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Institutional Ownership and Concentration of Capital in Pharmaceutical Companies: Evidence from Iran

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A B S T R A C T

Background: Institutional owners influence the direction of policy and the performance of owned companies. This research was motivated by the presence of pharmaceutical companies in the Tehran Stock Exchange and the uncertainty surrounding the extent and influence of institutional owners on the policy direction and performance of the companies.

Methods: This was a descriptive-analytical and cross-sectional study. The descriptive phase of the study involved measuring sales figures, market value, and market share of pharmaceutical companies listed on the stock exchange. In the analytical phase, the network of shareholders' relationships was analyzed with Gephi version 0.1 and Microsoft Excel version 2016, followed by the calculation of the capital concentration index and market share.

Results: Estimates indicated that approximately 45% of the pharmaceutical companies in Iran were publicly traded in stock exchange. In 2020, the total value of these companies in the Iranian capital market reached 9.79 billion USD. Out of this amount, 45% (equivalent to 4.4 billion USD) was offered in Tehran Stock Exchange. The concentration of final shareholders, with a Herfindahl–Hirschman index(HHI) index of 0.036, signified a monopolistic competition market. On the other hand, the pharmaceutical capital market could be classified as an oligopoly market (with a CR_4value of 58.3) when analyzing only the direct shareholders at level 2. Additionally, the six main holding companies at this level collectively possess 67% of the pharmaceutical capital market.

Conclusion: Based on the results, the importance of institutional owners, such as the Social Security Organization (SSO), in the decision-making process regarding the Iranian pharmaceutical market can be acknowledged. The decisions about integration and supply chains which aimed at improving the productivity of the pharmaceutical market, need to be thoroughly examined by the institutions mentioned in this research.

Keywords: Securities, Network Analysis, Herfindahl–Hirschman index, Concentration Ratio, Medicine

Introduction

The existence of capital markets is crucial for the advancement and equilibrium of the economy in different countries. These markets have played a significant role in fostering growth and progress in recent times. Among these markets, the Securities held a special position in the expansion of both the financial sector and the stock market. Its primary function is to gather small savings and liquidity from society to be utilized in the production of goods and services. The financial sector serves as a vital source of funding in global economies, and therefore, the progress of businesses and economic activities in countries relies heavily on access to these financial

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resources (1, 2). From 1992 to 2014, the number of listed companies in Malaysia, China, South Korea, and Iran has had a substantial increase, growing 2.7, 10.2, 2.6, and 2.6 times, respectively. This upward trend reflects the growing participation of companies in capital market and indicates the increasing inclination towards financial investment and enterprise development in developing nations (3).

The economic development of countries is greatly influenced by health sector, making it a significant and crucial component. Planners and policy makers recognize the importance of industries such as pharmaceuticals, medical equipment, and health tourism, within this sector, as they contribute to high-income opportunities. Emphasis on this sector stems from the recognition of health significance in communities and the increasing demand for healthcare, which in turn leads to rising costs. The pharmaceutical industry plays a major role in this sector, accounting for 30% of health expenditures (1, 4, 5). Medications are essential in a majority of medical procedures, with over 75% of them relying on drugs. Iran ranks among the top 20 countries globally in terms of drug consumption (5, 6). These conditions have propelled the pharmaceutical industry to a prominent position among global industries (7). The projected global drug sales for 2020 amounted to $1.3 trillion, with higher growth rates compared to others, thanks to substantial profits and advancements in drug industry within the health sector. In 2014, Iran's pharmaceutical market was estimated at $2.35 billion. This market is competitive, with four large companies monopolizing 18.39% of it out of a total of 56 pharmaceutical companies. Of these 56 companies, 37 are listed on the Iranian Stock Exchange (the number may vary depending on the year of analysis) (5, 8-11).

