

Impact of Revealed Comparative Advantage and Energy Consumption on Bilateral Trade: An Analysis of Pakistan and China

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Abstract: The base of bilateral trade depends upon the revealed or absolute or comparative advantage of countries in production of the products upon their partner countries. In this study we used panel data from 2001 to 2019 and applied fixed effect model for achieving the objective of this study. The objective of the study is to observe the impact of revealed comparative advantage and energy consumption on bilateral trade between Pakistan and China on the bases of their comparative advantages in production. The findings of this study show that a positive relationship is revealed between Pakistan and china in terms of bilateral trade, which means that when RCA increases than bilateral trade increased by 71 percent per year. The results support the theory of comparative advantage proposed by David Ricardo. A country having a comparative advantage in a particular good over its partner country must specialize and increase the production of that good. It would increase the productive capacity and the overall economy can be improved the same way. The energy consumption shows a direct relationship with bilateral trade, that is when energy consumption increases the bilateral trade increased by 3.51 percent. Similarly, consumer price index, exports, institutional quality, GDP except Tariff rate also have positive correlation with bilateral trade. It is suggested that the resources of energy production and its availability at a reasonable cost for domestic users can improve the competitiveness of our home products in international market.

Keywords: revealed comparative advantage, energy consumption, bilateral trade, fixed effect.

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Introduction

Trade across borders occurs due to the price differences among countries. These differences exist due to initial factors endowment or due to differences in productivity among countries. Countries export those goods in which they have absolute/ comparative advantage either due to difference in productivity or initial endowment. So, the greater the price difference among countries the higher would be the trade volume, as well as, greater the range of products with price differences the wider would be the range of products exported. Similarly, existence of more countries with the price differences more would be the numeration of markets to trade with. But the inefficient and cumbersome trade procedures needed to be complied with for involving in cross border trade increase the trade transaction cost and cause the price wedge between the two countries to be vanished and the possibility of trade to be narrowed down if not completely swallowed.

Trade between Pakistan and China has been expanding rapidly, especially in recent years. Pakistan revealed that China became Pakistan's first-largest trading partner after bilateral trade agreements while Pakistan became China's second-largest trading partner. The rapid increase in Pakistan-China bilateral trade stems not only from the fact that the two countries have both been experiencing rapid economic growth recently and reaping the benefit of trade liberalization undertaken by both countries. As an agriculture and resource-based country, Pakistan exports its comparative advantage in agricultural and mineral goods such as, animal product, textile fibers, and iron ores to China, which provides China with low-priced raw materials for her industrial production. As a rapidly industrializing country, China absorbs raw materials from Pakistan and exports its comparative advantage in labor-intensive manufacturing goods, such as textiles and clothing, electronic products, and some general machinery to Pakistan, which in turn provides Pakistan with cheaper goods for consumption. Thus, Pakistan-China bilateral trade has been driven mainly by the two countries' underlying comparative advantages, which forms a special pattern of international specialization between the two countries.

The Islamic Republic of Pakistan and the People's Republic of China have acclaimed long-lasting and gracious ties apart from of their ideological divergence, apparent from their very names (Irshad, Xin, & Arshad, 2016). Pakistan and China are both members of World Trade Organization (WTO) and in accordance with Article XXIV of General Agreement on Tariffs and Trade (GATT), WTO members are permitted to enter into bilateral or regional agreements provided they wrap a large number of bilateral trade flows and they do not have net trade diversion effect. Both the nations have dissimilar economic structures and constructed accordingly. According to WTO policy review, China continues to enlarge its bilateral and regional free-trade agreements (Xin, Irshad, & Hao, 2014, Mustafa, Abro, & Awan, 2021).

After signing FTA, both countries experienced an upward trend in bilateral trade which resulted in rapid increase of imports US\$ 11 billion in 2015 which is calculated 278% growth rate compared to US\$ 2.91 billion in 2006. China has obtained substantial advantage after signing the FTA with Pakistan. China has

established win-win relationships in its targeted market by providing common benefits to its counterparts (Irshad & Xin, 2015b).

