized as the dominant form of housing in the city. In contrast, *contemporary housing* refers to a specific architectural style, characterized by modern layouts emphasizing privacy, functionality, and individualism. Additionally, two critical spatial concepts are examined: *social area* and *private space*. The social area refers to spaces within a home designated for collective activities, such as living rooms, dining rooms, and salons. Conversely, private space refers to areas intended for individual use, which is typically limited to bedrooms.

3. Yaser Rahmaniani, Asghar Mohammadmoradi, and Homeira Asgari, "Explaining the Main Indicators for the Proliferation of Small-Scale Housing in Metropolises: A Survey of Residents' Perspectives in the Nawab Area of Tehran Review," *Quarterly Journals of Urban and Regional Development Planning* 5, no. 12 (2020): 67-103.

4. Mazdak Irani, Peter Armstrong, and Amir Rastegar, "Evolution of Residential Building in Iran Based on Organization of Space," *Asian Culture and History* 9, no. 2 (2017): 46.

The Evolution of Iranian Housing and its Various Spaces

The Collective Nature of Traditional Iranian Houses and the Absence of Defined Private Space

In Iran, most traditional houses were introverted, focusing inward. Rooms were organized around a rectangular courtyard that connected the house's various areas. In traditional Iranian houses, rooms were not named according to their function, such as a living room, dining room, or bedroom. For example, a courtyard house in Yazd (see Figure 1) illustrates this concept. Rooms rarely served a single function. The house's main room, known as *Panj-dari* (meaning a five-door room), served as a main reception area, also referred to as *Salon*, and was the most decorated room in the house.[5] *Orosi*, another significant room with a high ceiling, was used for hosting special guests and ceremonial events. *Seh-dari*, a room with three doors, functioned similarly to a living room; its decoration was simpler than Panj-dari.[6] The family's daily activities (including eating, sleeping, and socializing) typically took place in Seh-dari, which had basic decoration. Close relatives and visiting neighbors were also entertained in this room.[7]

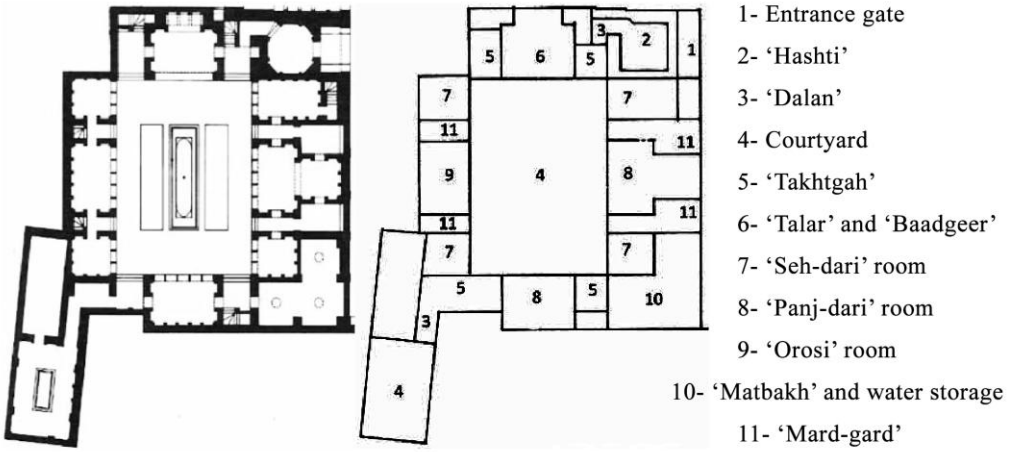

Figure 1. *A Courtyard House in Yazd*
Key: (1) Entrance gate, (2) Hashti (vestibule), (3) Dalan (corridor), (4) Courtyard, (5) Takhtgah (raised platform), (6) Talar (hall) and Baad-geer, (7) Seh-dari room (three-door room), (8) Panj-dari room (five-door room), (9) Orosi room, (10) Matbakh (kitchen) and water storage, (11) Mard-gard.[8]

5. Mirmoghtadaee, "Process of Housing Transformation in Iran."

6. Maryam Gharavi Alkhansari, "Analysis of the Responsive Aspects of the Traditional Persian House," *Journal of Architecture and Urbanism* 39, no. 4 (2015): 273-89.

7. Farzaneh Soflaei, Mehdi Shokouhian, and Seyed Majid Mofidi Shemirani, "Traditional Iranian Courtyards as Microclimate Modifiers by Considering Orientation, Dimensions, and Proportions," *Frontiers of Architectural Research* 5, no. 2 (2016): 225-38.

8. Mohammad reza Ghezelbash and Farhad Abouzia, *Alphabets of Yazd traditional house [الفبای کالبد خانه سنتی یزد]* (Program and Budget Organization, 1985); Alkhansari, "Analysis of the Responsive Aspects of the Traditional Persian House."

Seh-dari and Panj-dari were multifunctional spaces, serving as living rooms during the day and transforming into bedrooms at night.[9] According to historical records, there was no room in a traditional Iranian house designated solely for sleeping purposes. The only private space was located above the Seh-dari and on the sides of Orosi or Panj-dari (on the upper level), referred to as *Bala-khaneh Gooshvar*. These two small and cozy rooms were utilized for seclusion, though they were not used as personal spaces or for sleeping.[10]

In traditional Iranian houses, individuals did not have their own space because privacy was defined collectively for the entire household. Consequently, the house served primarily as a communal space rather than one with a distinct private area for each family member. These courtyard houses were well-suited to an extended family lifestyle, often encompassing up to three generations living together, and served as venues for frequent social gatherings and ceremonies.[11]

Historically, the extended family formed the core of social life, with wealthier households during the Qajar period sometimes comprising dozens of relatives, up to 30-40 individuals, linked by marriage and descent. In more modest families, parents often lived with their unmarried daughters and married sons (along with their spouses), creating a shared environment where children were nurtured and socialized by multiple family members. Before formal orphanages were established, extended families or charitable individuals commonly took on the responsibility of caring for orphans, reflecting the strong tradition of collective support in these communal living arrangements. By emphasizing communal living spaces and shared responsibilities, traditional Iranian houses fostered close social ties that shaped daily life.[12]

In some noble houses, a specific room known as *Talar* was prepared to host special guests. This room was distinguished by its Persian carpets, colored windows, and other decorative elements, setting it apart from other rooms. Hospitality and the design of social areas within Iranian houses have a long history deeply rooted in Iranian culture.[13] According to Islamic narrations, hospitality and family are essential values, as described by *Chardin* in his travelogue.[14] Hospitality is a characteristic deeply ingrained in Iranian culture, and this cultural emphasis is reflected in traditional house architecture; residents were consistently prepared to welcome visitors.

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9. Lakshmi Rajendran et al., "(Re)Framing Spatiality as a Socio-Cultural Paradigm: Examining the Iranian Housing Culture and Processes," *Journal of Architecture and Urbanism* 45, no. 1 (2021): 95-105; Mohammad Karim Prinia, *Introduction to Iranian Islamic architecture Tehran* (Iran University of Science and Technology, 1991).

10. Alkhansari, "Analysis of the Responsive Aspects of the Traditional Persian House."

11. Seyed Reza Hosseini Raviz et al., *Iranian Courtyard Housing: The Role of Social and Cultural Patterns to Reach the Spatial Formation in the Light of an Accentuated Privac*y (ACE: Architecture, City and Environment, November 23, 2015).

12. Shireen Mahdavi, "Qajar Dynasty XIII. Children's Upbringing in the Qajar Period," in *Online Encyclopedia, Encyclopaedia Iranica*, 2015.

13. Javaneh Mehran, "The Meaning of Hospitality in Iran," *Bridging Tourism Theory and Practice* 10 (2019): 155-67.

14. Alireza Einifar, "Explaining the Continuity of Hospitality from Iranian House to Contemporary Apartment," 2021, 155-66.

The Transition from Traditional to Modern Housing

In the 1940s, a growing population and increased demand for housing led to rising land values and greater urban density. By the mid-1940s, many middle-class and upper-class families had moved from traditional homes to smaller houses influenced by Western styles. The demographic shift towards nuclear families (consisting of two parents and several children) became more prevalent. The lifestyle of these nuclear families, being smaller and simpler compared to extended family structures, had a direct impact on their housing patterns.[15] As nuclear families required less space, their homes became smaller and more compact.

Emergence of Contemporary Housing and the Rise of Private Space

Contemporary housing in Iran emerged in 1961.[16] According to census data from 1986 and 1996, the nuclear family predominated in Iran's urban areas.[17] In terraced houses, the collective space, known as *Salon*, was larger than other rooms and elaborately decorated with Persian carpets and furniture to honor visitors and host guests[18]. Salon was well decorated compared to other rooms, such as private space which was quite basic. Bedrooms for individual use were introduced in terraced houses, reflecting a growing desire for privacy, independence, a separate room for children, and spaces for personal belongings. These changes indicated a shifting need for personal space in dwellings,[19] aligning with the individuality valued in modernist culture. Before this modern era, such trends did not exist, and collective values prevailed in society. Since 1970 in Tehran, due to urban population growth and rising land prices, the government permitted the construction of multi-story and mid-rise apartments to replace low-rise houses (see Figure 2 for these morphological changes in Iranian housing).[20]

Today, apartment housing is the only option in Tehran, and the size of residential units continues to shrink each year. The optimal apartment size approved by the *Ministry of Roads and Urban Development* in Tehran is 75 m², while the minimum size, according to the *Detailed Plan of Tehran City*, is 35 m². This basic area of 35 m² meets only the initial needs[21].