Governance encompasses the intricate process of decision-making among actors who possess different levels of conflict pertaining to a particular issue and its execution. While the government serves as the most formal governing body, there exists other entities responsible for governance, such as companies, tribes, families, and less formal groups. Broadly speaking, governance can be categorized into three main types: global, national, and organizational (corporate) (12). The widespread adoption of corporate governance concept in various fields and literature has given rise to a lack of precise definition universally accepted by researchers with no clear understanding of what corporate governance truly entails. However, in a general sense, corporate governance refers to mechanisms, processes, and relationships that regulate, direct, and manage firms (12, 13). Corporate governance can be defined as a comprehensive framework consisting of various methods, policies, and legal principles. Its primary objective is addressing the agency problems that arise due to the separation of ownership and control within a company. According to agency theory, shareholders grant authority to managers to act on their behalf. However, challenges arise as shareholders have limited oversight over managers whose objectives may differ from their own. Consequently, managers may allocate company resources in a manner that aligns with their personal preferences, contradicting the interests of shareholders (14-18). Therefore, the hypotheses of active supervision, self-interest, and strategic cooperation emerge, reflecting the conflict and collaboration between management and shareholders, which can significantly impact a company's performance (19, 20).

Robust corporate governance mechanisms play a crucial role in safeguarding the interests of both shareholders and stakeholders, ultimately enhancing company performance. These mechanisms ensure that managers act in the best interests of shareholders (21, 22). Among the various effective corporate governance mechanisms, the emergence of institutional investors as corporate owners has gained significant importance. Institutional investors,

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who hold a substantial portion of corporate shares, have considerable influence and can mitigate agency problems (23, 24). Institutional ownership encompasses shares held by banks, insurers, holdings, investment firms, pension funds, capital financing companies, government agencies, and governmental companies. Typically, institutional investors hold large stakes, granting them the ability to directly influence management activities through ownership and indirectly through stock trading. Extensive research has highlighted the correlation between ownership concentration and productivity, information symmetry, and financial performance (22, 25-28).

This research aims to examine the level of institutional ownership in pharmaceutical companies listed in the Stock Exchange. Specifically, it focuses on analyzing the concentration of ownership among institutional investors. The significance and novelty of this study lies in the fact that no previous research has been conducted on this topic in Iran, and there is a lack of understanding regarding the role of institutional shareholders in the capital market. Through this study, the researchers will provide an overview of the current state of ownership and ownership patterns in pharmaceutical capital market, while also assessing the extent of ownership concentration. Additionally, recognizing the decision-making authority held by institutional owners as a governance tool, the authors will propose recommendations to enhance the performance of Iranian pharmaceutical market.

Materials and Methods

This research was conducted as a descriptive-analytical and cross-sectional study. The statistical data pertaining to the current companies listed in the stock market were obtained from the Iranian pharmaceutical statistics in 2018 and the official website of the stock exchange organization at TESME.IR in 2020 (29, 30).

In the descriptive phase of the research, a thorough examination was conducted on the sales volume, value, and market share of each company, as well as the capital held by their shareholders. Moving on to the analytical phase, the network of shareholders' relationships among the listed companies was analyzed using Gephi version 0.1 and Excel software version 2016. Network analysis entails representing external reality by plotting interconnected elements as points, connected by lines, thereby revealing the nature of their connections. This method typically exhibits a pattern resembling spider-like lines or a net, which serves as a visual representation of a real network. At its core, network analysis relies on graph theory in mathematics. Within this theory, the authors work with two sets: a set of nodes, which represent the elements of the network (such as individuals, organizations, molecules, and cells), and a set of edges, which represent the relationships between these elements (such as friendship, biological exchange, capital flows, energy, and population). Consequently, different types of networks can be defined based on the characteristics of the nodes and edges (31, 32). The results of the measurements conducted using Excel software are illustrated in Figure 1.

