Changing Dynamics of Trade Balance of Therapeutic, Prophylactic Uses of Medicaments in Pakistan.

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Abstract: *This paper aims to present structural changes and trade competitiveness in Pakistan's pharmaceutical and biotechnology industries. Trade of pharmaceutical inputs including therapeutic and prophylactic uses of medicaments were analysed to improve their exports. The data was collected for exports and imports of therapeutic, prophylactic uses of Medicaments for Pakistan and major export destinations (China, Germany, South Africa and India) for the period 2003-2020. The normalized RCA (NRCA) index was calculated as an alternative measure of comparative advantage and trade competitiveness of the country and for forecasting, the ARMA model was applied. Results revealed that the trade of therapeutic, prophylactic uses of Medicaments was increasing with time. Pakistan is now well known for its export of pharmaceutical products. This study will help policymakers and planners for improving the trade of therapeutic, prophylactic uses of Medicaments in Pakistan.*

Introduction

Trade nowadays attains extraordinary levels due to increased productivity and more specialization in the production process alongside bringing positive impact to the trading countries. Overall international trade of pharmaceutical products is increased during the period of COVID-19 (González, et al, 2021). Pharmaceutical products (medicament) are utilized to treat, cure and prevent disease (Martín Lizaso, 2020). Pharmaceutical is the world's 8th largest industry trade business attracting FDI (Bergman, 2006) and it is also the main source of growth and employment. Most pharmaceutical companies invested in R&D expenditure because the use of R&D in the pharmaceutical industry improves knowledge and productivity (Pammolli et al, 2020). It directly increases their trade of pharmaceutical products. Pharmaceutical trade is under certain HS codes like

3001, 3002, 3003, 3004, 3005, 3006. (Ahmed et al., 2020). HS Code 3004 is the most traded pharmaceutical product in the world and Germany is the dominant exporter of the pharmaceutical product in the world. Now China and US are making significant progress in this sector (Bhardwaj et al., 2018).

In underdeveloped countries, the private sector is a vital source of spending on the health sector (Frimpong, et al, 2022). Government spending is low as compared to developed countries and it also effect the health and trade of these countries. There is also another reason that affect the trade of pharmaceutical products in countries like price discrimination, imported tariffs and domestic tax etc. the difference in the trade of pharmaceutical product is due to the different HS codes. Because some codes are for active ingredients and some for finished products

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(Waugh, 2010).

Pakistan's pharmaceutical industry are making significant growth in the last 4 to 5 years (Wang, et al 2021) and now Pakistan is becoming the world's top 3rd fastest-growing market. In this era, Pakistan's local pharmaceutical firm sale is 13.1% annually in the last 4 years. Pakistan's pharmaceutical market is making speedy growth compared to other emerging economies like Bangladesh, Brazil, India, Russia and Vietnam. Pakistan is forecasting significant growth between 2019-2023 (WHO, 2020).

The active component in a drug is referred to as its API (active pharmaceutical ingredient). For example, an active ingredient is included in a pain reliever to relieve pain. Many countries around the world rely on traditional medicine because it is easily accessible from local plants. There is a traditional medicine Available in most regions locations of the world where human and cattle diseases are treated (Khan et al., 2019).

Therapeutic is associated with the cure of diseases or disorders by remedial agents or producers (Aponte et al.,2020). Prophylactic is used in health care to preclude illness and it also decreases the risk of health problems. Prophylactic care includes dental cleanings, birth control and vaccinations (McGill et al., 2021). According to a WHO report, almost 3.5 billion people in poor nations use medicinal herbs to keep themselves healthy. It is a conventional treatment. available for treating human and cattle ailments throughout the majority of the world's areas (Ishizaka et al., 2018).

The majority of medicines with two or more ingredients combined together for medicinal or preventative purposes are exported from India (HS code 3003) (Cunningham et al., 2018). This paper analyzes Pakistan's trade of HS code 3003 products. The data set comprised 2003 to 2020. In the first period of 2003-07, the imports of therapeutic and prophylactic uses are higher than exports but from the period 2008-20, the exports are higher than the imports (Fig. 1).