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15. Mahya Hagh-shenas and Pirooz Hanachi, "Influencing Factors on Residential Architecture and Lifestyle in Century-Old Iran (Case Study: Transformation of Housing Models in the Historical City of Lar)," *Jias* 9, no. 17 (2020): 57-76.

16. M. Haeri, "Designing the Contemporary House and the Architectural Principles of Traditional Houses," *Abadi, Quarterly Journal of Architecture and Urbanism* 6, no. 23 (1997): 18-28.

17. Marie Ladier-Fouladi, "Iranian Families between Demographic Change and the Birth of the Welfare State," *Population* 57, no. 2 (2002): 361-70.

18. Mirmoghtadaee, "Process of Housing Transformation in Iran."

19. Samaneh Nazif, "Investigation of interior and exterior spaces in past residential houses and its change to today's public areas and its impact on the behavior of family members," in *National Conference on Humanistic Architecture and Urbanism*, 2013.

20. Homeira Shayesteh and Philip Steadman, "Typo-Morphological Analysis of Housing Layout and Density in Tehran," *Urban Book Series*, 2016, 187-204.

21 "What are the details of the 'small size' housing plan? [جزئیات طرح مسکن «کوچک اندازه» چیست؟]," Eghtesad online (اقتصاد آنلاین, August 17, 2020), https://www.eghtesadonline.com/news/460479/.

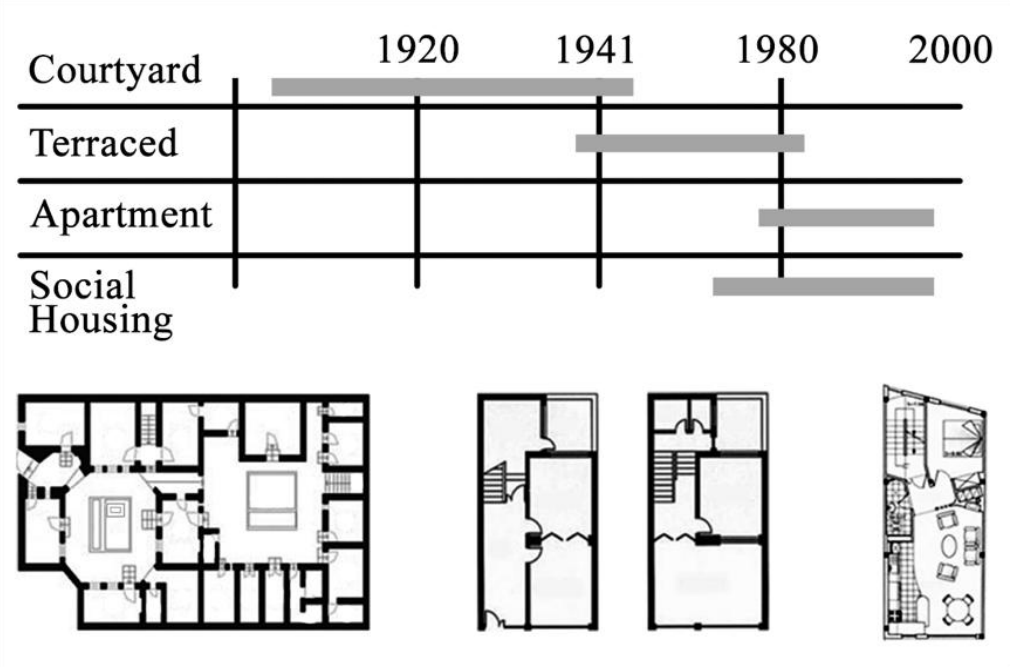

Figure 2. *Morphological Changes in Iranian Housing*
This illustration shows how housing in Iran has evolved from courtyard houses to terraced houses and, eventually, to mid-rise apartments.[22]

Previous Research

Hospitality and Communal Spaces in Iranian Houses

The study of Iranian houses has concentrated more on traditional houses' configuration and morphological transformations rather than on the spatial characteristics of contemporary residences.[23] Research has consistently shown that traditional Iranian homes prioritized communal values over individual needs.[24]

Einifar's study on the enduring nature of hospitality in contemporary houses examined 12 residences ranging from the Qajar period to recent times, concluding that hospitality continues to influence spatial design by creating a spatial hierarchy.[25] Comparative studies of Middle Eastern architecture further support this emphasis on shared spaces. Research suggests that Iranian,[26] Syrian, and Iraqi houses historically incorporated multifunctional rooms and lacked separate rooms designated for

22. Shayesteh and Steadman, "Typo-Morphological Analysis of Housing Layout and Density in Tehran."

23. Mirmoghtadaee, "Process of Housing Transformation in Iran."

24. Mojtaba Valibeigi, Sara Danay, and Yegane Mokhtari, "Forgotten Personal Territories in the Traditional Iranian House: A Critical Reading," *Journal of Civil Engineering and Urbanism* 11 (2021): 15-24.

25. Einifar, "Explaining the Continuity of Hospitality from Iranian House to Contemporary Apartment."

26. Mahta Mirmoghtadaee, "Demands and Feasibilities of Open Building in Iranian Urban Context," *Open House International* 33, no. 1 (2008): 61-71.

personal use, while traditional Egyptian homes frequently included separate bedrooms.[27] This evidence highlights regional variations in the spatial organization of domestic interiors, demonstrating that the preference for shared versus private spaces has evolved differently across cultures.

Privacy in Traditional and Contemporary Housing

The concept of privacy has been widely analyzed in the context of traditional Iranian houses, with several studies focusing on its spatial and social implications.[28] A comparative study of Hamedan's traditional and contemporary house layouts revealed a gradual reduction in interior privacy, primarily attributed to a diminished spatial hierarchy and weakened territorial boundaries.[29] Another study on visual privacy in Kerman found that Iranian housing layouts became less integrated between the 1970s and 2010s, further confirming the shift from highly structured traditional layouts to more fluid contemporary designs.[30] Despite the extensive research on privacy in traditional housing (where the family as a whole was regarded as the smallest unit of society), studies on the private spaces of contemporary residences remain limited. In these modern homes, privacy is increasingly structured around the individual rather than the family, particularly regarding bedroom allocation and personal space preferences. This gap underscores the need to examine whether today's Iranian apartments successfully balance privacy with the enduring cultural significance of interior social area.

27. Loredana Ficarelli, "The Domestic Architecture in Egypt between Past and Present: The Passive Cooling in Traditional Construction," in *Proceedings of the Third International Congress on Construction History* (Cottbus, May 2009); Alev Erarslan, "Typological Variations of The Courtyard House with Iwan Tradition. A Comparative Analysis of Examples in Syria, ...," *Advances in Scientific Research: Engineering and Architecture* (2020): 407-44.

28. Shahrzad Dousti, "Sanctity and Privacy in Traditional Iranian Houses," *Iranian People's Culture* (2018): 53-54; Siyamak Nayyeri Fallah and Akram Khalili, "Privacy as a Cultural Value in Traditional Iranian Housing; Lessons for Modern Iranian High Density Vertical Development (HDVD) Housing" 9, no. 1 (2015); Hannaneh Khamenehzadeh, "An Introduction to the Concept of Privacy and How it is Realized in the House Life-World Comparative Study in Pre-Modern and Modern Iranian Houses," *Architecture & Urbanism* 14, no. 49 (2017); Fatemeh Khozaei Ravari et al., "The Development of Residential Spatial Configuration for Visual Privacy in Iranian Dwellings, a Space Syntax Approach," *International Journal of Building Pathology and Adaptation* (February 2022); Kazem Seifian and Mohamadreza Mahmoudi, "Privacy in traditional architecture of Iran," *Hoviat shahr Journal* 1, no. 1 (2007): 3-14; M. M. Shabani et al., "Achieving Privacy in the Iranian Contemporary Compact Apartment through Flexible Design," 2010.

29. Saeid Alitajer and Ghazaleh Molavi Nojoumi, "Privacy at Home: Analysis of Behavioral Patterns in the Spatial Configuration of Traditional and Modern Houses in the City of Hamedan Based on the Notion of Space Syntax," *Frontiers of Architectural Research* 5, no. 3 (2016): 341-52.

30. Khozaei Ravari et al., "The Development of Residential Spatial Configuration for Visual Privacy in Iranian Dwellings, a Space Syntax Approach."

