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Abstract

Pharmaceutical sector of Pakistan has a huge potential in exports. Pakistan can gain in terms of sustainable growth and strong industrial development if properly accommodated with the trade favourable policies. Literature on export competitiveness of various products is available however, research on specifically pharmaceutical sector has not been done. This study is an attempt to fill the gap by investigating the Revealed Comparative Advantage of pharmaceutical exports of Pakistan. RCA index is used in this study (from 2004 to 2023) and the index has revealed that there is comparative advantage in exports in 2 out of 5 product groups of HS level 4 and in 7 product groups of HS level 6, Pakistan possess comparative advantage in export. This margin can be increased with proper policy making which will lead to the sustainable growth of Pakistan.

Keywords: Pharmaceutical sector, exports, Pakistan

1. Introduction

Pakistan is an important economic player when Asian or world economic discourse is discussed. It has the potential to become more important economic player and to contribute to the global economic development. Pakistan in its recent past has seen many dramatic ups and downs in its growth rate. Even when the growth rate is low, it is certain that the potential is much more than needed to become self sustaining economic player. It has been unanimously agreed by the researchers and policy makers that "Industry" can play the role not only in order to bring Pakistan's economy back to the track, but it can assist the economy in miraculous ways. When the role of industry is discussed, obviously it does not mean that the industry only within the country is meant. In fact, international trade is the main target of the industry. Actual fruits of industry can be enjoyed when the products are introduced in the international market in an appealing manner i.e. good quality, competitive price etc.

In the international market, the size of the share economies get is decided by the competitive advantage they possess over the other competitors. The concept of comparative advantage is globally used in the literature and theory to appraise the position of economic player in the global market, it further portrays that in which commodity/ service an economy has an advantage over the others to sell in the international market. When the evaluation/ estimation of comparative advantage is discussed, a popularly used "Revealed Comparative Advantage" (RCA) index is the first concept which hits the mind of a researcher. RCA index was developed by Balassa (1965) and this unit was constructed on the foundations led by Ricardo.

Being economist, when the overall economic condition of Pakistan is discussed/ analysed, one possible and potential field to improve the overall economic condition/ growth is the increased exports which comes to mind. For an increased exports, one of the most efficient ways is to find the fields in which Pakistan has the comparative advantage. While studying the literature on comparative advantage of exports, it was found that there is a huge gap in the field of pharmaceutical products. For Pakistan, there is no such study conducted whereas pharmaceutical products are very important when trade and specifically exports are being discussed. Therefore, this study aims to explore the export potential and comparative advantage of Pakistan in pharmaceutical products. Moreover, this study uses HS level 4 and HS level 6 data to achieve the objective.

In 2022, the share of top 5 exporters of pharmaceutical products was as follows: Germany (\$125B), Switzerland (\$93.8B), United States of America (\$90B), Ireland (\$83.5B) and Belgium (\$73.5B). It can be seen by the magnitude of exports of pharmaceutical products that there is a potential and margin to play role as an exporter in the said field.

1.1. Objective

As this study is an attempt to evaluate the importance of the role of Pakistan's pharmaceutical industry in a global frame of reference. The specific objective is to analyse whether Pakistan has comparative advantage in export of pharmaceutical products or not. If yes, then which products of HS level 4 and HS level 6 have comparative advantage. To achieve this target, this study utilizes RCA index analysis of Pakistan's exports of pharmaceutical commodities.

2. Review of Literature

Some researchers have applied the RCA index technique to find the comparative advantage of Pakistan's exports but none of these have targeted pharmaceutical sector. Mahmood and Nishat (2004) employed RCA to the non-agricultural sector to find the comparative advantage of exports. Hanif and Jafri (2008) used RCA to explore the textile sector and Mahmood *et al.* (2019) targeted chemical sector. Akhter *et al.* (2009) among few others has tested the potential of export of fruits. Riaz (2009) used the same technique (RCA) and explored the advantage of a wide range of agricultural products. In general, it has been seen that almost two-third of the total exports of a developing country relies on a developed country (Madaan, 1996).