The trade facilitation endeavours of countries through the removal of the impediments to trade and simplification of the cumbersome procedures needed to be complied during cross border trade reduce the trade transaction cost. This in turn reduces the threshold output quantity required for profitable engagement in cross border trade. As a result, not only a large number of products find way to go across borders but also trade with new export markets becomes profitable.

Sensitive scarcity of energy sources has shown that energy has become an obligatory production process in developing countries in general and Asian countries in particular. Transportation of raw material and final products from their place of destination and operation of heavy machinery nowadays require heavy consumption of energy in one form or the other. Therefore, the previously ignored energy consumption has now gained vital importance in the production process of a firm and an economy. In a country, by increasing energy consumption; more of the output can be produced with the available stock of labor and capital, which directly enhances the GDP ratio. The competitiveness of home products in international markets can also be improved by the availability of energy at a reasonable cost and thus augments exports of home country at a greater level. As a result, the net exports further add to the GDP of the economy through multiplier effect (Shakeel et. al. 2014).

Objective of research is to look into impact of the impact of revealed comparative advantage on bilateral trade and the impact of energy consumption on bilateral trade between Pakistan and china. This research paper uses the fixed effect model along with the hausman test for estimation of our model and use the time period from 2001 to 2019. A lot of work has been done in this line but still there is a need to contribute further research on it. For further recommendations, it is suggested that if the resources of energy production and its availability at a reasonable cost to improve the competitiveness of the home products are assured, the country's market can succeed in international market.

In the first part of this study we explained the introduction and objective of the study. In the second section the literature review is shown. Third section shows the methodology. Fourth section will be representing the empirical result and in the last section we explain conclusion and policy recommendations.

Literature Review

Affluent literature is found explaining the relationship of bilateral trade and comparative advantage. In most of these studies fixed effect and traditional gravity model has been used for studying the revealed comparative advantage and bilateral trade between countries, using the theory of David Ricardo as its base and the Balassa index (1965).

To question revealed comparative advantage for both Pakistan and China at HS-2 digit product level and to have by and large depiction of both countries relative performance, in general, if the import barriers are lowered by importing country, exports of the home country to the importing country are expected to increase. As FTA lowers China's barriers for imports, the exports of Pakistan to China are anticipated to rise. Specially, the exports of the items with $RCA > 1$ are anticipated to rise faster than exports of other items

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after free trade agreement because of the comparative advantage for Pakistan. This shows that the pattern of Pakistan-China trade has moved the way as projected by the principle of comparative advantage. If not, it is suspected that there might be some blockage preventing the bilateral trade in following the principle of comparative advantage (Irshad, 2015).

Empirical evidence and economic hypothesis have noticeably established the association between productivity, trade and economic development. Countries having immense internal markets have also expanded from reconciling into the world economy and opening up their economies. World total exports in 2014 amounted to US\$18.7 trillion and total imports of the world accounted US\$ 18.73 trillion in the same year. The size of Pakistan's internal market was only US\$ 271 billion in 2015. Just a 0.5 percent share of Pakistan's export in the world export market could mount the country to \$60 billion instead of US\$ 30 billion in a year. The outcome of expansion in the production and invention of exportable items directly or indirectly could be imagined in multiple ways. On the other side, imports heave the country's production opportunity frontier by bringing into the country the transfer of technology ingrained in imported goods and services. Hence, it pursues that amplified trade is in the bigger economic interest of the country (Saqib et. al, 2017,).

In 2010, Noor & Siddiqi investigated the association between GDP and energy consumption among Pakistan, Bangladesh, Nepal, Sri-Lanks and India using panel co-integration and fully modified OLS technique. Their results showed a negative long run association between GDP and energy consumption and they a found short run unidirectional causality running from GDP to energy. The same way, Chen et, al. (2007) investigated the relationship between GDP and energy consumption using panel data of ten newly industrialized Asian countries. They found long run association between the variables and recommended to enhance economic growth in the long run and to avoid the short run causality.

Energy consumption has either bidirectional or unidirectional association with gross domestic product and with trade and exports showing imperative importance of energy consumption for formulation of trade and energy policies for a country (Shakeel et. al, 2014).