Spatial Transformations in Contemporary Housing

The spatial evolution of Iranian housing has been investigated in multiple studies; however, research has predominantly emphasized historical changes rather than current trends in interior configurations. A 2019 study on Tehran's apartments analyzed five decades of transformation in the ratios of bedroom, living room, and dining room sizes, highlighting a progressive shift in space allocation.[31] While various researchers have examined specific interior elements, such as balconies and kitchens,[32] comprehensive studies on the spatial layouts of contemporary residential units remain limited, partly due to privacy concerns that restrict access to floor plans.

Urban Transformation in District 9

This district is characterized by its dense urban texture, narrow passages, and predominantly middle- to low-income residents. The district features a blend of old and new buildings, with numerous land plots of irregular geometries. It is undergoing a dynamic transformation, marked by the demolition of aging structures and the emergence of new apartment complexes, as reported by Hatami Nejad and colleagues.[33] As one of Tehran's older and more densely populated neighborhoods, it reflects the evolving lifestyles of its residents. Increasing land values, shrinking household sizes, and changing family structures have driven demand for smaller, more efficient living spaces. According to the 2016 Census, the average household size in District 9 was three persons per unit, showing a gradual decline from 2011, when the figure was 3. 1. The 2016 distribution of household sizes was as follows: one-person (11.06%), two-person (23.44%), three-person (30.69%), four-person (27.51%), and five or more persons (5.93%), reflecting an ongoing trend toward smaller households. This district's housing fabric is representative of the majority of Tehran's residential units, making it a relevant choice for analysis.[34]

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31. Amirpejman Darvish, Fatemeh Dastyar, and Babak Dariush, "The Phenomenon of Lifestyle and the Architecture of Apartments in Iran Case Study: The Apartments in District 9, Tehran," *Socio-Spatial Studies* 3, no. 5 (2019): 78-84.

32. Seyyedeh Mahsa KamiShirazi, Hossein Soltanzadeh, and Farah Habib, "The Impact of Lifestyle on the Spatial Organization of Residential Architecture in Iran - Case Study: Kitchen from 1925 to 1978," *Women Studies* 9, no. 24 (2018): 33-70.

33. Hosein Hataminejad, Ahmad Pourahmad, and sara Allah gholipour, "Analysis of Residential Sustainability Indicators in Urban Worn out Textures, Case Study: Area 1 of District 9 in Tehran," *Biannual Journal of Urban Ecology Researches* 10, no. 2 (2020): 185-98.

34. "Household and Population of 22 Districts of Tehran (1375-1395) [خانوار و جمعیت مناطق 22 سامانه اطلاعات آماری استان تهران (گانه شهر تهران 1375-1395)]," Statistical information system of Tehran province [تهران], accessed August 3, 2024, https://amar.thmporg.ir/main-topic/population-and-labor/population.

Research Gap and Study Contribution

Most previous studies on contemporary Iranian housing have focused on iconic or luxury residential complexes, often failing to represent the majority of urban dwellings. This study addresses these gaps by analyzing the interior layouts through floor plans of 469 newly constructed housing units in Tehran's District 9, a representative case study that reflects the dominant residential typologies within the city. This research aims to provide a comprehensive and quantitative analysis of the relationship between private and social spaces in current Iranian housing and to explore how Iranian society negotiates the balance between collective and individual spaces.

Methods

Selected Case Study: District 9

This study employs a case study approach to examine the interior layout configuration of residential apartments in District 9 of Tehran, one of the 22 districts of Tehran Municipality (Figure 3). To ensure a comprehensive and unbiased dataset, sample units were selected through a randomized process. This study evaluates existing housing conditions to analyze residents' preferences for interior private space versus social area.

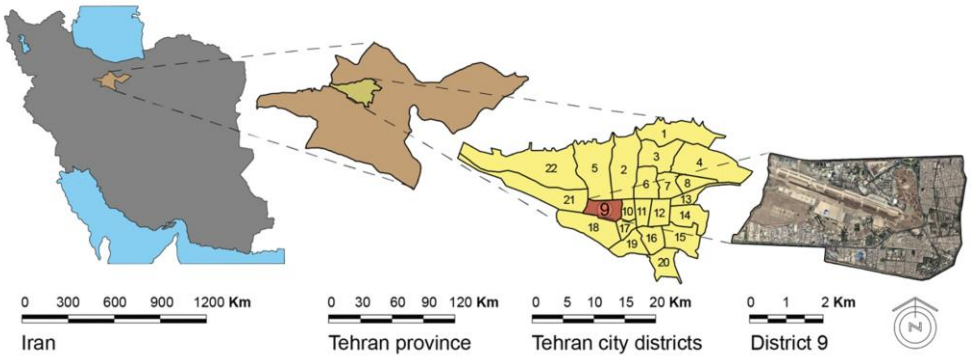

Figure 3. *Location of District 9*
Geographical position of District 9 within the city of Tehran, the capital of Tehran Province, Iran.

Our analysis primarily focused on the floor plans of residential buildings. To capture the latest trends in urban housing design, we selected 469 residential units across 65 buildings, all constructed between 2018 and 2019 in District 9, Tehran.

This study evaluated current housing conditions to analyze residents' preferences for interior private space versus social area in these units. Our analysis also explored spatial functions across the sampled units, including kitchen, living room, salon, dining room, bedroom, toilet, bathroom, entrance, corridor, and balcony. Not all units featured a salon, dining room, entrance, corridor, or balcony. While this omission initially appeared to result from spatial limitations, further investigation

revealed alternative design considerations influencing these choices. This study provides insights into the dominant approaches to interior housing layouts in Tehran.

Definition and Classification of Interior Spaces

This study involved a process of quantifying concepts that are inherently difficult to measure: individual versus social activities. Within this conceptual framework, we narrowed our focus to two key spatial functions: social area and private space. The *Social Area*, representative of a collectivist approach, serves as a space where people gather and interact. It typically includes communal spaces such as the living room, dining room, and salon. Conversely, the *Private Space*, reflecting an individualist approach, consists solely of the bedroom, which is designated for personal activities. For the purposes of this study, the most spacious bedroom was categorized as the main bedroom.

To facilitate the analysis, interior spaces were further categorized, in addition to the social area and private space, into *Service Areas* (such as toilets, kitchens, and bathrooms) and *Secondary Spaces* (including entrances, corridors, and balconies).[35] This classification was based on commonly observed spatial functions within the sampled residential units.

Spatial Analysis and Regulatory Framework

After collecting primary data from interior floor plans, we conducted a detailed analysis of interior space functions. Social area and private space were defined for each unit based on the lifestyle and spatial characteristics of typical Iranian houses. We measured and analyzed each unit's total area, social and private zones, as well as their form, geometry, access to natural light, and spatial proximities. Additionally, we reviewed existing regulations that define the minimum size requirements for residential units and their interior spaces, including *Booklet 4 of Iran's National Building Regulations (B4 INBR)* and the Detailed Plan of Tehran City. Since 75 m² is frequently cited as a threshold for residential unit size in these regulations, we adopted this benchmark as a reference point in our analysis.

Regression Analysis of Spatial Allocation

Space allocation in current residential design is highly constrained in smaller units, where layouts must adhere closely to minimum regulatory standards to ensure functionality. In contrast, larger units offer greater flexibility, allowing designers to allocate additional space based on resident preferences rather than rigid regulatory mandates. This distinction raises a key research question: as unit size increases, is the extra area primarily allocated to social area or to private space? To systematically quantify this relationship, we employed linear regression analysis, with total unit size as the independent variable and the distribution of social and private spaces as

35. Kengo Makino and Yoshinori Natsume, "Secondary Spaces of Entrance, Corridor, and Balcony in Tehran Housing - A Comparative Analysis with Nagoya Residences," *Athens Journal of Architecture* 10, no. 4 (2024): 329-60.

dependent variables. This approach enables us to identify spatial allocation patterns as unit sizes increase, revealing whether additional space is primarily dedicated to expanding communal living areas or enhancing private spaces.

Moreover, by analyzing regression coefficients, we distinguish between regulatory constraints and design choices. Smaller units adhere to mandatory minimum standards, while larger units allow for greater flexibility in resident-driven spatial distributions. This statistical analysis provides empirical evidence of prevailing residential design trends, offering insight into how current Iranian housing balances collective and individual needs.

Beyond the regression analysis, we also conducted a complementary quantitative assessment of how other interior spaces (such as kitchens, bathrooms, and corridors) impact social and private areas. This assessment evaluates whether homes remain hubs for social activities or primarily serve personal needs. The findings from this study are expected to contribute significantly to the development of design guidelines for interior housing spaces, thereby uncovering the underlying socio-cultural dynamics shaping urban residential layouts.

Ethical Considerations and Data Confidentiality

Throughout our research, we adhered to rigorous confidentiality principles when handling primary raw data. The research process required extensive correspondence with municipal authorities due to the sensitive nature of accessing information on residential units, highlighting the challenges of studying private interior spaces.