Figure 1

Therapeutic, Prophylactic uses of Medicaments Import and Export (HS Code 3003)
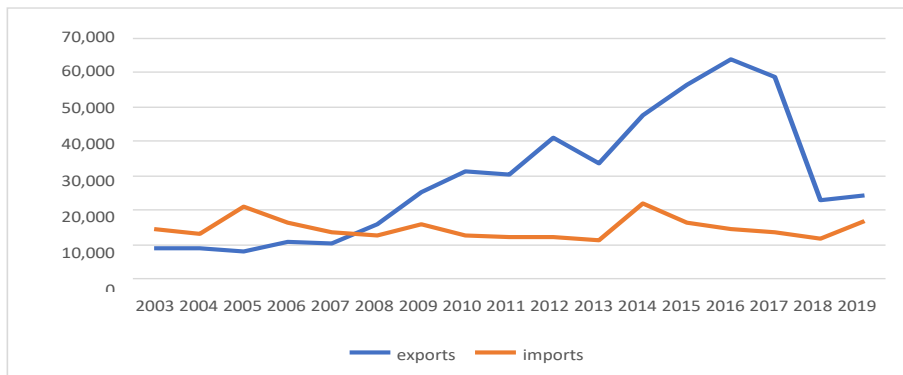
This study is planned to identify the strength and weaknesses of Pakistan in the field of

$$NRCA_{ij} = \frac{X_{ij}}{X_w} - \frac{X_{wj}X_i}{X_w X_w}$$

Pharmaceuticals for designing strategies for improving the competitiveness of Pakistan's Pharma industry.

Methodology

The data on the export and import of therapeutic and prophylactic uses (HS code3003) medicaments in Pakistan for the period 2003-20 was collected from PakistanEconomic Survey and Trade Map.

Measurement of RCA and NRCA

Revealed comparative advantage (RCA) and Normalised RCA index was applied to find out the pattern of export and import of Pakistan to the world that make possible comparisons across countries (Ahmad et al., (2021). A country determines as having RCA when its product has a larger share of total exports relative to the product's share in world exports and The Balassa RCA index is calculated as the proportion of total product exports in a country's overall exports to the total of all product exports

globally (Ceglowski, 2017).

To examine the nation's comparative advantage, the Normalised RCA (NRCA) index established by Yu et al. (2009) was used. The NRCA index of the country i's exports of product j is calculated as follows:

An explanation of what the country's share of global exports will be of j equal to its share in total $\frac{x_{wj} x_i}{x_w x_w}$ global exports is used to stabilise the $\frac{x_{wj} x_i}{x_w x_w}$ deviations by total global exports in the index's calculation of deviations in a country's exports of j from its comparative advantage-neutral point. The NRCA index has a positive value when real exports exceed their neutral point of comparative advantage, indicating a comparative advantage, while a negative value denotes a comparative disadvantage. According to Ashrafizadeh et al. (2020), the NRCA index has a number of advantages over Balassa's RCA. Additionally, there are aggregate and average NRCA score figures for a certain product or nation. A characteristic that allows comparisons across sectors and nations is that it is both constant and equal to zero (Yu et al., 2009). The fact that the sum of the scores for a specific industry or country is zero indicates that if a country's NRCA index increases over time for one product, it must also decrease over the same time period for another product.
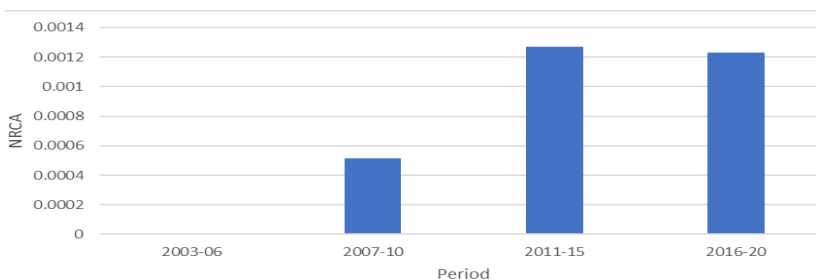
ARMA Model

Three basic model types are available for time series analysis: Moving Average (MA), Auto-Regressive (AR), and Auto Regressive Moving Average (Wang et al.,2018). The major part's time series must be stationary in order for the ARMA model to work. The collected time series should be tested for stationarity using the ADF unit root before modelling. Differential processing is required for non-stationarytime series smoothing. The Eviews software implements the ADF unit root test, and the stability of the time series is assessed in accordance with the calculation's outcome. Comparing the ADF statistic with the crucial value at 5% of the significance level is often recommended. The unit root does not exist if the ADF statistic is less than the test's critical value, proving that the initial sequence is a stationary sequence. If the ADF statistic is greater than the test's critical value (Paolella, 2018).