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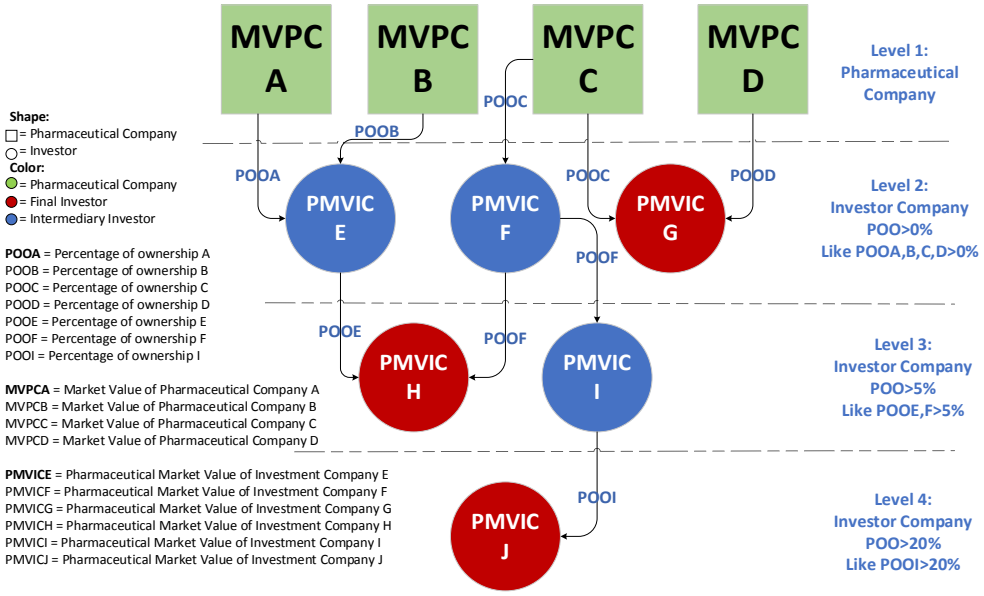

Figure 1. The method of calculating the concentration of ownership and capital in the pharmaceutical market [a]

*a: The calculation method employed in this study involved several steps. First, the daily value of pharmaceutical companies, such as MVPCA, was determined on a specific day. Once the shareholders of these companies were identified, the relationships were established. The value of each shareholder was dependent on their total ownership of shares in pharmaceutical companies. As illustrated in the diagram, the share capital E (PMVICE) was determined based on the ownership of shares in pharmaceutical companies A and B (PMVICE = (MVPC * POOA) + (MVPCB * POOB)).*
To ensure a comprehensive analysis, a hierarchical approach was adopted. Pharmaceutical companies were placed on the first level, while their shareholders on the second level. This second level included both direct shareholders and those who held shares in the pharmaceutical company. Moving further, the third level consisted of companies with a capital stake exceeding 5%, and finally, the fourth level comprised companies with a 20% shareholding.
Companies at the third and fourth levels were considered indirect shareholders in the pharmaceutical market, as they held shares through their lower-level companies. For instance, if investor F in the second level owned 3% of the shares in pharmaceutical company C, and shareholder I in the third level owned 1% of the shares in shareholder F, the indirect pharmaceutical capital of company I was calculated as 0.002 (0.01 multiplied by 0.02%) of the pharmaceutical company C. This represented a relatively small amount. To ensure the accuracy and relevance of the analysis, companies with assets below 5% at the third level were excluded from the calculations. Similarly, in the fourth level, companies with a shareholding exceeding 20% of the previous level were included in the study. This approach helped to focus on significant shareholders and their impact on the pharmaceutical market.

