Table 7 and Figure 9 show the situation of the authorization in Shandong province. There is not evident wave in the sixteen cities. But in 2014, except for several cities, there is different degree decline in the whole province except for several cities. The main reason of the decline is the more standardized check procedures and the more strict check standards.

Table 7
The Statistics of Invention Patent Authorization in Shandong 16 Cities During 2012 to 2015

	2012	2013	2014	2015
Jinan	14,367	12,403	11,737	15,537
Qingdao	12,689	13,856	14,176	20,168
Zibo	4,401	5,203	4,711	6,478
Zaozhuang	1,864	1,918	1,665	2,446
Dongying	2,576	2,971	3,058	3,189
Yantai	5,801	4,991	4,466	6,065
Weifang	7,386	8,186	8,435	11,055
Jining	5,457	5,453	4,582	6,349
Taian	2,701	2,768	2,626	3,191
Weihai	2,990	3,075	2,832	3,795
Rizhao	1,638	1,707	1,514	1,779
Laiwu	1,913	1,919	1,712	2,380
Linyi	2,706	2,838	2,922	4,211
Dezhou	2,423	2,807	2,411	2,975
Liaocheng	1,409	1,915	1,731	2,583
Binzhou	3,280	2,931	2,399	3,268
Heze	1,912	2,035	1,841	2,632

Data source: Shandong Statistical Yearbook 2015.

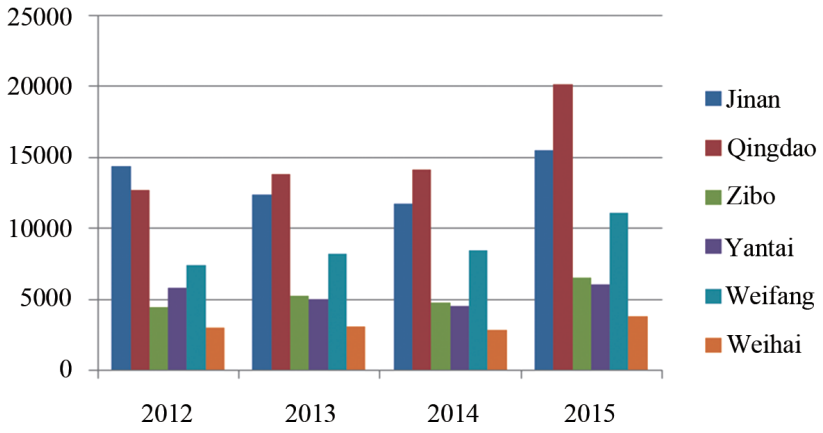

Figure 9
The Statistics of Invention Patent Authorization of Top Six Cities in Shandong During 2012 to 2015
Data Source: Shandong Statistical Yearbook 2015.

Making a horizontal comparison among the sixteen cities in Shandong province, whether the application or authorization of innovation patent Qingdao and Jinan lead the province, and then Qingdao has more distinct advantages. In recent years, the development of Qingdao rapid especially which is the typical "rising star", but Jinan is slower significantly. So, in allusion to Jinan and Qingdao, this research makes a further detailed comparison of the various indexes.

Table 8
Each Index Comparison Between Jinan and Qingdao

	The application of Invention patent		The authorization of Invention patent		The turnover of technology market (Billion)		The volume of technology market		The technology transaction turnover accounted for the proportion of technology transaction turnover in Shandong province	
	Jinan	Qingdao	Jinan	Qingdao	Jinan	Qingdao	Jinan	Qingdao	Jinan	Qingdao
2012	23,094	27,009	14,367	12,689	26.37	21.97	3113	3608	25.97%	15.70%
2013	22,527	48,607	12,403	13,856	27.68	31.47	3459	2673	15.43%	17.54%
2014	23,512	55,174	11,737	14,176	37.14	52.17	3327	3667	14.90%	20.93%
2015	28,944	63,691	15,537	20,168	30.99	74.87	3594	5054	10.08%	24.34%

Data source: Jinan Science & Technology Bureau; Qingdao Science & Technology Bureau; Shandong Statistical Yearbook 2015; Torch High Technology Industry Development Center, Ministry of Science & Technology.