Results

Distribution of Residential Units and Building Typology

Building Typology and Spatial Constraints

The residential buildings analyzed in this study ranged from three to seven stories, reflecting the mid-rise typology that dominates Tehran's urban fabric. Among these, four- and five-story buildings were the most prevalent, comprising 90% of the sample and integrating harmoniously with the existing urban landscape. Specifically, the sample included one three-story building, 31 four-story buildings, 27 five-story buildings, five six-story buildings, and one seven-story building. This distribution highlights the predominance of mid-rise structures in our samples, which balances density with compatibility to the surrounding built environment. Tehran's high housing costs have resulted in a significant proportion of residential units being smaller than 100 m². Over 50% of the units analyzed measured less than 75 m², underscoring the spatial constraints faced by urban residents.

Minimum and Optimal Unit Sizes in Tehran

According to the Detailed Plan of Tehran City, the minimum size of an apartment in Tehran is 35 m². The basic area of 35 m² meets only initial needs. However, our study identified instances where some units were smaller than this legally mandated minimum, highlighting significant constraints in urban residential spaces. Conversely, guidelines from the Ministry of Roads and Urban Development, as cited by Economy Online (2020), specify that the optimal minimum size for a residential unit in Tehran is 75 m². We categorized residential units based on their size to analyze the relationship between the area of existing units and the optimal minimum size recommended by the Ministry of Roads and Urban Development for Tehran.

We also classified interior spaces to assess their contribution to overall living space, with particular attention to the distinction between social area (living room, dining room, and salon) and private space, which was limited to bedrooms. This investigation seeks to understand how various interior spaces influence residents' preferences for social and private spaces.

Kitchen was identified as a unique space due to its central role in food preparation and its emphasis on cleanliness and hygiene, which are significant under Iranian-Islamic cultural norms. Although our primary focus was on social and private spaces, service areas (specifically bathrooms) were confined to their minimum designated sizes. Bathrooms were considered separate from toilets, and their influence on our study will be discussed further. Additionally, secondary spaces such as balcony, corridor, and entrance, though qualitative and supplementary in nature, were omitted in numerous samples.

Unit Size Variation and Measures of Central Tendency

The dataset revealed a variance in unit areas, indicative of diverse architectural responses to urban living needs. The smallest unit measured a mere 29.5 m², suggesting a compact living solution even smaller than the minimum legal area, likely allocated to single occupants or those with minimalistic preferences. In contrast, the largest unit spanned 144.2 m², indicating a design that accommodates more expansive familial living requirements.

Our analysis categorized 276 of the 469 residential units (58.8%) as falling at or below the 75 m² threshold, with 193 units (41.2%) exceeding it. The average unit area across the dataset was 71.88 m². This average, along with the median and mode at 71.3 m², falls below the optimal minimum but remains close to it, suggesting a preference for mid-sized units. This trend likely reflects an architectural inclination to optimize space to address urban development constraints while maintaining comfort and affordability. Various factors likely contribute to this trend, including urban space limitations, economic considerations, and evolving lifestyle dynamics. The prevalence of mid-sized units, as shown in Figure 4, may indicate a general consumer preference or an economically motivated choice common in urban environments.

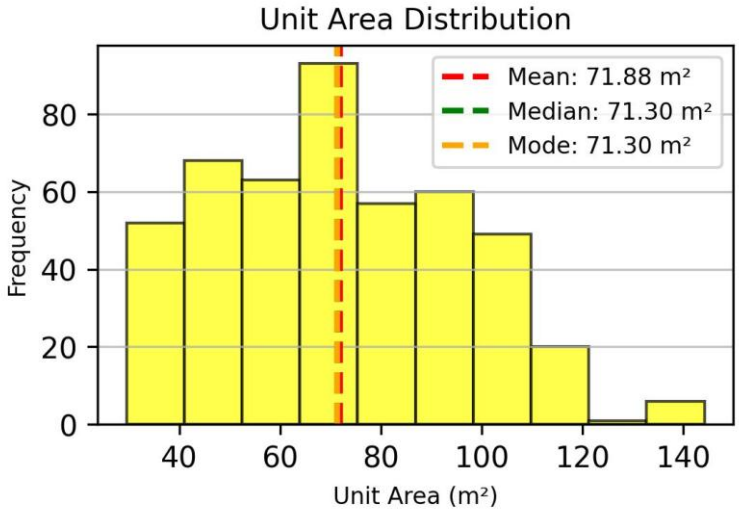

Figure 4. *Distribution of Unit Area in Residential Units*
This histogram illustrates the overall distribution of unit areas (m²), highlighting the mean (71.88 m²), median (71.30 m²), and mode (71.30 m²). Their close alignment indicates minimal skewness and a consistent approach to spatial allocation. Vertical dashed lines indicate central tendencies.

Comparative Analysis of Private Space, Social Area, and Kitchen

Methodology and Correlation Metrics

To understand the relationship between total unit area and the allocation of space to different functional areas within residential units, we conducted a regression analysis focusing on three key spaces: social area, private space, and kitchen. Linear regression analysis was employed to examine the correlation between total unit area (independent variable) and the areas of social, private, and kitchen spaces (dependent variables). The strength of these correlations is quantified by the correlation coefficient (R-value), which ranges from -1 to +1, while the slope indicates the rate of change in each specific area per unit increase in total area. The statistical significance of these relationships is represented by the p-value, with values below 0.05 interpreted as statistically significant.

Regression Findings for Social, Private, and Kitchen Spaces

Our analysis revealed distinct correlations for each space type (Figure 5). The social area exhibited the strongest correlation with unit size ($R = 0.9212$, $p < 0.001$, slope = 0.5042), indicating that for every 1 m² increase in total unit area, the social area expands by approximately 0.5 m². Private space, while also strongly correlated, demonstrated a slightly weaker relationship ($R = 0.8804$, $p < 0.001$, slope = 0.2909), expanding more modestly by about 0.29 m² for each additional square meter of total area. In contrast, kitchen areas exhibited only a weak correlation with unit size ($R = 0.2411$, $p < 0.001$, slope = 0.0129), suggesting that kitchen dimensions remain relatively constant regardless of unit scale. The statistical significance ($p < 0.001$) for all relationships indicates a high level of confidence in these observed patterns.

This analysis highlights a design paradigm that prioritizes the expansion of communal living spaces in larger units while maintaining more modest growth in private areas and relatively consistent kitchen dimensions.

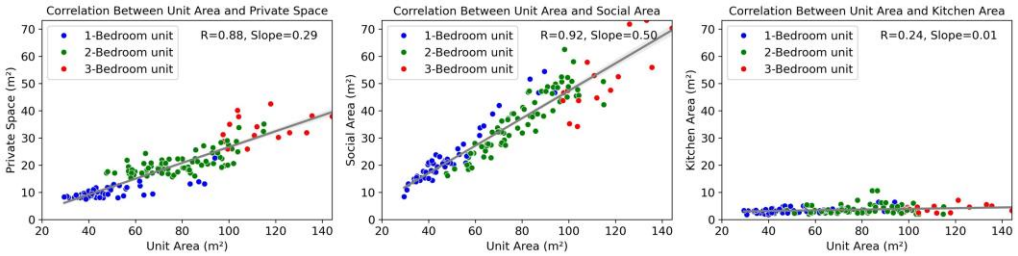

Figure 5. *Regression Analysis of Space Allocation in Residential Units*
The scatterplots and regression lines show how social, private, and kitchen areas vary with total unit area. R-values represent correlation strength (–1 to +1), and slopes indicate each area's rate of change per 1 m² increase. Social (R = 0.9212) and private (R = 0.8804) areas have strong positive correlations, while kitchen area (R = 0.2411) shows a weaker relationship.

Private Space (Bedrooms)

Bedroom Count Distribution (One-, Two-, Three-Bedroom Units)

The private spaces of a home, specifically bedrooms, serve as a sanctuary for residents, offering a retreat from the communal areas of a dwelling. We examined the allocation of space dedicated to bedrooms. Our dataset includes diverse configurations regarding the number of bedrooms within residential units: 164 one-bedroom units (35%), 264 two-bedroom units (56%), and a smaller contingent of 41 three-bedroom units (9%). These figures indicate a strong preference for two-bedroom layouts among the sample population.

For one-bedroom units, the average area was approximately 49.21 m², with a slightly lower median of 46.2 m². This observation suggests a modest inclination towards smaller-sized units within this category, likely more suitable for individuals or couples without children. The standard deviation of 15.38 m² reflects substantial variation in size, illustrating a range that accommodates both compact single-occupancy units and more spacious single-bedroom apartments. Unit sizes in this category span from 29.5 to 94.0 m², with the most common (mode) unit size around 40 m².

In contrast, two-bedroom units exhibited a higher mean area of 79.85 m² and a median close to 78.1 m², suggesting a more consistent distribution of unit sizes. The standard deviation is comparable to that of one-bedroom units at approximately 15.79 m²; however, the range is slightly broader at 67.4 m². The smallest two-bedroom unit in the study measures 47.6 m², while the largest spans 115 m². The mode of 71.3 m² highlights this as the most commonly observed size, reinforcing the prevalence of this unit type in the urban housing market. Three-bedroom units exhibited the largest average area at approximately 111.26 m², with a median of 107.9 m²; however, they were less common within the dataset. The narrower standard deviation of about 12.26 m² spans a range of 46.7 m² between the smallest unit (97.5 m²) and the largest unit (144.2 m²). The mode for this category

is 100.3 m², indicating a clustering around this size for three-bedroom units (Figure 6).