When the sustained high growth and overall economic well-being is concerned, export is the second most important determinant after foreign direct investment. Pakistan being a developing economy needs to establish new firms and supporting existing firms to export, by which firms can attain economies of scale. As exporting results in the transfer of technology from one country to another (Pack, 2008). Real exchange rate, comparative advantage, terms of trade, geographic concentration, trade policies and world income etc are the factors by employing which, competitiveness and performance of exports can be measured. Trade policy is certainly an important determinant of total exports of Pakistan. Initially Pakistan's exports were majorly dependent on agricultural products then it was realised and tried to expand the industry which resulted in an increased export. Export favourable policies like tariffs reduction etc played an important role in the significant increase in total exports. With the development in technology, trade patterns are being modified (Irshad and Xin, 2017).

There are a number of factors that determine export volume of a country. Macroeconomic instability, political instability, weak trade policies, inadequate infrastructure may decline the exports of a country. Geographical location is also an important determinant of the export volume. Rahmaddi and Ichihashi (2012) explored the potential of manufacturing exports, they also

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studied the structure of exports of Indonesian economy by employing RCA index. Their study concluded that there are several reasons which cause poor export share like product concentration, specialization in the products which are unskilled labour extensive and abundantly natural resources extensive. Irshad and Xin (2017) conducted a study which used RCA analysis to explore a sector wise export performance of Pakistan. In the study Harmonized System (HS) was used with the data spanning from 2003 to 2015. They have concluded that there is very less quantity of products that are exported and the countries are also very limited to which these products are exported. Moreover, it seems that no serious efforts have remained under consideration for the improvement of exports.

Ismail and Ahmed (2022) applied RCA index to analyse the share, competitive advantage of India and China in the global market. Harmonized system was used and data from 2000 to 2018 was used. Their study indicated that India has comparative advantage in 9 products out of the total 16 products while China has advantage in 6 products out of 16.

3. Data and Methodology

As the study revolves around the potential of trade, comparative advantage of Pakistan's exports to international market, so the principal data used and discussed is "Export Data" of Pakistan and the whole World. The data of export is extracted from "Trade Map" which was developed by International Trade Centre UNCTAD/ WTO (ITC). Data spanning from 2004 to 2023 has been taken for the analysis in the study. Data of following variables is used in the study:

- i- Total exports of Pakistan
- ii- Pharmaceutical exports of Pakistan
- iii- Total exports of World
- iv- Pharmaceutical exports of World

The Empirical Methodology used in the study is Revealed Comparative Advantage (RCA) index, which was developed and presented by Balassa in 1965. RCA index advocates that "comparative advantage is revealed by the relative export performance of individual product categories" (Ismail & Ahmad, 2022). A wide range of literature has used the Balassa index (RCA) to measure the export potential of a country. In fact, it is assumed to be a good indicator for the said purpose.

3.1. Revealed Comparative Advantage Index

Balassa's Revealed Comparative Advantage Index (RCA) or simply said as Balassa's index is calculated as follows:

$$RCA_{p,c} = \frac{\left(\frac{E_{p,c}}{E_p}\right)}{\left(\frac{E_{w,c}}{E_w}\right)}$$

In the above-mentioned equation:

$RCA_{p,c}$ = Revealed comparative advantage of Pakistan in export of selected commodity.

$E_{p,c}$ = Pakistan's export of selected commodity.

E_p = Pakistan's total exports.

$E_{w,c}$ = World's export of selected commodity.

E_w = World's total exports.

The range of the RCA value lies between 0 to infinity. If the output value of RCA is greater than 1 ($RCA > 1$) then the country is assumed to have revealed comparative advantage in export of that commodity, which in this study is "Pharmaceutical Products" (Product code at HS level 2 = 30).

Product code of pharmaceutical products at HS level 2 is "30" and this study has used HS level 4 and HS level 6 data to explore the comparative advantage of Pakistan's export of pharmaceutical products.

4. Results and Discussions

This study used Harmonized System (HS) and there are 3 categories/ levels of HS product groups. Namely, HS at level 2, HS at level 4, and HS at level 6. This study has used HS at level 4 and 6. As the level of HS is increased, more specific products come under consideration/ discussion. So instead of being generic at level 2, this study has preferred to be more specific by using level 4 and 6.