Pakistan has trade specialization in the production of leather as she has a high comparative advantage in leather products over other economies. Whereas, China is shifting to a comparative advantage strategy from heavy industry-oriented development strategy, as the nature of products is the significant factor for influencing the national comparative advantage rather than individual income groups (Saleem & Nasreen, 2014).

Exports are a key component of economic growth and it depends upon the availability of energy consumption. Shortage of energy will affect the trade inversely, which will result in an indirect cause of low economic growth. Hence, energy has a positive impact on trade, therefore, trade with other countries should be improved and meanwhile steps should be taken to increase the resources of energy production. Economic growth pushes the demand for energy consumption. Energy conservation technologies can play a vital role in the efficiency of energy (Hafiz et. al, 2016, Mustafa, et. al. 2021).

Research Methodology

The empirical analyses for the current study were established in the light of theoretical framework and econometrics technique. In this section we will discuss problem, model and particularly estimation technique applied for the empirical work.

Theoretical Framework

The hypothesis postulates a fact of producing those products in which a country has abundant resources and factors of production, while importing those products with scarce resources. Our study is based on the theory of comparative advantage proposed by David Ricardo. This study used panel data to achieve its objectives i.e, the impact of revealed comparative advantage on bilateral trade and the impact of energy consumption on bilateral trade between Pakistan and china. Fixed effect model has been applied for the analyses of the data and the relationship among revealed comparative advantage, energy consumption and bilateral trade.

Data Specification

In this study for the estimation of analyses, the panel data are collected from different sources and cover the time period from 2001 to 2019. The commodity wise export data at HS-02 level in the study is collected from (COMTRADE) database of the United Nations Statistics division. In HS-02 level the chapters are identified and the goods are classified, whereas the data for institutional quality is extracted from world development indicator.

Methodology and Model Specification

The model specification for the study is as follows: The study would be applying the fixed effect model along with the hausman test. Hausman test proposed in 1978 is a tool used for selection of fixed effect model and its validity upon random effect model. Fixed effect transformation is a technique which permits us for estimation of efficient coefficient through OLS. Fixed effect works on data for each cross-sectional unit over time, i.e, country-pair and origin product. In this study fixed effect model is used to find the impact of variations of explanatory variables from their mean on the variations of dependent variable from its mean. Fixed effect model, in fact, is a popular model. It is a statistical model in which parameters are fixed or non-random; it is a group-specific fixed quantity model. The model helps us in controlling the omitted variables due to unobserved heterogeneity.

In our study, the fixed effect model used is specified below:

$$\ln B_{ijt} = \beta_0 + \beta_1 \ln rcap_{ij} + \beta_2 \ln cpi_i + \beta_3 \ln ec_i + \beta_4 \ln export_{pc_{ij}} + \beta_5 \ln inst_i + \beta_6 \ln ypc_{ij} + \beta_7 \ln tariff_{pc_{ij}} + \epsilon_{ijt}$$

where 'i' is showing Pakistan and 'j' is representing china and 't' in the subscripts of the variables show time period in years.

$\ln B_{ijt}$ = shows the log of bilateral trade between Pakistan and china.

$\ln rcap$ = log of revealed comparative advantage for Pakistan and china.

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l_{cpi} = log of consumer price index.

l_{ec} = log of energy consumption.

l_{exportpc} = represents the log of exports between Pakistan and china.

inst = institutional quality

l_{ypc} = indicate the log of gross domestic of Pakistan and china.

l_{tariffpc} = log of tariff rate between Pakistan and china.

ε = the error term.

To enhance the bilateral trade, countries should specialize according to their comparative advantage and to further elaborate this bilateral trade between countries, tariff rate among them should be decreased so that the countries benefit from each other more and more.

Discussion of variables and their relationship

Bilateral trade is used as a dependent variable in the study. Bilateral trade is a subject of main concern in international trade and the same is observed in literature review. Trade among countries is expanding day by day, bridging the gap and widening the trade market globally. In the model bilateral trade shows the overall trade between Pakistan and china. r_{capc} represents the revealed comparative advantage between Pakistan and china. c_{pi} represents the consumer price index for Pakistan. e_c represents the energy consumption in Pakistan. Export pc shows the level of exports the level of exports among Pakistan and china. ins represents the institutional quality. Institutional quality is the level to which a country's institutions smooth the progress of the international transactions and provide for their security and certainty. The index for institutional quality is made from different indicators such as, control of corruption, government effectiveness, political stability, regulatory quality, voice and accountability and rule of law. y_{pc} shows the gross domestic products of Pakistan and china. Tariff pc represent the level of tariff rate between Pakistan and china.