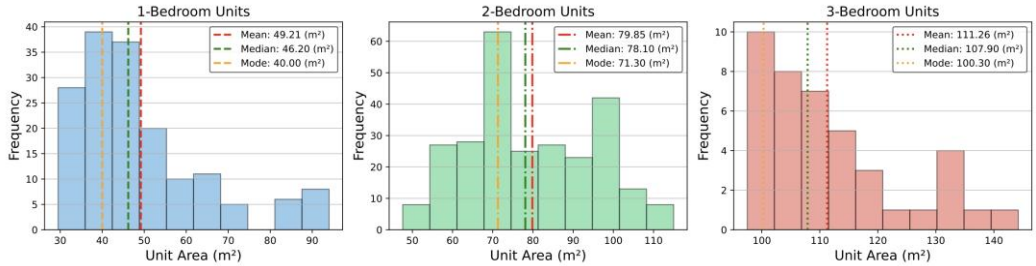

Figure 6. *Unit Area Distribution by Bedroom Count*
Histograms indicate area frequencies for one-, two-, and three-bedroom units. Mean areas are 49.21 m², 79.85 m², and 111.26 m², respectively.

Bedroom Size Ranges and Private Space Ratio

The analysis of private space, defined exclusively as the sum of bedroom areas, reveals a relatively consistent distribution across the residential units evaluated. The mean private space ratio is 25.3% of the total unit area, with the median and mode both precisely aligned at 25.3%. This indicates a homogeneous distribution of private space across the dataset, with the majority of units allocating approximately a quarter of the total area to bedrooms. The normality of the distribution is further supported by the close alignment of the mean and median, which indicates minimal skewness. The histogram of the private space ratio (Figure 7) visualizes this distribution, with the central tendency depicted by vertical dashed lines.

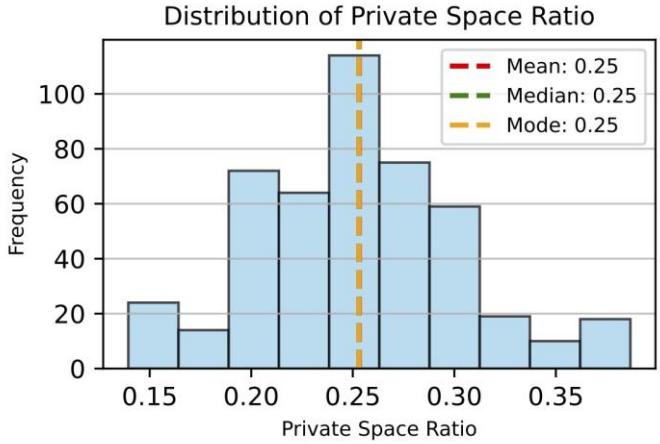

Figure 7. *Private Space Ratio Analysis*
This histogram shows the frequency distribution of the bedroom (private space) ratio, emphasizing its mean, median, and mode for the surveyed units.

Regulatory Compliance in Bedroom Sizing

A critical aspect of residential unit design is adherence to established rules and regulations, which are continuously refined to enhance living standards. In this

study, we compared the sizes of bedrooms in the surveyed residential units against the B4 INBR standards established by the Ministry of Roads and Urban Development. These regulations stipulate that in apartments measuring 75 m² or larger, one bedroom must be at least 12 m², while in smaller apartments, one bedroom must measure at least 9 m². To facilitate analysis, we categorized the units into two groups based on the 75 m² threshold. For units smaller than 75 m², main bedroom sizes ranged from 7.5 to 17.7 m², while in larger units, bedroom sizes varied from 8 to 22.6 m². This variation within each category provides a nuanced view of bedroom allocation and occasionally reveals deviations from regulatory guidelines.

The data showed that units below the 75 m² threshold had an average main bedroom area that marginally exceeded the minimum requirement at 9.93 m². Conversely, larger units exhibited an average main bedroom size of 13.03 m², slightly surpassing the 12 m² minimum mandated for their category.

Despite these averages, a significant proportion of units failed to meet the minimum size criteria: 35.14% of smaller units and 41.97% of larger ones. Consequently, approximately 38% of all surveyed units did not comply with prescribed standards, with larger units demonstrating a higher rate of noncompliance. This deviation from regulatory standards is graphically represented in Figure 8, which highlights differences between prescribed regulations and actual bedroom sizes within residential units. These discrepancies underscore the challenges in aligning architectural practice with regulatory mandates. The findings suggest a notable lack of effort or interest in extending private living areas, with spaces designated for these zones often barely meeting required legal standards.

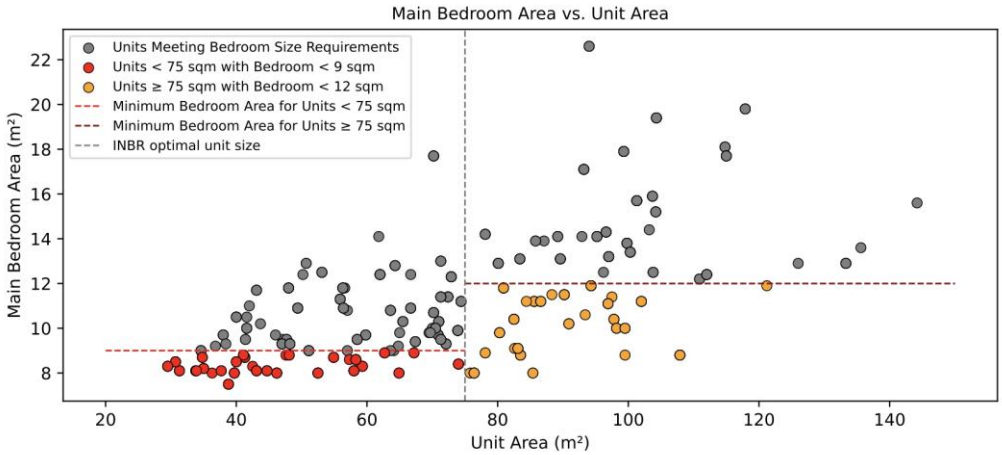

Figure 8. *Main Bedroom Area versus Unit Area Compliance*
This scatter plot compares main bedroom sizes to total unit area, illustrating adherence (grey=291) or non-adherence (red= 97/orange=81) to B4 INBR thresholds: 9 m² or 12 m² for the main bedroom, depending on whether the unit is below or above 75 m².

Social Area (Living Room, Dining Room, and Salon)

Scaling of Social Areas in Different Unit Sizes

The social area within a residence, encompassing the living room, dining room, and salon, plays a pivotal role in shaping the social dynamics of the home. These areas serve as hubs for family interaction and are also used to receive and entertain guests and close relatives during various events, occasions, and ceremonial practices that have long been integral to Iranian-Islamic culture. Our analysis of the social areas aimed to examine their allocation and distribution across residential units, focusing on how this space function varies with unit size. We observed that the scaling of the social zone is substantially influenced by the overall unit size. Smaller units, often constrained by size, typically feature a singular, multi-functional living room that accommodates various collective activities.

Dedicated spaces for dining rooms and salons are rarely present in these units. This optimization highlights the necessity of maximizing functionality in smaller spaces. Dining rooms and salons become more common in larger units, particularly when unit sizes exceed the 75 m² threshold. Moreover, the mean social area ratio of 45.5%, with a standard deviation (SD) of 6.81% and a median of 45.0%, indicates that nearly half of the total unit area is allocated to social spaces on average. However, the mode of 37.4% suggests a prevalent design approach that allocates a smaller proportion to communal areas. This discrepancy between measures of central tendency points to a right-skewed distribution (skewness = 0.31), implying the presence of units with substantially larger social areas that influence the mean value. The 28.47% to 63.65% range underscores significant variability in spatial allocation strategies. Figure 9 illustrates this distribution, revealing a tendency for social areas to expand into larger units.

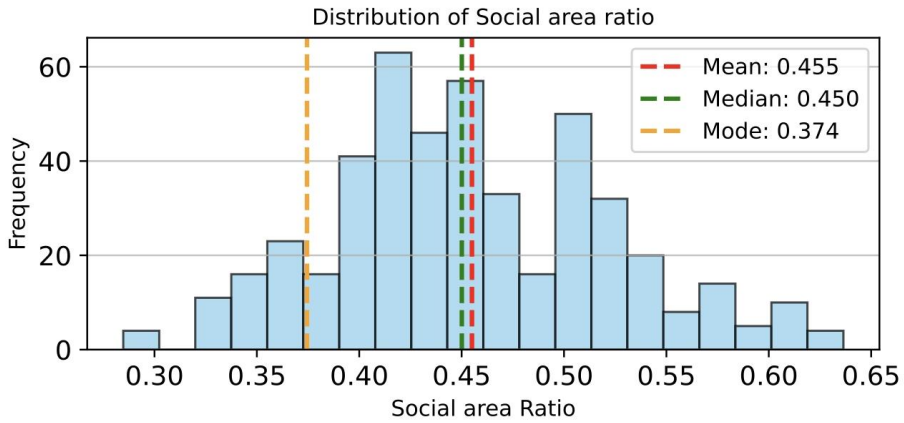

Figure 9. *Frequency Distribution of Social Area Ratios in Residential Units*
This histogram presents the share of social spaces (living room, dining room, salon) as a percentage of total unit area. The mean (45.5%), median (45.0%), and mode (37.4%) reveal a right-skewed distribution ranging from about 28.47% to 63.65%.