Table 8, from the aspect of the middle technology output- the application and the authorization of innovation patent, there is a large gap in the application but a small gap in authorization between Jinan and Qingdao. Although there is a small gap in authorization, the final technology output—the turnover and the volume of technology transaction in Jinan is still very low. This phenomenon reflects a very serious problem in Jinan, the gold content of the unit technology output is very low, it needs to be further improved.

Table 8 makes a comparison of the Jinan and Qingdao technology transaction turnover accounts for the proportion of technology transaction turnover in Shandong province. Jinan technology transaction turnover accounted for 25.97% of the province, Qingdao accounted for 15.70% of the province, Jinan was the leader before 2012. However, Qingdao exceeded Jinan and ranked first since 2013.

Up to now, Jinan has activated 847 different kinds of enterprise research and development institutions, 39 of them are national level and 256 of them are provincial level. These institutions include 304 enterprise technology centers of city level and higher, 460 engineering the technology research centers, 71 engineering technology research centers, 12 enterprise key laboratories, 6 national science and technology parks, 6 international technology cooperation bases. Jinan totally has 22 high-teach business incubators of city level and higher, 7 of them are national level and 2 of them are provincial level.

Up to 2015, Qingdao has 52 colleges and scientific research institutions, 1,827 relative exports, 92 technology transfer intermediaries, and more than 400 characteristic industrial bases which approved by the ministry of science and technology. Qingdao has established more than 70 various types of industrial bases and Industrial Parks, 4 of them are national torch characteristic industrial base. In the end, Qingdao technology transaction market has 105 relative laws.

Through the comparison, Jinan technology transaction market falls short in professional technical personnel and authoritative intermediaries, scale R&D bases and relative laws. Thus, Jinan municipal government can cut into these weakness points to stimulate the development of technology transaction market.

3.3 Analysis on the Turnover and Volume of Technology Transaction Market in Shandong Province

Table 9
Shandong Province Technology Transaction Turnover During 2010 to 2015

	2010	2011	2012	2013	2014	2015
Turnover(Billion in RMB)	100.67	126.37	140.02	179.40	249.29	307.55
Amplification	39.90%	25.20%	10.79%	28.12%	38.96%	23.37%
Shandong technology transaction turnover accounted for the proportion of GDP in Shandong	0.26%	0.28%	0.28%	0.32%	0.42%	0.49%
Shandong technology transaction turnover accounted for the proportion of turnover in China	2.58%	2.65%	2.12%	2.40%	2.91%	3.13%
Shandong technology turnover ranking in China	7	7	9	9	8	8

Data source: Jinan Science & Technology Bureau, Torch High Technology Industry.

On the basis of the previous analysis, the further research on Shandong technology transaction turnover accounts for the proportion of turnover in China. So that study on the economic big environment of Jinan.