In the subsequent section, the utilization of Excel software facilitated the measurement of the capital concentration index in the pharmaceutical market. The concept of "concentration" evaluates how the market is divided among different firms (33). The classification of the market was established by considering the market share held by each company and the total number of companies operating within it. Markets can exist in either a state of monopoly or perfect competition. The various types of markets were delineated as follows (34):

Monopoly refers to a situation in which a single company possesses the entire market share. On the other hand, oligopoly arises when a company holds a dominant position in the market, with a market share ranging from 50% to 100%, and the demand for its products is relatively unresponsive to price changes. In the case where the combined market share of the four leading companies exceeds 60% during a specified period, oligopoly is considered closed or tight. Conversely, if the cumulative market share of these four companies falls below 40% of the total market, oligopoly is classified as open or loose. Monopolistic competition, however, occurs when numerous competitors coexist in the

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market, yet none of them possess a market share exceeding 10% of the total market. Finally, perfect competition is characterized by the presence of over 50 companies in the market, none of which hold a significant market share.

Various indicators are employed to assess market structure and concentration. The Concentration Ratio (CR_n) and Herfindahl-Hirschman Index (HHI) are the most commonly used metrics in both investigating the relationship between market structure and firm performance, and in evaluating the competitive effects of proposed mergers and acquisitions (35). The CR_n reveals the proportion of industry shares held by major corporations, while the HHI index provides a more comprehensive analysis by considering information about all the companies within the industry, not just the leading ones. Moreover, HHI not only examines how market share is distributed among firms in terms of production, sales, assets, and workforce, but also offers a superior assessment of market structure compared to the CR_n(33, 34, 36, 37). The formulas for these indicators are as follows (34, 38):

$$CR_n = \sum_{i=1}^{n} S_i \quad , \quad n = 1,2,4,6,\dots,20 \qquad (1)$$

$$HHI = \sum_{i=1}^{n} (S_i)^2 \, , S_i = \frac{y}{Y} \qquad (2)$$

In Formula 1, the concentration index is derived by summing up the market shares of the top "n" companies, which indicates the cumulative percentage of active companies. Formula 2, on the other hand, utilizes "S_i" to show the market share of each company. This market share is obtained by dividing the capital of each shareholder "y" by the total capital in the market denoted as "Y". HHI ranges from $1/n$ to 1. As HHI approaches 1, a higher level of concentration and a more monopolistic market is observed. Conversely, as HHI approaches n/1, the market becomes more competitive. If HHI is less than 0.1, the market is considered decentralized. In the range of 0.1, to 0.18, the market is relatively concentrated, and if HHI exceeds 0.18, the market is highly concentrated. Table 1 (34) provides the classification method based on the CR_n and HHI indices.

Table 1. Classification of markets based on concentration ratios and HHI

Type of market	N leading firms concentration ratios (CR_n) [a]	HHI
Perfect competition	$CR_1 \to 0$	$HHI \to 0$
Monopolistic competition	$CR_1 < 10$	$15 < \left(\frac{1}{HHI}\right) \leq 30$
Open (loose) oligopoly	$CR_4 < 40$	$10 < \left(\frac{1}{HHI}\right) \leq 15$
Oligopoly	$40 \leq CR_1 \leq 60$	$6 < \left(\frac{1}{HHI}\right) \leq 10$
Closed (tight) oligopoly	$CR_4 > 60$	$3 < \left(\frac{1}{HHI}\right) \leq 6$
Dominant firm	$CR_1 \geq 50$	$1 < \left(\frac{1}{HHI}\right) \leq 3$
Monopoly	$CR_1 \to 100$	$HHI \to 1$

a: CR_n denotes the concentration ratio of N leading firms

To conduct the computations, initially, estimation was made regarding the capital amount of every ultimate investor. Subsequently, the proportion of capital from the overall market was determined for each investor. Ultimately, the cumulative frequency was computed.

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Results

Descriptive findings: According to the analysis conducted on pharmaceutical statistics in 2018, there were 185 manufacturing companies, 47 distribution companies, and 232 import companies. Among these, there were 162 active companies in 2018 for manufacturing, 47 for distribution, and 183 for import. Additionally, within the active companies, 28 manufacturing companies, 3 distribution companies, and 9 import companies were listed in the Tehran Stock Exchange as of December 15, 2020.