Natural Light and Spatial Layout Considerations

In addition to spatial allocation, our analysis extended to the role of natural light in the social area. Natural light is a critical factor in enhancing the ambiance and comfort of residential units. Approximately 87.6% of the sample units receive direct light in the social area, while about 12.4% feature indirect lighting in this space function. The range of unit areas with indirect light in living rooms spans from 29.5 to 71.3 m², with corresponding living room sizes ranging from 8.4 to 36.2 m². These findings indicate that ensuring natural light in the living rooms of smaller units is challenging, emphasizing the difficulties associated with achieving adequate natural light access in compact spaces.

Our analysis suggests that units with indirect natural light in their living rooms predominantly fall within a specific size range, indicating a potential correlation between unit size and the architectural integration of natural lighting features. Specifically, the social spaces in 12.4% of units with minimal areas receive indirect light through open kitchens, which may impact the overall quality and usability of these spaces.

Role of Kitchen

Cultural Emphasis and Functional Consistency

The analysis of kitchens within our sample units revealed a consistent pattern of spatial segregation and a distinct functional role. Contrary to global trends in small apartments that favor open-kitchen designs integrated into social areas, all surveyed units featured open kitchens as separate, distinct spaces equipped with fixed countertops. This spatial configuration underscores the kitchen's role as a specialized area for food preparation, reflecting specific cultural practices and norms in Iranian households. The deliberate separation of kitchens from social areas highlights a continued cultural preference for maintaining distinct functional zones for the kitchen, even as current architectural trends in other space functions move towards greater integration.

This finding underscores the enduring influence of traditional spatial structures in sampled units, where the kitchen remains a dedicated, separate space within today's apartments. As shown in Figure 5, the analysis of area allocations across three different spaces revealed a notable disparity in how kitchen spaces scale relative to overall unit size. While social and private areas demonstrated strong positive correlations with unit size ($R = 0.92$ and $R = 0.88$, respectively), kitchen dimensions exhibited significantly less variation ($R = 0.24$). This disproportionate scaling indicates a prioritization of functional consistency in kitchen design, regardless of overall dwelling size.

The relative stability of kitchen areas across varying unit sizes suggests that cultural and practical considerations governing kitchen functionality take precedence over proportional spatial allocation. This pattern diverges significantly from the scaling observed in social areas and private spaces. The consistency in kitchen allocation, regardless of overall dwelling dimensions, reflects deeply

ingrained cultural values and practices surrounding food preparation and household management in Iranian society.

Role of Bathroom

Bathroom Location and Impact on Privacy and Circulation

The location of bathrooms in residential units significantly influences the interior's spatial quality and functionality. In our analysis, we focused on the positioning of bathrooms and their accessibility relative to the private and social zones of the units. It is important to note that units with more than one bathroom were excluded from this part of the study, as the focus was solely on single-bathroom units. This aspect of design impacts not only space circulation but also the privacy and comfort associated with bathroom use experienced by residents.

Our data revealed a predominant preference for situating bathrooms that open into corridors in larger apartments. This configuration, observed in 52.8% of the units analyzed, creates a clear separation between the bathroom and the social area, thereby enhancing privacy and establishing a transitional space between functional zones. The corridor serves as a buffer zone, maintaining a distinction between bedrooms and the communal nature of the social area.

In contrast, approximately 36.2% of single-bathroom units feature bathrooms opening directly into the main bedroom. This direct adjacency compromises the privacy and seclusion typically associated with private space. Another 3.80% of units had a bathroom opening into a secondary bedroom, a less common but similarly disruptive configuration for personal space. A smaller subset of the dataset, about 6%, features bathrooms opening into the social area. While such an arrangement economizes on spatial allocation, it could affect the ambiance and functionality of the social area, particularly during guest visits or collective activities (Figure 10).

The analysis of bathroom placements within the sample layouts identifies a distinct architectural preference for optimizing shared spaces' efficiency and quality. This preference sometimes compromises bedroom privacy, especially when a corridor is absent. The direct opening of a single, commonly used bathroom into a bedroom presents a design challenge.

Our findings suggest that placing the bathroom adjacent to communal area is more justifiable in the absence of a corridor, given the shared nature of both the bathroom and social area. This implies a more cohesive relationship between two communal areas (social space and the bathroom) than the juxtaposition of a communal bathroom with private bedrooms.

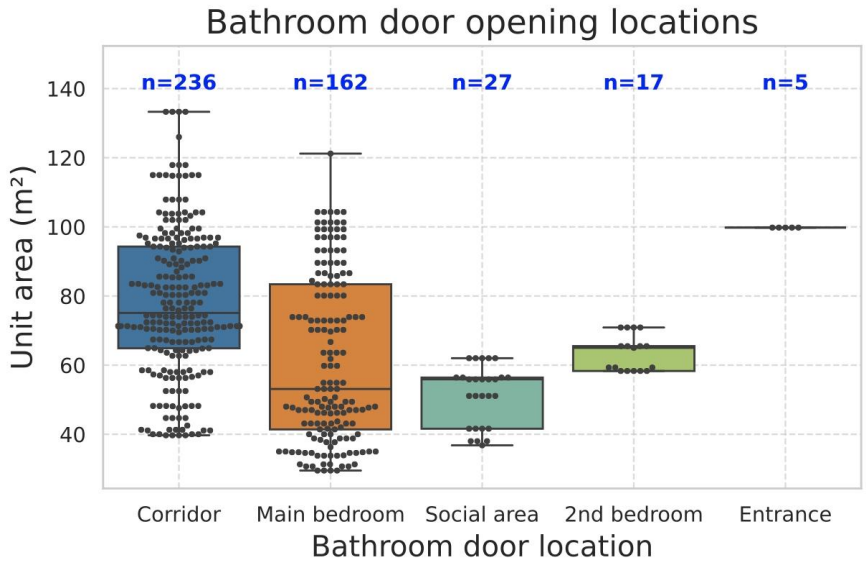

Figure 10. *Unit Sizes by Bathroom Door Opening Location*
Boxplots illustrate median, quartiles, and range of unit areas (m²) corresponding to each bathroom access layout. Sample size: 447 single-bathroom units.

Discussion

Private Space (Bedrooms)

Regulatory Minimum Size Versus Current Situation

In smaller residential units, particularly those ranging from 35 m² (the basic unit area in Tehran) to 75 m² (the optimal minimum unit area in Tehran as defined by regulations),[36] a clear trend emerges regarding adherence to minimum size requirements for interior spaces. Due to space constraints, these units often lack diversity in both the size and layout of interior spaces, with design efforts primarily focused on complying with basic regulatory standards.

Despite regulations requiring that main bedrooms in units under 75 m² measure at least 9 m², our study reveals that a substantial portion of such units fall short of this standard, negatively affecting the quality of bedroom spaces. As unit sizes increase beyond 75 m², the size of private spaces, particularly main bedrooms, often remains close to regulatory minimums. While regulations mandate a 12 m² minimum for main bedrooms in these larger units,[37] a significant proportion still fails to meet this requirement.

36. "What are the details of the 'small size' housing plan? [جزئیات طرح مسکن «کوچک اندازه» چیست؟]."

37. Iran Ministry of Roads and Urban Development, *Iranian National Building Regulations, Booklet 4: General Building Requirements* (Tehran: Road, Housing and Urban Development Research Center, 2017).

Bedroom Constraints: Number, Geometry, Aspect Ratio, Construction Elements, and Functionality

A considerable proportion of the residential units feature two-bedroom layouts, spanning a broad range of unit sizes. This prevalent pattern suggests a strong demand for such configurations, even in compact units. Given that the average household size in Tehran is three people,38 this design choice reflects families' prioritization of maintaining distinct private spaces for parents and children, reinforcing the cultural emphasis on privacy within family units. On the other hand, the number of bedrooms does not significantly increase in proportion to unit size and often remains limited to two bedrooms. Three-bedroom units are uncommon, and four-bedroom units were absent from our sample. This trend highlights a preference for allocating additional space to social areas rather than expanding private spaces, even when overall unit size permits such expansion.

In many units, bedrooms have limited dimensions and suffer from poor length-to-width ratios. The presence of structural elements such as columns, beams, bracing, HVAC ducts, and plumbing pipes, as well as irregular floor plan geometries with sharp angles, further detracts from the quality of these private spaces. Such design flaws limit bedrooms' functionality, making them suitable primarily for sleeping. These constraints also restrict furniture placement and hinder convenient spatial circulation.