Results and Discussion

Measuring the comparative advantage of Pakistan in Pharma Products The comparative advantage of Pakistan in therapeutic, prophylactic uses of Medicaments was positive and increasing over the period (Table 1).

Table 1

Estimation of NRCA of Pakistan from 2003 to 2020

Year	Pakistan	China	Germany	South Africa	India
2003-06	0.00000718	-0.01927807	-0.01927807	-0.00105128	0.00883340
2007-10	0.00051204	-0.04622045	-0.03274926	-0.00194691	0.02884282
2011-15	0.00127182	-0.05331368	0.00562155	-0.00120963	0.01146451
2016-20	0.00123182	-0.05903707	0.04044209	-0.00185191	-0.00012712

NARCA index shows that over the period, trade of therapeutic, prophylactic uses of medicaments in Pakistan increased (Fig 1) but Germany and India have more trade than Pakistan (Fig 2).

Figure 2

Revealed comparative advantage of export of Pharmaceuticals of Pakistan

During 2003-06, the NACA of Pakistan was the lowest, but gradually Pakistan's advantage over competitors in the production and export of therapeutic, prophylactic uses of medicaments. The period of 2007-10 was the era of the start of specialization of Pakistan in the production of therapeutic, prophylactic uses of medicaments. The era of 2011-15, was the period in which Pakistan specialized more in the production of therapeutic, prophylactic uses of medicaments. In 2016-20, Pakistan's advantage over competitors in the production of therapeutic, prophylactic uses of medicaments remain almost constant (Fig 1).

Results revealed that Pakistan's comparative advantage in the production of therapeutic, prophylactic uses of medicaments was increasing especially during the last decade when the other players in the market were losing the market. The major competition faced by Pakistan will be from India. Even then, Pakistan has to specialize more in the production of therapeutic, prophylactic uses of medicaments to continue its journey of capturing the market, otherwise India will capture the market leaving fewer opportunities for Pakistan (Fig 2).

Figure 3

Revealed comparative advantage of export of Pharmaceuticals of Pakistan withcompetitors.
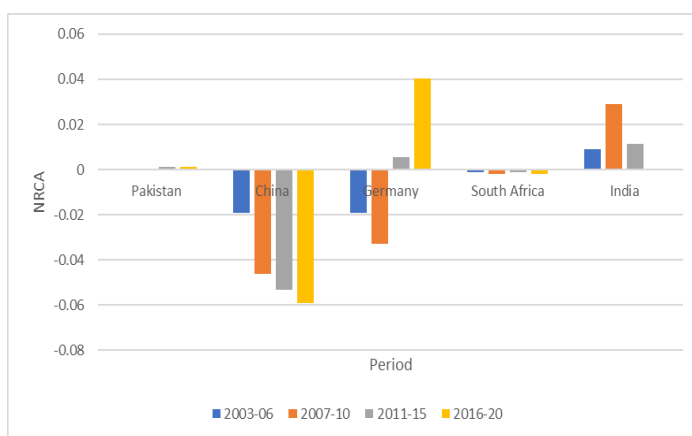
Consistency of Trade of Pharmaceutical Products in Pakistan

Pakistan is an underdeveloped country. There are problems related to the growing population, scarce resources and there is an insufficient amount of investment in the health Sector by the government (Yousaf et al., 2021). These factors have compromised development when compared according to international standards. The pharmaceutical industry in Pakistan consists of 650 registered companies, of which 31 are multinational companies. Pakistan was left behind the most developed countries in the field of medicine use research. There is no single organization that works for drug usage in the country (Muhammad et al., 2017).

Pakistan is able to supply a wide range of pharmaceuticals and around 90% of domestic demand for finished goods (Sohil et al.,2021). Pakistan produces little quantities of active pharmaceuticals and more than 90% of the raw materials required for pharmaceuticals used in Pakistan come from China and India (Babar et al., 2016). Pakistan is anticipated to be among the top three developing nations with the fastest increase in pharma expenditure in the next five years (Malik & Figueras, 2019).