Data further revealed that the capital market played a significant role in the pharmaceutical industry. Approximately, 30.2% of the sales were made by distribution companies, 52.3% by drug manufacturers, and 4.8% by import companies, which were offered in the capital market. This highlighted the importance of the stock exchange in facilitating financial transactions within the pharmaceutical sector.

Furthermore, the market value of pharmaceutical companies operating in Iran was estimated to be 2350 thousand billion rials. These figures provided valuable insights into the financial landscape of the pharmaceutical industry in the country. Table 2 provides a more comprehensive understanding of statistics, , which provides detailed information on the subject matter.

Table 2. Detailed statistics of Iranian pharmaceutical companies [a]

Area	Number of companies	Active companies[b]	Total sales estimate for the year 2018	Number of companies listed on the stock exchange[c]	Sales estimates of listed companies in 2018	Percentage of sales in listed companies from the total sales market	Market value of stock exchange companies	Estimation of the total value of the Iranian pharmaceutical market[e]
production	185	162	161,364	28	84,444	52.33 %	946,797	1,809,235
Importation	232	183	69,244	9	3,333	4.81 %	9,469	196,685
Distribution	47	47	231,269	3	70,036	30.28%	104,562	345,278
Total	----	----	----	36[d]	----	45.1%	1,060,829	2,351,198

a: Figures of billion rials

b: Companies with turnover

c: Eight manufacturing companies were also importer ones.

d: Four pharmaceutical raw material manufacturers were excluded from the pharmaceutical statistics as they did not produce consumable drugs.

e: The estimation relied on the proportion of drug sales attributed to each company (third column)

In relation to the calculation of shareholders' capital in the stock market, companies were classified into three distinct categories. The initial category, serving as the primary reference for computations, encompassed companies engaged in the production, distribution, and importation of pharmaceuticals. The second group consisted of ultimate shareholders, while the third group included intermediary shareholders. Within the ultimate shareholders category, a further division was made between micro shareholders, which, including both individuals and companies holding less than 1% of the total investment, and institutional shareholders, who possessed more than 1% of the shares. Table 3 provides an overview of the statistics pertaining to micro and institutional shareholders of companies listed in the stock exchange.

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Table 3. Statistics of shareholders and their relationships in drug capital market

Node[a]	Node number	Edge type[a]	Total number of Edges
Pharmaceutical company	56[c]	Only input edge	
Micro shareholder [b]	50	Only output edge	
Institutional shareholder	139	Only output edge	333
Intermediary shareholder	13	Input and output edge	
Total	259	--	

a: There were three distinct categories in which the nodes were classified. The first category consisted of nodes belonging to pharmaceutical companies, namely the manufacturer, distributor, and importer. These nodes were characterized by having only an "input edge," indicating their role in the supply chain. The second category comprised the final shareholder nodes, encompassing both small and major shareholders. These nodes were distinguished by having solely an "output edge," signifying their position as recipients of the company's profits. Finally, the intermediary investor nodes constituted the third category, possessing both an "input and output edge." This indicated that these nodes not only owned shares in the investor company but also held the position of a shareholder in another company.
b: Less than 1% of the total shares of any investing or pharmaceutical company were owned by individual shareholders, excluding major investors of the same company. These individual shareholders, who did not have any significant influence on the company's decision-making, were referred to as final shareholders.
c According to Table 2, there were 36 pharmaceutical companies available in the capital market. Additionally, the pharmaceutical holdings' portfolio included twenty non-listed pharmaceutical companies.

Analytical findings

A) Shareholders' network analysis in capital market:

In Figure 2, the graph shows the composition of the pharmaceutical holdings' portfolio, consisting of 36 listed companies and 20 non-listed companies. This stock basket formed a network that involved a total of 189 micro and institutional ownerships as final investors, along with 13 intermediary investors. The network was interconnected through 333 communication edges.