The relationship between these variables is as under: Bilateral trade and revealed comparative advantage between countries is taken in a way that countries trading more with each other tend to follow the pattern of comparative advantage and geographically bordered countries trade more as compared to distant countries (Martin & Tomas, 2019). Gross domestic product is positively associated with bilateral trade in a country. The more the gross domestic product of a country grows, the exports of the country would be increasing and the same way the trade with other countries would be enhancing.

The theory of revealed comparative advantage definitely needs not to be commenced at length. Initially presented in Balassa's 1965 paper, it has unlocked a topic which has been famous in the literature in the last five decades. The index can be calculated as:

$$RCA = \frac{\frac{x_i}{\sum_1^i x_i}}{\frac{\sum_1^c x_i}{\sum_1^c \sum_1^i x_i}}$$

where x is the total exports of country c for product i . Plainly said, it is ratio of a product's share in the exports of a country relative to the share of product in global exports, and it can take values from zero to infinity. Values greater than 1 indicate the country has a relative comparative advantage in the product, and *vice versa*. (Grancay & Dudas, 2019).

Results

This portion represents findings of estimation and the discussion of the findings in relation to the present study.

Lbtall	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Lrcapc	0.716	0.107	6.71	0.000	0.926	0.506	***
Lcpi	4.537	0.527	8.61	0.000	3.5	5.573	***
Lec	3.519	0.636	5.53	0.000	4.77	2.267	***
lexportpc	1.184	0.049	24.38	0.000	1.088	1.279	***
Inst	0.133	0.066	2.02	0.044	0.004	0.262	**
Lypc	0.051	0.045	1.12	0.263	-0.038	0.14	
ltariffpc	-7.045	1.641	-4.29	0.000	-10.272	-3.817	***
Constant	19.215	5.532	3.47	0.001	8.335	30.095	***
Mean dependent var			9.321		SD dependent var		2.229
R-squared			0.8		Number of obs		380
F-test			201.375		Prob > F		0
Akaike crit. (AIC)			1069.031		Bayesian crit. (BIC)		1100.552
Hausman (1978) specification test							
Chi-square test value			57.292		P-value		0.000
*** $p < .01$, ** $p < .05$, * $p < .1$							

Table-1

Table-1 shows the result of fixed effect model. We used this model on the bases of hausman test. The hausman test indicated the significant probability value which means that we would apply fixed effect model for the analyses of our estimation. Now we move towards the explanation of fixed effect outcome which is represented in table-1. Table-1 also explains the F-statistic value which shows that all the independent variables in fixed effect model are statistically significant or explaining a significant impact on their dependent variable.

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In above table *lrcapc* represent the log of revealed comparative advantage for Pakistan and china. The outcome of revealed comparative advantage for Pakistan and china explain a positive and significant relationship at 1% level of significance with bilateral trade, which means that a one percent increase in revealed comparative advantage would increase the bilateral trade between Pakistan and china by 0.71% in a single year. The revealed comparative advantage is an index which is used for the calculation of relative advantage or disadvantage of a particular country in trade with the other country. It is an economy's ability to produce a particular good or service at a lower opportunity cost than its trading partner. Its base is Balassa index (1965). A country having a comparative advantage in a particular good over its partner country must specialize and increase the production of that good. It would increase the productive capacity and the overall economy can be improved the same way.

Now in the second row of the above table, we discuss *lcpic* which stand for the log of consumer price index. The outcome of consumer price index shows a positive and significant relation at 1% level of significance with bilateral trade. This reflects that a one percent increase in consumer price index would cause the bilateral trade to rise by 4.5% in a single year between Pakistan and china. As inflation erodes the value of cash, so it encourages the consumers to spend less and stock up. The amount is then invested which is again a positive step towards trade.