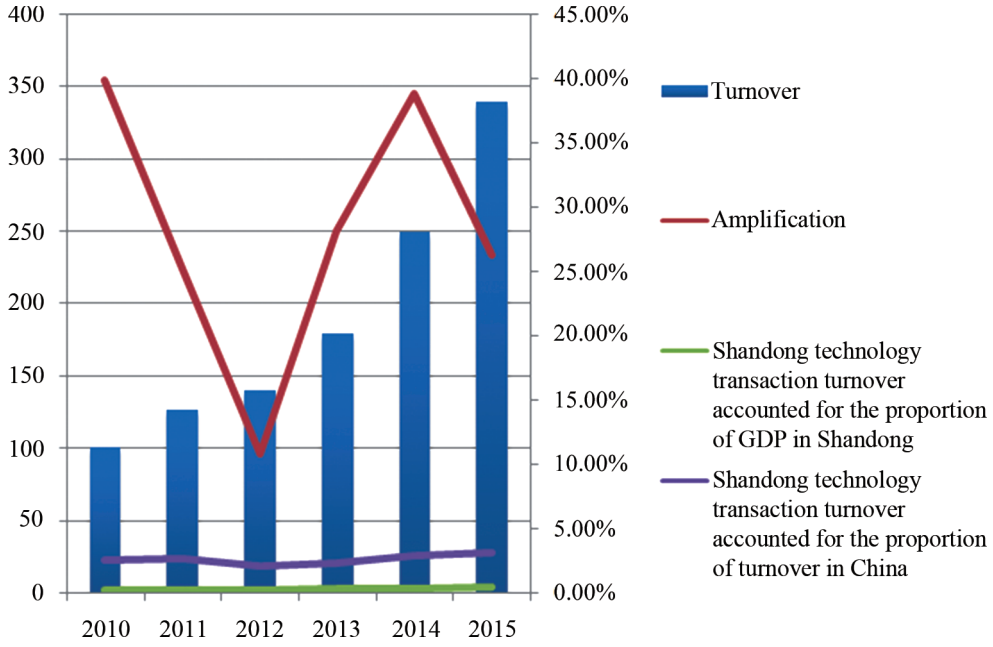

Figure 10
Shandong Province Technology Transaction Turnover During 2010 to 2015
Data source: Jinan Science & Technology Bureau; Torch High Technology Industry Development Center, Ministry of Science & Technology.

Table 9 and Figure 10, the province's technology transaction turnover from 200.67 billion yuan in 2010 to 307.55 billion yuan in 2015, the amplification climbed to 205%. It appears a high speed increase stat. Its development momentum is good.

The proportion of the technology transaction turnover accounts for the proportion of GDP in Shandong province is very low. The proportion from 0.45% in 2010 to 0.51%, in 2015, the overall trends didn't improve a lot. There is still very large space to improvement.

The proportion of the technology transaction turnover in Shandong accounts for the proportion of the technology transaction turnover in China is very low, from 2.58% in 2010 to 3.13% in 2015. Shandong as a large economy province, this proportion is nowhere near enough. Anyway the rank is the top ten in national and the gap is also clearly. A case study of the central interior province of Hubei, in 2015, the total turnover of technology transaction exceeded 80 billion yuan, while Wuhan alone accounted for nearly 60% of the whole turnover. So the technology transaction market in Hubei province relies on the radiation effect of Wuhan.

Table 10
Shandong Province Technology Transaction Volume During 2010 to 2015

	2010	2011	2012	2013	2014	2015
Volume	7,865	9,037	11,114	14,263	17,331	20,422
Amplification	2.52%	14.9%	22.98%	28.33%	21.51%	17.84%
Unit technology transaction turnover in Shandong (million yuan)	127.15	139.84	126.00	125.99	143.84	150.60

Data source: Jinan Science & Technology Bureau, Torch High Technology Industry Development Center, Ministry of Science & Technology.

Table 10 and Figure 11, the province's technology transaction volume from 7,865 in 2010 to 20,422 in 2015, steadily increased year by year. And the unit technology transaction turnover keeps rising in Shandong. The structure of Shandong technology transaction market is becoming more and more scientific and reasonable; at the same time, the real scientific and technological content in unit output product continue rising, and the ability of connecting with market is improving.

Jinan as the capital of Shandong province has the distinctive advantages in geography, personnel, and policy. In the regional, Jinan located in the center of the Bohai economic circle, the economic hinterland is vast, and the market potential is huge; on the other hand, there is lack of an economic transition zone between Beijing and Shanghai. In the policy, Jinan as the capital city enjoys a lot of convenience in policy. "Jinan Regional Science and Technology Innovation Center for the Construction of Three-Year Target System and 2016 Goals and Tasks" proposed the goal of Jinan "to build a regional scientific and technological innovation center," Jinan municipal government begins to pay more attention to