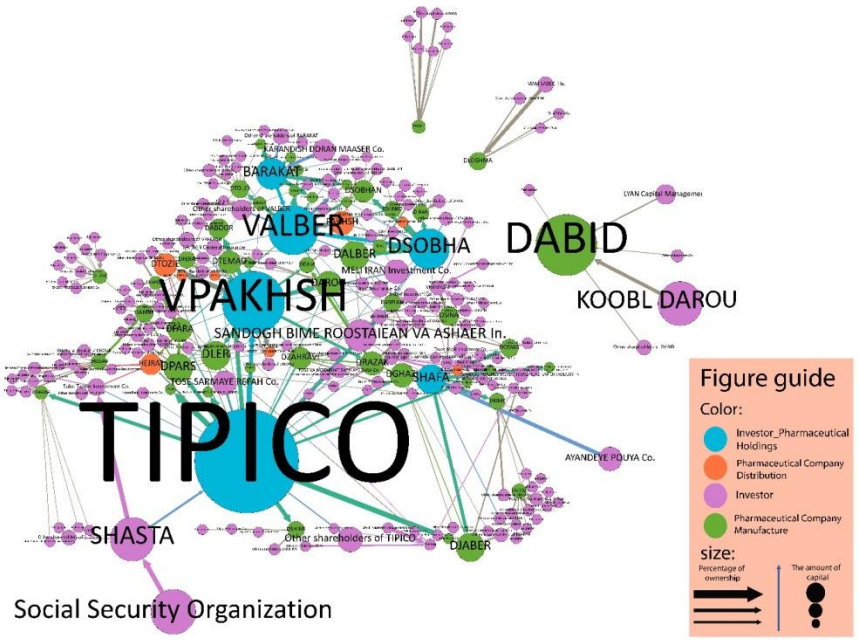

Figure 2. Shareholder's network in the pharmaceutical industry stock market [a]
a: Importing companies and manufacturing companies were considered one.

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Figure 2 depicts the robustness of various holdings, with a notable emphasis on Tamin Pharmaceutical Investment Holding (Tipico), which held shares in both pharmaceutical companies and holding (Vpakhsh). As indicated by Figure 2, the Social Security Organization (SSO) indirectly held shares in 17 pharmaceutical companies listed in the Tehran Stock Exchange.

B) The concentration of the shareholders analysis in the capital market:

This study carried out tests in two distinct sections, each based on different hypotheses. The first section focused on calculating the capital concentration index for final owners, specifically those who did not possess an input edge (as indicated in Table 3). This section encompassed all the four levels, as depicted in Figure 1. Within this section, 189 final shareholders from the pharmaceutical market of the Tehran Stock Exchange were taken into consideration. The stock value held by each shareholder was carefully measured and subsequently reported to the overall value of the pharmaceutical stock market. The resulting HHI index for this market was estimated to be 0.0368. Furthermore, the concentration ratio for the top 1, 4, and 8 leading firms was 10, 30.2, and 45.4, respectively. Based on these findings, it can be concluded that market structure at the level of final shareholders exhibited characteristics of a monopolistic competition. The detailed analysis of this particular section can be found in Table 4.

Table 4. Capital concentration index of the final shareholders regarding pharmaceutical companies in the capital market