Pharmaceutical sector has product code of "30" in the data set. When level 4 is taken it has further 6 product groups, which are explained below:

3001: Dried glands and other organs for organo-therapeutic uses, whether or not powdered; extract of glands or other organs or their secretions, for organo-therapeutic uses; heparin and its salts; other human or animal substances prepared for therapeutic for prophylactic uses, n.e.s.

3002: Human blood; animal blood prepared for therapeutic, prophylactic or diagnostic uses; antisera and other blood fractions and immunological products, whether or not modified or obtained by means of biotechnological processes; vaccines, toxins, cultures of micro-organisms (excluding yeasts) and similar products, cell cultures, whether or not modified.

3003: Medicaments consisting of two or more constituents mixed together for therapeutic and prophylactic uses, not in measured doses or put for retail sale (excluding goods of heading 3002, 3005 and 3006).

3004: Medicaments consisting of mixed or unmixed products for therapeutic and prophylactic uses, put up in measured doses "including those for transdermal administration" or in forms or packing for retail sale (excluding goods of heading 3002, 3005 and 3006).

3005: Wadding, gauze bandages and the like, e.g. dressings, adhesive plasters, poultices, impregnated or covered with pharmaceutical substances or put up for retail sale for medical, surgical, dental or veterinary purposes.

3006: Pharmaceutical preparations and products of subheadings 3006.10.10 to 3006.93.00.

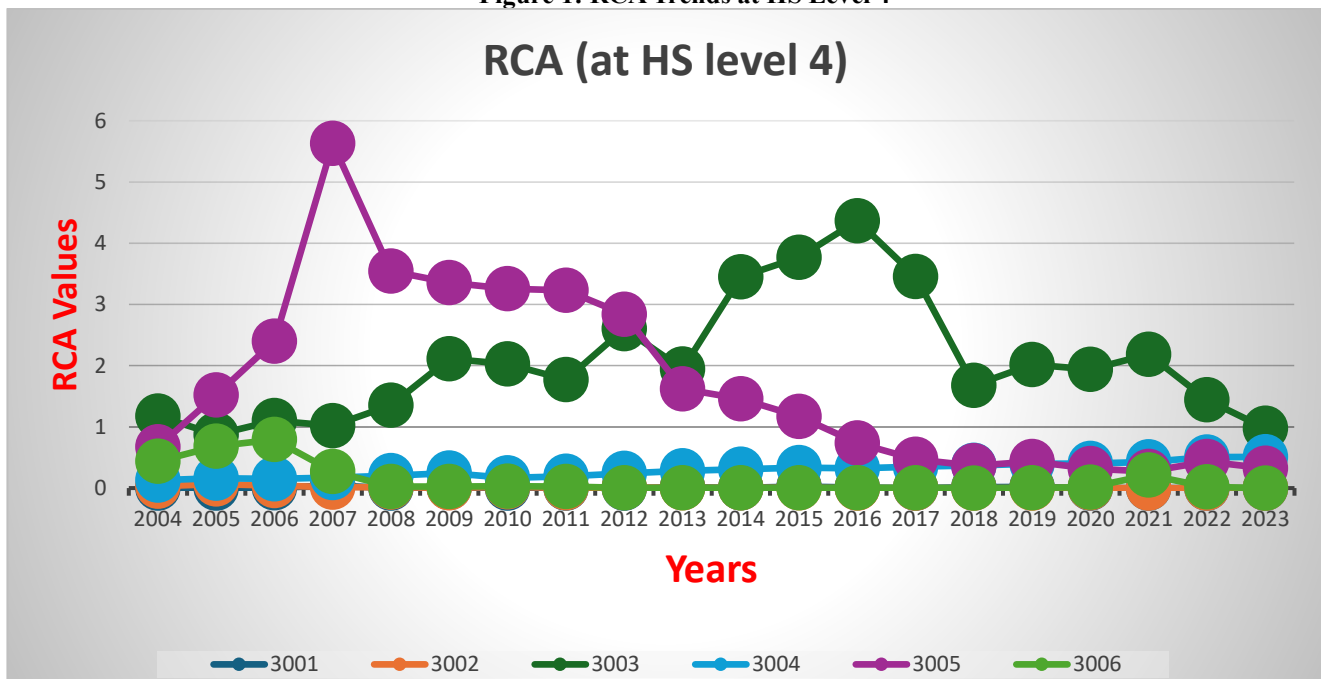
As known, the value of RCA index ranges from 0 to infinity and if the values of RCA of a product is greater than 1 ($RCA > 1$) then that product is assumed to be having revealed comparative advantage. The values of RCA at HS level 4 are presented in table 1 given below:

Table 1: RCA Values at HS Level 4

Revealed Comparative Advantage (RCA) at HS level 4

Years	Years					
	3001	3002	3003	3004	3005	3006
2004	0	0.032452	1.174066	0.128214	0.671474	0.440511
2005	0	0.065154	0.872982	0.158388	1.522038	0.684604
2006	0.005334	0.040483	1.102452	0.152238	2.399716	0.791863
2007	0.04451	0.012573	1.017195	0.171219	5.630025	0.270835
2008	0.001302	0.012886	1.355611	0.202269	3.543004	0.02371
2009	0.006979	0.005721	2.109009	0.24572	3.358269	0.02241
2010	0	0.018648	2.028474	0.166892	3.257864	0.028446
2011	0	0.006013	1.772629	0.191408	3.232311	0.023092
2012	0	0.009552	2.600902	0.237155	2.839712	0.004787
2013	0.015514	0.004162	1.94592	0.279101	1.620142	0.003738
2014	0.003269	0.002493	3.449645	0.306801	1.455594	0.005487
2015	0.026479	0.004426	3.769035	0.334897	1.17111	0.005201
2016	0.007419	0.000675	4.366997	0.324653	0.736962	0.002999
2017	0	0.000354	3.453987	0.350563	0.468631	0.002275
2018	0.012425	0.000226	1.675389	0.36915	0.366527	0.000154
2019	0.02185	0.000149	2.016053	0.398014	0.433906	0.004991
2020	0	0.006133	1.940886	0.403827	0.316424	0.01637
2021	0	0.00038	2.185077	0.429183	0.271109	0.211813
2022	0	0.000668	1.443122	0.503635	0.430386	0.021932
2023	0	0.000254	0.975595	0.509704	0.323435	0.001185

(Author's own calculations)

Figure 1: RCA Trends at HS Level 4

(Author's own calculations)

RCA analysis has been applied on the data of exports (pharmaceutical and total) of Pakistan and the world. As shown in the RCA analysis results table given above, 2 out of 6 product groups have comparative advantage in export i.e. 3003 and 3005. Other product groups (3001, 3002, 3004 and 3006) do not have comparative advantage in exporting as shown by the results of RCA analysis. Product group 3003 has shown only 2 years of not comparative advantage in 2005 and 2023. In the remaining years comparative advantage has shown fluctuations with the highest value in 2016. Overall, from 2014 to 2017, highest values of RCA have been observed and from 2021 onwards a decreasing trend started which lessen the RCA value in 2022 and subsequently less than 1 in 2023. However, trend in the RCA of 3005 is different from the 3003, as in 2004, there was no comparative advantage for Pakistan in the export of pharmaceutical product (3005), but it started to rise; 1.5 in 2005, 2.3 in 2006 and then highest 5.6 in 2007. RCA fell to 3.5 in 2008, and it sustained to above the value of 3 till 2011. From 2012 onwards it

showed a decreasing trend with greater than 1 till 2015 and after that it went less than 1. In order to show a simpler and clearer picture of the trends of RCA analysis, a graphical presentation is shown below in Figure 1.

Same results of Table 1 are shown graphically in Figure 1 to better illustrate the fluctuating trends over the years.