The WTO system is the reality of today, thus we should seek to provide Pakistan's pharmaceutical trade under the WTO framework a competitive advantage (Bacchus, 2022). National low prices of pharmaceutical companies make them a prospective candidates to increase drug exports in the new free trade regime. It is a secure means of surviving in a system with intense rivalry. Despite the fact that China and India can be difficult, (Asif et al., 2020).

Time Series Analysis on the Total Export of Therapeutic, Prophylactic uses ofMedicaments in

Pakistan

Figure 4

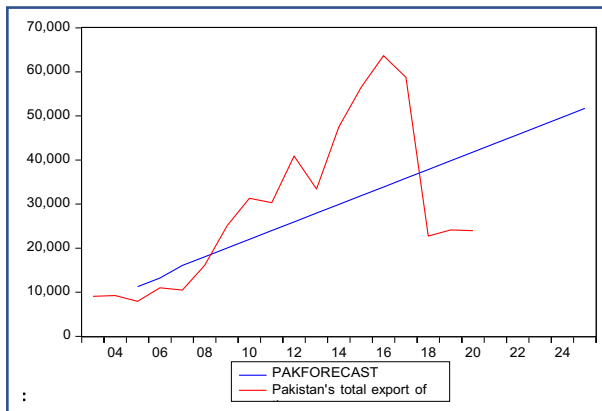*Pakistan's total Export of Therapeutic, Prophylactic uses of Medicaments*

There is an upward trend in its mean over the period the export of therapeutic, prophylactic uses of medicaments in Pakistan increasing at a faster rate (Fig 4).

Forecasting of Pakistan's Pharma Industry Performance

ARMA Model on the Total Export of Therapeutic, Prophylactic uses of Medicaments in Pakistan

Figure 5

Pakistan's Total Export of Therapeutic, Prophylactic uses of Medicaments usingARMA Model

There is an upward trend which means the export of Therapeutic, Prophylactic uses ofMedicaments increasing over the period of time.

Table 2

Exports and Imports of Pakistan- 30 pharmaceutical Products (2016, USthousand dollars)

HS code	Industry	Exports to the reporting partners	Imports from the reportingpartners	Non-reported exports as %	Non-reported imports as %
3004	Mixtures of medications (not 3002, 3005, or 3006), added	78,890	401,205	42.1	2.1

	Dosage				
3003	Mixtures of medications (not 3002, 3005, or 3006)not in Dosage	6,328	14,346	90.1	1.1
3005	Medicated dressings bundled	5,210	5,881	25	4.4
3002	Blood from humans and animals; antisera; vaccinations; poisons; and microorganism culture	2	259,689	98.2	1
3006	Pharmaceutical goods specified sterile products sutures, laminaria, b	53	22,251	1.9	1.2
3001	Secretions, glands, and extracts for organotherapeutic purposes; heparin and it	12	0	68.4	0

Data source: Trade Map

Markets with Potential for Pakistan Exports of Medicaments Containing Penicillin or Derivatives (HS Code 300310)

The recent positive experience of a local firm in obtaining a licensed technology transfer from a leading US firm on Antiviral drugs for COVID-19 is a confirmation of the potential of this sector (Ayat et al., 2020). Pakistan can fulfil the global demand for original blockbuster drugs without patents in low and middle-income countries. Pakistan has potential untapped export potential for pharmaceutical products comprised of US$2561 million (Godman et al.,2021). To identify the product lines in which Pakistan may have a relatively long-term advantage, A modified version of the Growth Identification and Facilitation Framework (GIFF), a tool for policymaking based on insights from the new structural economics,

is included in this analysis (Pakistan Business Council, 2021).

There are a total of 9 product lines (at the HS 6-digit level) on which Pakistan can concentrate. Pakistan began exporting these products earlier than other countries, and in 2019 it had less than 0.5% global export share with exports of USD 195.6 million (Pakistan Business Council, 2021). It includes medications made of combined or uncombined products in dosage form that contain provitamins, vitamins, alkaloids, or hormones/steroids (but not antibiotics); medications made of hormones or steroids used as hormones but not antibiotics (aside from corticosteroids and insulin); and medications made of antibiotics put up in measured doses (aside from penicillins and streptomycins). (Pakistan Business Council, 2021).