Row /No	Shareholders (institutional ownership)[a]	Capital value (figures of billion rials)	Market share	$CR_n(\%)$		
				n=1	n=4	n=8
1	Social Security Organization (SSO)	98,073	0.100	10	30.2	45.4
2	Koobl Daroo Company	95,539	0.098			
3	Villagers and Nomads Insurance Fund (Sandogh Bime Roostaiean Va Ashaer In.)	60,606	0.062			
4	Other shareholders of TIPICO (With a sum of under 1 percent)	41,551	0.043			
5	Meli Iran Investment Company	38,905	0.040			
6	Ayandeye Pouya Company	38,444	0.039			
7	Tose Sarmaye Refah Company	37,808	0.039			
8	Karandish Doran Maaser Company	33,077	0.034			
9	Other shareholders of VALBER (With a sum of under 1 percent)	28,077	0.029			
10	LYAN Capital Management Company	26,908	0.028			
.	.	.	.			
.	.	.	.			
.	.	.	.			
Total (189 final investor companies)		977,144	1	--		
HHI		$\frac{1}{189} \leq HHI \leq 1 \rightarrow HHI = 0.0368$				
$\frac{1}{\text{HHI}}$		27.6				

a: Considering micro-shareholders as a cohesive unit (like other Tipico shareholders who were considered an institutional shareholder)

In the subsequent section, an examination of direct shareholders, specifically holdings (confining shareholders to level 2 as depicted in Figure 1), revealed that the top four companies constituted 58.35% of the market, while the six primary holdings (Tipico, Vpakhsh, Valber, Dsobha, Shafa, and Barakat) accounted for 67% of the market share (as indicated in Table 5). Market structure at this level of shareholders could be classified as an oligopoly. The variance of 83 thousand billion rials

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in the total capital value between Tables 4 and 5 can be attributed to the exclusion of shareholders below 5 and 20 percent in Figure 1.

Table 5. Capital concentration index of direct shareholders (level 2) of pharmaceutical companies in the capital market

Row/ No	Shareholders (institutional owners)	Capital value (figures in billion rials)	Market share	CR_n n=1	CR_n n=4	CR_n n=8
1	Tipico	265507	0.250	25.03	58.35	79.50
2	Vpakhsh	147394	0.139			
3	Valber	110585	0.104			
4	Koobl Daroo Co.	95539	0.090			
5	Dsobha	85561	0.081			
6	Barakat	58276	0.055			
7	Shafa	53618	0.051			
8	Lyan Capital Management Company	26908	0.025			
.	.	.	.			
.	.	.	.			
.	.	.	.			
	Total	1,060,829	1		--	

Discussion

According to latest estimates, the Iranian pharmaceutical market's value in 2020 reached an impressive 2350 thousand billion rials, equivalent to approximately 9.79 billion dollars (with an exchange rate of 1USD = 240000 rials) (39). Out of this total, around 45% or 1060 thousand billion rials (equivalent to 4.4 billion dollars) were listed in Tehran Stock Exchange. It is worth noting that the market value of the Iranian pharmaceutical market was estimated at 3.31 billion dollars in 2019(40). Additionally, in 2019, this value was estimated at 23 thousand billion tomans or 5.5 billion dollars, considering the official dollar rate of 1USD = 42000 rials (41). However, it is important to mention that the free exchange rate fluctuated between 60 and 120 thousand rials at the beginning and end of the year (39).

Taking these statistics into account, the Iranian pharmaceutical market currently represents 0.4% of the global pharmaceutical market. This percentage indicated a significant increase compared to the 0.2% share it held in 2015 when calculated using the government exchange rate of 1USD = 42000 rials. This demonstrated a remarkable 100% increase in Iran's market share. However, when it was calculated using the free-market exchange rate of 1USD = 80000 rials (the average rate in 2018), there was no change in Iran's share (42).

The concentration of institutional shareholders in the pharmaceutical capital market, as indicated by a 0.036 value in the HII Index showed a market structure characterized by monopolistic competition. However, Emamgholipour and Agheli's research in 2016 revealed that the market structure for drug sales in the production, import, and distribution industry was characterized by perfect competition, open (loose) competition, and oligopoly. This was attributed to the presence of six pharmaceutical holdings acting as intermediaries, indirectly distributing the capital of institutional owners among pharmaceutical companies. This distribution of capital can be seen as a contributing factor to the competitiveness of the pharmaceutical market, as highlighted in the previous study. For instance, Abidi Pharmaceutical Company, one of the leading pharmaceutical companies in Iran, demonstrated its value in the stock market and sales performance. It is noteworthy that Abidi Pharmaceutical Company had a strong institutional owner, Koobl Daru Company, which did not distribute its capital through an intermediary investor. On the other hand, the SSO, the largest institutional shareholder in the capital market, held a significant number of