This study went one step a head and also analysed the RCA index at HS level 6 product codes. Due to the data limitation, this study explored 19 product codes of HS level 6. RCA results of all 19 product codes are given in the Table A1 (appendix). Out of 19 product codes, analysed by applying RCA, 7 product codes showed comparative advantage in export of pharmaceutical products for Pakistan. Result of these 7 product codes is shown in the below mentioned Table 2:

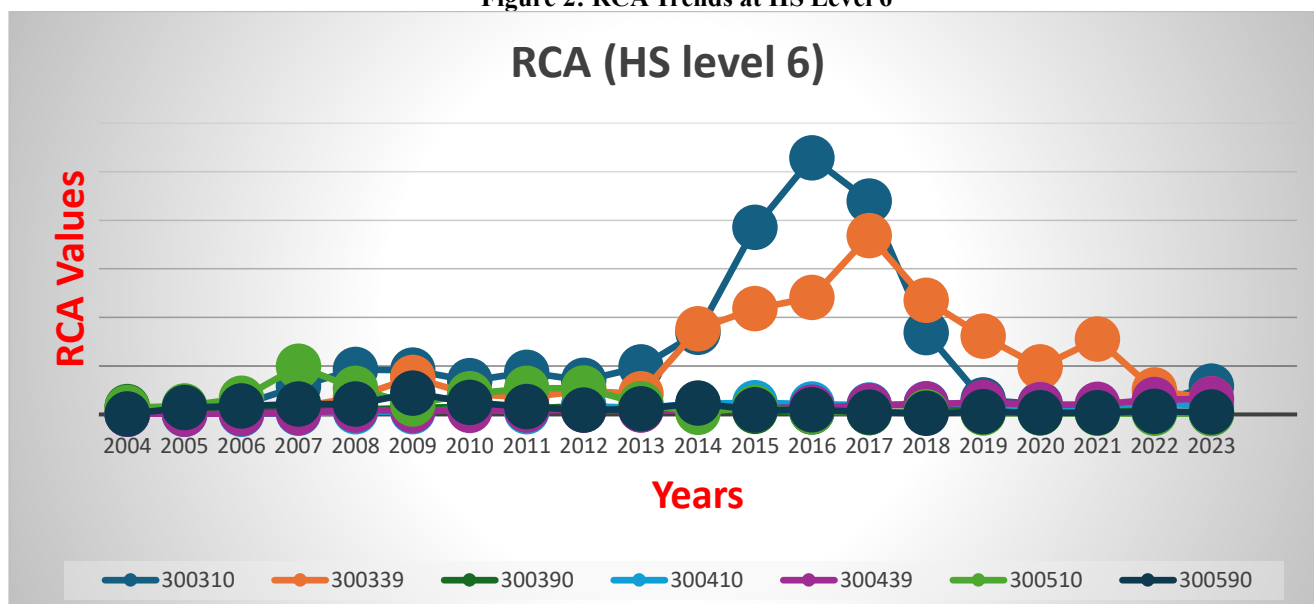
Table 2: RCA Values at HS Level 6

Product Code	Years									
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
300310	0.01604	0.12658		5.83827	9.21291	9.10034	6.96441	8.62415	6.97380	9.74631
	4	2	1.97716	7	8	2	2	1	4	7
300339	0.06114	0.10785		1.46370	3.53888	7.59373	4.13485	3.54108	4.79515	4.24697
	9	9	0.47306	8	1	7	8	4	7	5
300390	1.62223	1.19318	1.43843	0.94423	1.00215	1.29667	1.58692	1.19597	1.75043	1.06223
	6	8	4	4	6	3	9	6	3	7
300410		0.02681		0.23772	0.53065	0.54953	1.12728	0.52281	1.64634	1.37198
	0.03988	1	0.03072	4	6	3	7	5	3	3
300439		0.02864	0.13668	0.31939	0.88007	0.78103	0.77973	0.88306		0.84580
	0.01497	5	3	5	7	6	7	5	0.87744	5
300510	1.36573	1.70071	3.31441	9.91634	5.35462	2.10176	4.19800	5.35145	5.41057	2.18481
	7	9	2	6	4	1	2	2	5	6
300590	0.07369	1.37014	1.69988	2.09759	2.11293	4.38264	2.46392		0.83606	1.16277
	3	1	7	1	7	4	5	1.5763	7	5