Figure 5

Pakistan's Export of Therapeutic, Prophylactic uses of Medicaments
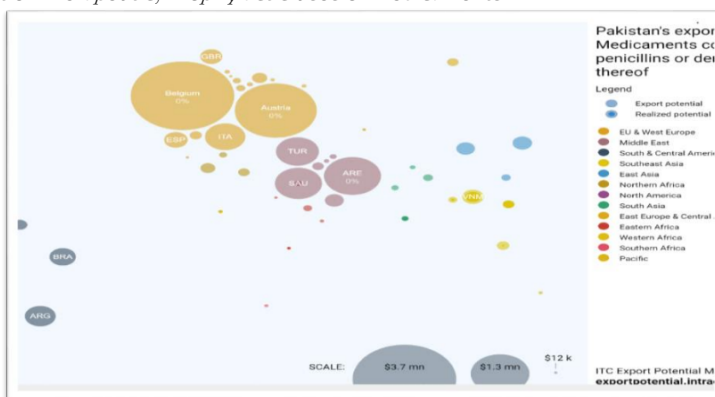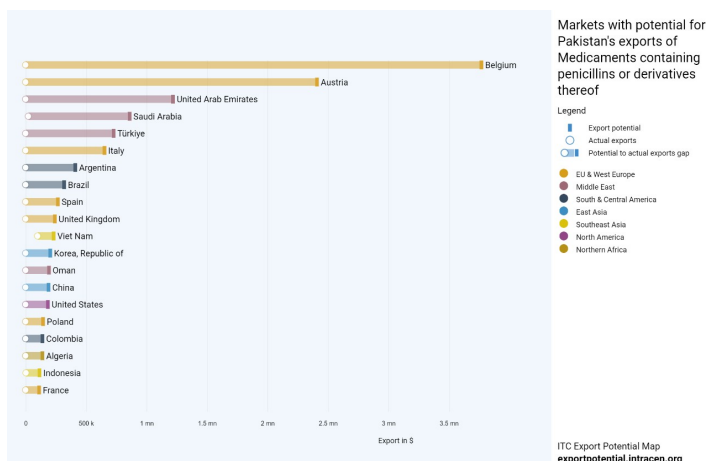
Figure 6

Potential Markets for Export of Therapeutic, Prophylactic uses of Medicaments of Pakistan

Source: Trade Map

Belgium, Austria and the United Arab Emirates are the largest export potential markets for Pakistan's HS code 300, 310 drugs containing penicillin or its derivatives. Belgium shows the largest absolute gap between potential and actual exports by value, realizing an additional $3.7 million in exports (IIT, 2021).

The high research cost for product development of drugs in the pharma industry forcethem to increase export (Kundera, 2020). Pakistan is now well known for its export of pharmaceutical products. In this paper, we analyze the trade of therapeutic, prophylactic uses of medicaments in Pakistan (HS code 3003) (Kathuria et al., 2018). We take the data from 2003 to 2020. The export of therapeutic and prophylactic increased after 2008. But in the COVID-19 period, there is little decrease in its export. In this period, export is still higher than its imports. Pakistan mainly exports to Afghanistan and imports from Germany (Trade Map, List of importing markets for a product exported by Pakistan). Potential markets for Pakistan's therapeutic and prophylactic uses of medicaments (HScode 300310) are Belgium, Austria,

United Arab Emirates and Saudi Arabia.

Conclusion

The pharmaceutical industry of Pakistan is growing fast and it is the third strong industry in Asia and the 8th world. Pakistan's export of therapeutic and prophylactic uses of medicaments is increasing with time. NRCA Results shows that from the period 2003-07, the import of therapeutic and prophylactic uses of medicaments is higher than its exports but from the period 2008-2018 export of these products are higher. During the COVID-19 period export of therapeutic and prophylactic uses is lower but at the same time its higher thanits imports. This means that pharmaceutical inputs exported to Pakistan are increasing day by day. In this paper time series analysis results show that in future the export of therapeutic and prophylactic uses medicament will increase at a faster rate. The overall result of this paper shows that it's beneficial for the pharmaceutical industry of Pakistan to increase their production and it indirectly increases their revenue and it also benefits the economy of the country.

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