After that in the third row of the table we have *lec* which express the log of energy consumption. The outcome of energy consumption explains a positive and significant relationship at 1% level of significance with bilateral trade, representing that a one percent rise in energy consumption would be causing a 3.5% improvement in bilateral trade between Pakistan and china. Consuming more and more of energy directly affects the GDP of a country; more output can be produced with the labor and available stock of capital. Availability of energy at reasonable cost improves competitiveness of domestic products in international markets, thus increases exports of home country. This results in enhancing of net exports and resultantly gross domestic product improves through multiplier effect. Our findings are in line with the findings of Shakeel et, al. 2014.

After energy consumption we have *lexportpc* in the above table. *lexportpc* represents log of exports for Pakistan and china. Exports for Pakistan and china explain a positive and significant association at 1% level of significance with bilateral trade, which means that a one percent increase in export would increase the bilateral trade between Pakistan and china by 1.1% in a single year. Increasing the export level of a country is considered the influential step towards the economic growth of a country. The more the exports of the country enhances, economies of scale would be provided in production and the more improved would be the business cycle.

Now we have *inst* in the above table which represents the institutional quality. The outcome of institutional quality shows a positive and significant association at 5% level of significance with bilateral trade, reflecting a five percent increase in institutional quality would improve the bilateral trade by 0.1% in a year. The index of institutional quality mainly comprises of political stability, law and order situation, control of corruption, etc. Having institutional quality in a country, can attract foreign direct investment for the country which is a positive sign for the overall growth of the economy.

After institutional quality in the above table comes lypc which represents log of gross domestic product for Pakistan and china. The outcome of gross domestic product explains a positive and insignificant relation with bilateral trade between Pakistan and china in a year. Our result is in line with the findings of Saqib et. al, (2017). Improvement of GDP of a country is dependent upon certain other factors in the economy, specially increasing the productive capacity of the country which enhances the export level of the country and as result gross domestic product improves.

The last variable in the above table is l tariffpc which represents the log of tariff for Pakistan and china. The outcome of tariff explains statistical significance at 1% and negative association with bilateral trade. It means that a one percent increase in tariff rate would decrease the bilateral trade by 7.0% in a single year between Pakistan and china. For smooth trade between partner countries, tariff rate should be reduced between them so that the trade is carried out without any hurdle and the economies are better off.

Conclusion and Policy recommendation

Trade across borders occurs due to the price differences among countries. These differences exist due to initial factors endowment or due to differences in productivity among countries. Countries export those goods in which they have absolute/ comparative advantage either due to difference in productivity or initial endowment. Trade between Pakistan and China has been expanding rapidly, especially in recent years. Pakistan revealed that China became Pakistan's first-largest trading partner after bilateral trade agreements while Pakistan became China's second-largest trading partner. The rapid increase in Pakistan-China bilateral trade stems not only from the fact that the two countries have both been experiencing rapid economic growth recently and reaping the benefit of trade liberalization undertaken by both countries. The finding of this study indicate that revealed comparative advantage for Pakistan and China explain a positive relationship with bilateral trade, which means that when RCA increases than bilateral trade increased by 71 percent per year. A country having a comparative advantage in a particular good over its partner country must specialize and increase the production of that good. It would increase the productive capacity and the overall economy can be improved the same way. The energy consumption shows a direct relationship with bilateral trade, this direction express that when energy consumption increases the bilateral trade increased by 3.51 percent. Furthermore, we found that consumer price index, exports, institutional quality, GDP except Tariff rate have positive correlation with bilateral trade. The outcome of this study will offer a better guideline to the policy makers for devising policies: Making use comparative advantage by differentiating the export product structure is important in promoting international trade. Government should focus that sector of the economy in which we have comparative advantage in producing a specific product at a cheaper cost than international market. It provides a chance for promotion of international trade for governments worldwide. Government should reduce tariff on all those goods which are imported as a raw material and those products are used in the final goods production. Government should ensure the implementation of technical and financial support to promote the export of comparative advantageous products to strengthen

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the economy. Government should increase the resources of energy production and its availability at a reasonable cost to improve the competitiveness of the home products in international market.

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