Product Code	Years									
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
300310	16.9117	38.5472		43.9637	16.8048	2.99180	2.10720	0.93438	2.50368	5.82867
	4	3	52.8657	4	5	9	4	9	2	3
300339	17.6338	21.7736	24.0702	36.8403	23.5114		9.74445	15.4892		3.14835
	3	2	6	2	5	16.0824	1	2	4.99535	6
300390	1.16695	0.59996	0.44354	0.31986	0.58116	1.20908	1.05909	1.27407		0.17575
	1	6	5	9	1	3	9	3	0.5702	7
300410	2.17327	2.41062	2.10723	1.92995	2.16736	2.17184	1.43707	1.75942	2.26177	1.77159
	6	6	4	5	1	3	7	3	4	5
300439		1.32703	1.43461	1.81799	2.13838	2.43877	1.96934	2.03690	3.01131	
	0.76085	5	3	6	1	8	7	3	7	3.20352
300510	0.43233	1.47399			0.50725	0.30213	0.27716	0.22509	0.23422	0.17386
	7	8	0.54363	0.4769	4	9	5	3	5	3
300590	2.29147	0.91945			0.22467	0.56184	0.35117	0.31498	0.62315	0.48210
	5	1	0.91409	0.46078	4	7	2	7	5	8

(Author's own calculation)

Figure 2: RCA Trends at HS Level 6



(Author's own calculation)

RCA of product codes 300310 and 300339 have proved to be better in sense of greater comparative advantage among 7 product codes. Trend of both product codes (300310 & 300339) are almost same as RCA of both products gradually started to rise from 2004, where the RCA values were 0.016 & 0.061 of 300310 & 300339 respectively. RCA of 300310 rose faster and touched value of 5.83 in 2007, 6.96 in 2010, 52.86 in 2016 and then it started to decline observing RCA equals to 0.93 in 2021 but once again rose to 2.50 in 2022 and 5.83 in 2023. Almost same pattern but with different magnitude was observed for 300339, as RCA was 1.46 in 2007, jumped to 17.63 in 2014, with the highest RCA value of 36.84 observed in 2017 and then started to decline with RCA of 3.14 in 2023.

Other five product codes have shown mixed values of RCA index as in some years RCA value was above 1 and, in some years, less than 1. Pictorial evidence of the trends of all 7 product codes is given below in Figure 2.

So, it can be concluded that there are 7 potential products for comparative advantage in exports for Pakistan with 300310 and 300339 with the greater RCA values.

5. Conclusion

This study is assumed to be of immense importance as the economy of a developing country like Pakistan can be expanded by the international trade and the advantage of developing countries is that they have great potential in exports. Need of the hour is trade friendly policies. Policy which benefits industry to grow, to attain economies of scale and to attract the foreign currency cash flow which in turn will help to grow the economy by creating a greater capacity of employment; eventually leading to sustainable growth.

This study has used data of exports from 2004 to 2023 at two levels of product groups (HS level 4 and level 6). This study concludes that there is a potential in pharmaceutical industry to export the selected commodities as they have comparative advantage in them. 2 product groups in HS level 4 namely, 3003 and 3005 and 7 products at HS level 6 namely, 300310, 300339, 300390, 300410, 300439, 300510 and 300590. Among these 7 product codes of HS level 6, 300310 & 300339 possess the greater comparative advantage for Pakistan.

As concluding remarks, it can be said that exports can boost the development of a country and proper trade policies can lead to a significant increase in exports of Pakistan. So, stakeholders should consider the pharmaceutical industry while discussing trade and export friendly environment should be introduced for a journey to sustainable development.

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Appendix
Table A1: RCA Index Values at HS Level 6

Product Codes	Years						
	2004	2005	2006	2007	2008	2009	2010
300190	0	0	0.002919	0.044476	0.000838	0.007381	0
300220	0.000482	0.001612	0.016808	0.031837	0.003515	0.002215	0.050682
300230	0.589129	1.09443	0.840946	0.19935	0.347928	0.188014	0.084255
300290	0.018825	0.084323	0	0.00493	0.027697	0.010249	0.072652