Despite societal changes, the role of bedrooms has evolved beyond serving as mere sleeping and resting areas, now accommodating a wide range of activities. Overlooking the importance of bedrooms can significantly affect the overall living experience in residential units, disrupting the balance between private spaces and social areas. This highlights the need for thoughtful design interventions to create functional, comfortable, and culturally appropriate private spaces, even within limited spatial constraints.

Social Area (Living Room, Dining Room, and Salon)

Layout Configurations in Smaller and Larger Units

In residential units smaller than 75 m², the social area typically consists of a single living room. The absence of a corridor in these smaller units results in a direct transition between spaces, eliminating the intermediary hierarchy that corridors typically provide. This design approach was also common in housing in past decades, even when the shortage of residential space was not as severe as it is today. An example of this lack of intermediary space is shown in Figure 11, which depicts a terraced house in a central district of Tehran where no corridor or transitional space exists between the social area and bedrooms. In contrast, in larger units exceeding 75 m², the social area tends to be more expansive and varied, frequently including a living room, dining room, and salon. These areas are often integrated into a unified space, as illustrated in Figures 11 and 12. These examples (from the 1970s

38. "Household and Population of 22 Districts of Tehran (1375-1395) [خانوار و جمعیت مناطق 22 گانه شهر تهران (1375-1395)]. ”

and 2010s) demonstrate how subspaces within the social area (living room, dining room, and salon) are combined in Tehran's residential units.

Spatial Hierarchy

The presence of a corridor in these larger units effectively connects the social area to adjacent spaces, ensuring a more structured and orderly flow between functional zones. There appears to be a greater emphasis on social areas in residential units exceeding 75 m², where space constraints are less pronounced. This trend is particularly notable compared to other indoor spaces, such as private ones, suggesting a potential cultural and architectural preference for prioritizing social areas in larger units.

Figure 11. *Social Area in a 1970s Terraced House, Tehran*
Designed with ample space, this integrated layout lacks solid dividers, so residents use furniture to define distinct areas within the social zone. *Source:* Authors.

Figure 12. *Two Examples of Integrated Social Areas in 2010s Tehran Apartments*
Both examples combine living room, dining room, and salon into an open, undivided space. *Source:* Authors.

Open Kitchen: Separate from or Integrated with the Social Area?

In most Iranian housing designs, including all samples analyzed in this study, the kitchen space, while open in form, is distinct and separate from the adjoining social area. This separation is characterized by specific features common in Iranian houses, such as different flooring materials and a slightly elevated floor level compared to other interior spaces. Additionally, the presence of fixed countertops and the traditional role of cooking in Iranian culture further distinguishes the kitchen, classifying it outside the social area. These design elements collectively contribute to the kitchen's unique identity within residential layouts.

Social Area Layout and Collective Activities

In larger units, the living room, and other subspaces of the social area, including the dining room and salon, are often integrated and overlap without clear boundaries or dividing elements, making it challenging to distinguish them from one another. Figure 13 demonstrates a terraced house in western Iran, illustrating the integration of social areas alongside their separation from the kitchen. The figure also depicts examples of daily activities that commonly occur within these social zones.

Figure 13. *Example of Social Area Integration in a Western Iranian-Terraced House*
This interior view highlights the connected social area and its separation from the kitchen, reflecting typical daily activities in contemporary Iranian domestic life. *Source:* Authors.

In current households, family members often spend less time together due to individual commitments and evolving lifestyles. This spatial configuration enables eye contact throughout the social areas, including the kitchen, potentially facilitating increased interaction among family members. Figure 14 highlights furniture arrangements and the multifunctional use of social areas in three current residential units in Tehran. In such layouts, family members are exposed to more frequent social interactions with each other.

Figure 14. *Social Area in Current Conventional Residential Apartments in Tehran*
These examples illustrate furniture arrangements and typical resident interactions within the social zone. *Source:* Authors.

Despite societal changes in Tehran, the analyzed floor plans reveal a persistent cultural preference for family-centric spaces. The preference for unified and adaptable social areas reflects deep-rooted values in Iranian culture, accommodating a blend of activities and fostering familial connections. This cultural heritage (traditionally associated with extended family living, hospitality, and communal gatherings) continues to influence contemporary residential design, as evidenced by the prominence of large social areas across the analyzed floor plans. Despite modern changes, this enduring preference for expansive social areas within today's residential units underscores these lasting cultural practices.

The Spatial Implications of Bathroom Placement

In our study, the location of the bathroom significantly influences the balance between private and social spaces. We observed that in over half of the units, the bathroom opens into the corridor, a configuration that is more common in units larger than 75 m². This design choice effectively preserves bedroom privacy and establishes a clear separation between private and social areas, enhancing spatial hierarchy. However, this pattern is not consistent across all units.

In a minority of units, bathroom opens directly into the living room often in smaller units where corridors are typically removed to expand the social area. This layout negatively affects furniture arrangement options and disrupts occupant circulation within the social area.

Conversely, in a considerable number of units with a single bathroom, this space is directly accessible from the main bedroom. This layout is predominantly observed in units with minimal total area, significantly undermining bedroom privacy, restricting the functionality of private spaces by limiting bed and personal item arrangements, and reducing overall bedroom quality. These findings highlight a tendency to prioritize social areas, particularly in units with limited space.

Given the family-oriented nature of Iranian society, the bathroom in an apartment is generally considered a shared space. Locating the bathroom adjacent to the social area is preferable in layouts without an intermediary corridor. This design rationale reflects the shared nature of both the bathroom and social area, suggesting a harmonious relationship between communal spaces and shared bathrooms. In contrast, placing a shared bathroom within a private bedroom can disrupt spatial coherence and disturb the balance between communal and private needs in residential design.

Kitchen's Role in Compact Units: Balancing Private and Social Needs

Tehran's District 9 features a dense and compact urban texture, predominantly occupied by low- to middle-income residents. Its neighborhoods are characterized by narrow land plots and passages, resulting in a prevalence of smaller and more affordable housing units. These units often face challenges related to natural light accessibility. A critical aspect emphasized by regulatory requirements is the mandatory provision of natural light for bedrooms. According to housing

regulations, any room lacking window access and natural light is not classified as a bedroom but rather as storage space. The design of kitchens in these units plays a crucial role in addressing the need for natural light in both the social area and the kitchen itself. Due to the narrow width of these units, which limits natural light entry, kitchens are often designed with an open layout. All kitchens in our sample featured open designs. This design strategy allows the adjacent living room to share the natural light entering the kitchen area, making it particularly effective in units smaller than 75 m². The adoption of open kitchen layouts is driven not only by aesthetic considerations but also by the practical necessity of maximizing natural light within space constraints and aligning with regulatory requirements.

The recommendation of a wall kitchen without a fixed countertop could represent a significant advancement in maximizing interior space efficiency. This design concept seamlessly integrates the kitchen with the adjacent living room, enabling residents to extend kitchen functions into the social area to accommodate various activities and occasions, such as hosting family events or gatherings. This adaptable approach to kitchen design offers a practical solution to urban housing constraints. In more compact units, this kitchen arrangement proves highly beneficial, optimizing limited space and fostering a social area that is both dynamic and flexible. As a result, additional space can be allocated to bedrooms. This design aligns well with the Iranian preference for social areas, providing an effective strategy for optimizing interior spaces in smaller units.

Prioritizing Social Area Over Private Space

Private space remains marginalized in terms of spatial allocation and attention to interior layout quality. There is a pronounced emphasis on the social area, with main focus placed on this space. Additionally, other interior spaces are designed primarily to serve the social area. However, today, the role of bedrooms has evolved beyond serving as mere sleeping and resting areas. They now accommodate a wide range of activities and neglecting them can significantly impact the overall living experience in residential units, distorting the balance between private space and social area.

Interior Layouts and Design Patterns

We present the following unit layouts to illustrate key trends and patterns in design approaches toward social and private zones. The layouts are categorized into units exceeding 75 m² (Figure 15) and units under 75 m² (Figure 16).