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pharmaceutical companies through Tipico and Vpakhsh Holdings. However, due to the distribution of capital through these holdings, it did not exert a significant influence on the sales of these companies, given the competitive nature of the drug sales market (34). Although the relationship between ownership and productivity was not explicitly established, the value of the company and the sales performance of Abidi Pharmaceutical Company, along with its largest shareholder, Koobl Daru, were in line with studies regarding the relationship between ownership concentration and overall productivity. These studies indicated that a lower number of institutional owners increased productivity which led to better financial performance for the company (25,26). One possible explanation for this was the presence of greater information symmetry in companies with fewer institutional shareholders (27,28).

Production, import, and distribution companies in the capital market are frequently under the ownership of six prominent pharmaceutical holdings. This particular market could be classified as an oligopoly, as depicted in level 2 of Figure 1, with these six major holdings collectively controlling 67% of the capital market. As of 2015, both the global pharmaceutical market and the United States' market exhibited an HHI fluctuating between 0.05 and 0.07 (43). The integration trend observed in the pharmaceutical industry during that year primarily stemmed from the desire to improve research and efficiency, with economies of scale being utilized as a justification for consolidating dispersed research units and therapeutic areas within integrated companies (44). Considering the decision-making authority of institutional owners and the cost reduction objectives of holding companies through synergy and supply chain optimization, it can be inferred that such behavior was a favorable process that effectively leveraged integration and economies of scale. This was facilitated by the competitive nature of the production (sales) market and the monopolistic competition observed in the capital market (level 2), which provided conducive conditions for integration of pharmaceutical companies. Furthermore, in terms of anti-trust laws, any integration facilitated by pharmaceutical holdings was subject to fewer restrictions due to the relatively low HHI index (43, 45).

Limitations

Limited access to the latest information posed a challenge for this study. The publication of pharmaceutical statistics was delayed, and the pharmaceutical and capital market data extracted were not time-sensitive. However, these limitations did not hinder the estimation of the concentration index or network analysis.

Another limitation was the inclusion of non-listed pharmaceutical companies in the Stock Exchange regarding the portfolio of holding companies. The value of these pharmaceutical companies was measured based on the nominal value of their shares (each share being equivalent to 1000 rials). This aspect was crucial in calculating the value of pharmaceutical holdings, as it resulted in a lower value compared to their actual worth.

Ultimately, the methodology employed in this study was developed considering the presence of public companies. Privately-owned companies were treated as the final investor, similar to individuals, due to the absence of registration and identification of shareholders through the Security Organization.

Conclusion

The conclusions drawn from this study are based on the identification of decision centers in the drug market by using network analysis of shareholders in the pharmaceutical capital market. However, a comprehensive investigation into the correlation between capital concentration and sales concentration in pharmaceutical companies has not been conducted, further research is necessary to establish this relationship. Nonetheless, the findings of this study confirm the relationship between the structure of the capital market and company sales. Conversely, the institutional

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owners of the Iranian pharmaceutical market may consider pursuing the integration of pharmaceutical companies to capitalize on its advantages, given the low concentration index and absence of issues with anti-trust policies. To improve the current research, it is suggested that this methodology be applied to all pharmaceutical companies, regardless of their acceptance in the Stock Exchange

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Authors' Contributions
Yaghoubi R and Emamgholipour S designed research; All authors conducted research; Yaghoubi R analyzed data; All authors wrote the paper. Emamgholipour S had primary responsibility for final content. All authors read and approved the final manuscript.

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Ethical Approval
Non applicable.

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