300310	0.016044	0.126582	1.97716	5.838277	9.212918	9.100342	6.964412
300320	0.039584	0.0393	0.16387	0.192019	0.183716	0.536521	0.18607
300339	0.061149	0.107859	0.47306	1.463708	3.538881	7.593737	4.134858
300390	1.622236	1.193188	1.438434	0.944234	1.002156	1.296673	1.586929
300410	0.03988	0.026811	0.03072	0.237724	0.530656	0.549533	1.127287
300420	0.064226	0.118862	0.164383	0.451615	0.521122	1.005121	0.447256
300432	0	0	0	0.096069	0	0.004273	0.005375
300439	0.01497	0.028645	0.136683	0.319395	0.880077	0.781036	0.779737
300450	0.11007	0.467438	0.699853	0.87149	1.633762	1.291807	0.407788
300490	0.149684	0.1774	0.154386	0.142153	0.123723	0.162419	0.107536
300510	1.365737	1.700719	3.314412	9.916346	5.354624	2.101761	4.198002
300590	0.073693	1.370141	1.699887	2.097591	2.112937	4.382644	2.463925
300610	1.632833	2.831928	3.240821	1.233813	0.089151	0.049797	0.034139
300660	0.157456	0.162121	0.013173	0.003222	0.000442	0	0
300670	0	0.180545	0.994345	0.428475	0.256372	0.608621	1.293622

	2011	2012	2013	2014	2015	2016	2017
300190	0	0	0.01656	0.003508	0.028341	0.007948	0
300220	0.014752	0.025176	0.003413	0.002365	0.016597	6.85E-05	0
300230	0.080228	0.119634	0.08339	0.069782	0.0359	0	0.000879
300290	0.008093	0.011419	0.020252	0.002564	0.002834	0	0.007113
300310	8.624151	6.973804	9.746317	16.91174	38.54723	52.8657	43.96374
300320	0.078653	3.188193	0.211398	0.830445	0.109875	2.416129	0.112044
300339	3.541084	4.795157	4.246975	17.63383	21.77362	24.07026	36.84032
300390	1.195976	1.750433	1.062237	1.166951	0.599966	0.443545	0.319869
300410	0.522815	1.646343	1.371983	2.173276	2.410626	2.107234	1.929955
300420	0.530929	0.712037	0.648763	0.653833	0.82665	0.7928	0.837761
300432	0	0	0	0	0.001635	0.002813	0.004777
300439	0.883065	0.87744	0.845805	0.76085	1.327035	1.434613	1.817996
300450	0.644209	0.538872	0.422689	0.724408	0.696519	0.640045	0.303093
300490	0.121611	0.152901	0.21309	0.242548	0.23466	0.222233	0.222122
300510	5.351452	5.410575	2.184816	0.432337	1.473998	0.54363	0.4769
300590	1.5763	0.836067	1.162775	2.291475	0.919451	0.91409	0.46078
300610	0.067722	0.012706	0.00707	0.002546	0.001474	0	0.001289
300660	0	0	0	0	0	0	0
300670	0.326032	0.100744	0.052728	0.084975	0.266245	0.159395	0.013007

	2018	2019	2020	2021	2022	2023
300190	0.013323	0.02326	0	0	0	0
300220	0	0	0.008051	0.00099	0.195991	0
300230	0.001392	0.00192	0.001883	0	0	0
300290	0.00435	0.002852	0.00016	0.001246	0.000651	0.00478
300310	16.80485	2.991809	2.107204	0.934389	2.503682	5.828673
300320	0.022198	0.233385	0.037331	0.024251	0.017034	0.044922
300339	23.51145	16.0824	9.744451	15.48922	4.99535	3.148356
300390	0.581161	1.209083	1.059099	1.274073	0.5702	0.175757
300410	2.167361	2.171843	1.437077	1.759423	2.261774	1.771595
300420	0.815841	0.841634	0.842436	1.120482	0.872831	0.926664
300432	0.025516	0.023212	0.053236	0.039183	0.038307	0.024712
300439	2.138381	2.438778	1.969347	2.036903	3.011317	3.20352
300450	0.432834	0.492163	0.894906	0.975098	0.661085	0.665206
300490	0.215649	0.222299	0.264463	0.275967	0.319237	0.307333

300510	0.507254	0.302139	0.277165	0.225093	0.234225	0.173863
300590	0.224674	0.561847	0.351172	0.314987	0.623155	0.482108
300610	0.000168	0.010664	0.054535	0.047321	0.079241	0.004059
300660	0	0	0	1.289966	0	0
300670	0	0.017632	0.012742	0.012973	0	0

(Author's own calculations)