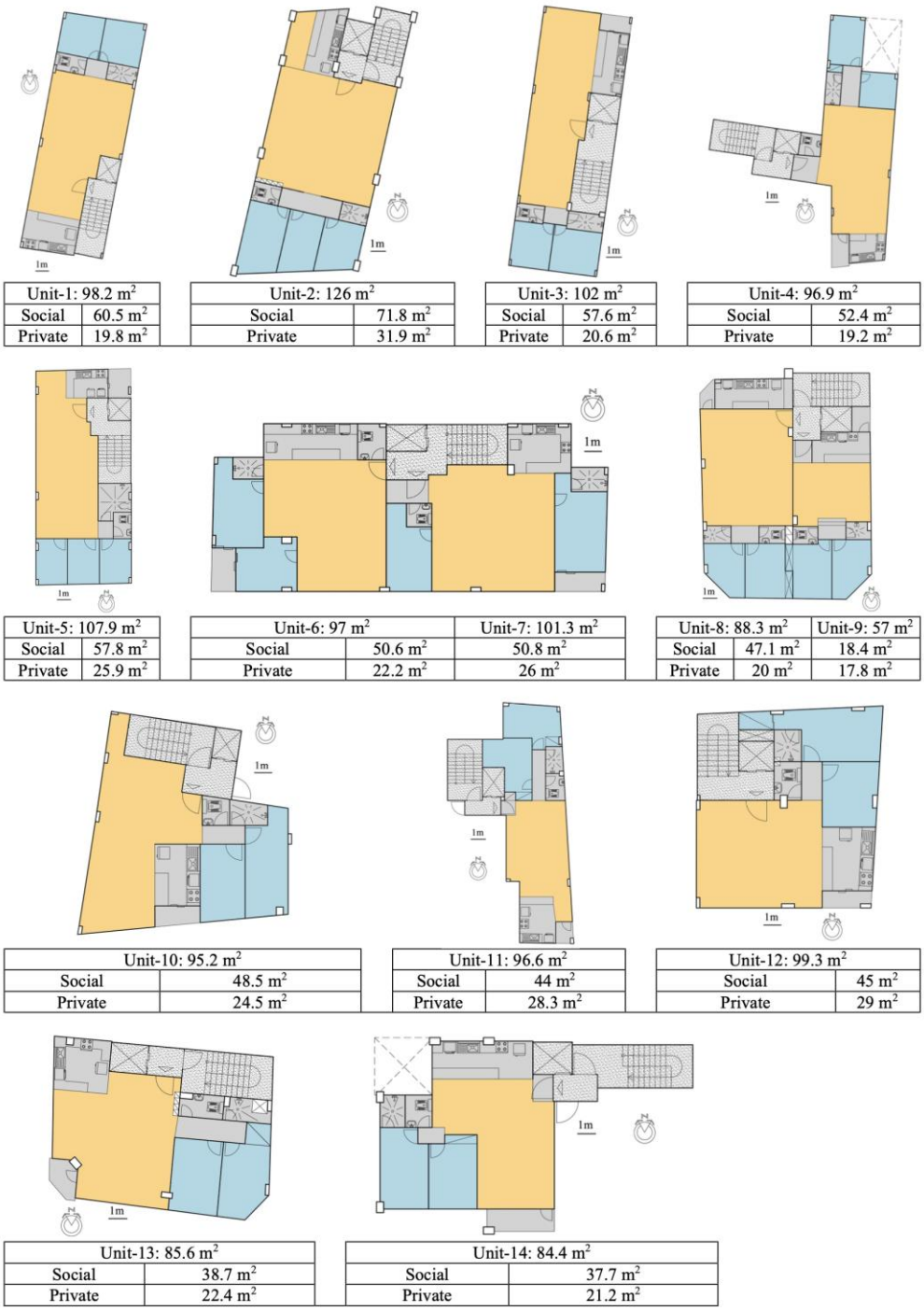

Figure 15. *Interior Layouts of Units Exceeding 75 m²*
Despite larger overall size, these examples reveal recurring challenges in bedroom design, spatial hierarchy, and disproportionate allocation of social space, often overshadowing the private zone.

Figure 16. *Interior Layouts of Units Under 75 m²*
These compact designs show challenges with bedroom dimensions, spatial hierarchy, and bathroom access, frequently using bedroom doors for the single bathroom to maximize the living area.

Our analysis of larger units uncovered some unexpected challenges. Even in spacious units, bedroom design emerged as a recurring issue. For instance, Unit-1 (98.2 m²) and Unit-3 (102 m²) featured inadequate bedroom sizes despite their generous overall areas. This finding suggests that ample total space does not

necessarily translate into optimal bedroom design. Some larger units also exhibited difficulties in establishing spatial hierarchies. Unit-5 (107.9 m²) and Unit-7 (101.3 m²) exemplify this issue, highlighting that size alone does not guarantee effective space arrangement or hierarchy. Additionally, most units demonstrated extreme proportions in social area allocation. Unit-1 (98.2 m²) allocated 61.6%, Unit-2 (126 m²) allocated 57%, Unit-3 (102 m²) allocated 56.5%, and Unit-5 (107.9 m²) allocated 53.6% of their total areas to social spaces, potentially compromising other functional needs. This disproportionate emphasis on social areas was observed in most samples exceeding 75 m², with the trend becoming more pronounced as unit size increased.

The following samples reveal that the social area consistently occupies the largest proportion of unit area. For other spatial functions, designs generally adhere to the minimum dimensions specified by regulations. In the examined samples, the social area, which consistently occupies the largest portion of unit space, is rarely divided into subspaces such as living room, dining room, and salon using solid dividing elements like walls. Instead, spatial separation within the social area is primarily achieved through non-fixed elements, such as furniture.

In the smaller units' category, illustrated in Figure 16, bedroom design issues were particularly evident. Several units, including Units 15, 16, 18, 19, 20, 22, and 23, exhibited challenges related to bedroom size, aspect ratio, and overall shape. This reflects the limitations of designing on constrained land plots with narrow widths, which often result in irregular floor plan geometries. Many smaller units demonstrated difficulties maintaining clear spatial hierarchies between different functional zones, particularly private and social areas. This issue was observed across various unit sizes within this category, ranging from the smallest example, Unit-15 (29.5 m²), to larger ones, such as Unit-31 (71.3 m²).

In samples with compact areas where space optimization is critical, bathroom doors frequently open into bedrooms to preserve the efficiency of the living room. However, this design approach compromises both the efficiency and privacy of the bedroom. Several unit examples, particularly those under 50 m², such as Unit-23 (31.3 m²) and Unit-30 (41.4 m²), illustrate this trade-off, emphasizing the compromises often required in compact designs. This pattern is also evident in Units 15, 17, 23, 24, 26, 27, 28, 29, and 30. Despite these efforts at optimization, achieving an ideal shape and size for the social area in small units with narrow widths and irregular floor plans remains challenging. This is evident in examples such as Unit-19 (72.4 m²) and Unit-20 (40 m²).

Many larger units face challenges efficiently utilizing their available space, while smaller units often struggle to accommodate all necessary functions. In both cases, bedroom design consistently emerges as an area requiring improvement compared to the social area, highlighting its critical role in optimizing residential layouts.

Conclusion

In concluding this study on the dynamic interaction between social and private spaces in Tehran's District 9 residential units, our analysis reveals distinct trends shaped by cultural norms, space constraints, and related rules and regulations. In smaller housing units, predominantly between 35 and 75 m², the interior layout and allocation of different spaces tend to be more uniform and consistent, with less variety and closely adhering to minimum mandatory regulations. There is a more balanced approach to allocating and distributing space among various functions in smaller units. Notably, a significant number of these units fail to meet the minimum area requirements for bedrooms, a trend that becomes more pronounced in units exceeding 75 m², where spatial constraints are less critical. Across all unit sizes, there is a clear preference for expanding the social area, often at the expense of private space. As a result, bedrooms frequently adhere to or, in many cases, fall short of the minimum spatial standards. The focus is typically on providing two bedrooms to maintain family privacy; however, less attention is given to the quality of these bedrooms within the private zone.

Particularly in larger units, there is a notable emphasis on expansive social area, overshadowing attention to private space. Interestingly, no specific regulations mandate minimum sizes for living room, dining room, or salon. In larger units, these spaces often overlap without clear boundaries, making it difficult to distinguish them from one another. The social area primarily consists of an integrated wide space that is typically the most spacious and frequently utilized area within the residential unit. This preference appears voluntary, independent of existing regulations, and significantly influenced by social norms deeply rooted in Iranian history and culture.

Despite ongoing changes in urban lifestyles and challenges in providing adequate residential space in large cities, particularly for lower-income residents in central districts of Tehran, there remains a persistent preference among many residents for maintaining separation between kitchen and social area. Conversely, despite global trends toward individualism, Iranian society continues to exhibit a family-oriented and collectivist approach in practice. The historical, traditional, religious and cultural values deeply embedded in Iranian society manifest in residential unit designs emphasizing open, unobstructed, and adaptable social area.

However, while fostering communal interactions, this pronounced focus on social area unintentionally diminishes the quality and functionality of private space. Recent lifestyle changes and economic conditions have also impacted traditional social practices. Family gatherings and ceremonies are increasingly held in public spaces such as cafes, salons, restaurants, and mosques, challenging interior space arrangements traditionally designed for hosting such events at home. The potential rise of remote work and online jobs further underscores the need for adaptable private space that can serve as home offices; however, this requires further investigation within the context of Tehran's housing landscape. The present contrast between rapid socio-cultural changes in recent years and interior residential layouts can be attributed to the slow pace at which cultural shifts influence interior design practices. This delay occurs because interior layouts possess a rigid nature that adapts slowly to evolving societal trends and preferences.

In Iranian housing design, while collective and familial interactions remain a strong cultural undercurrent, there is an increasing demand to balance these with individual privacy and personal space needs. Especially in the contemporary era, there is heightened emphasis on privacy and individual needs, even within traditionally rooted societies like Iran. Balancing collective values with individual priorities in residential unit designs can optimize interior space usage while enhancing overall spatial quality. This study highlights the need for a more nuanced approach to urban residential design that harmoniously integrates traditional values with modern living requirements.

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