Pakistan Journal of Applied Economics: Special Issue 2018, (27-50)

TRADE REVENUE IMPLICATIONS OF TRADE LIBERALIZATION IN PAKISTAN

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Abstract

This study attempts to investigate the effect of free trade on trade tax revenue in case of Pakistan, during 1972 to 2014. For time series analysis, Autoregressive Distributed Lag (ARDL) model has been used for examining the long-run co-integration among the variables; Vector Error-Correction (VECM) model is used for short-run dynamics of the variables. The empirical results show that quantitative trade restriction is positively linked with trade tax revenue. On the basis of empirical findings, this study suggests that trade liberalization has negative impact on trade tax revenue. It improves the volume of average tariff rate which may cause to increase the trade tax revenue for Pakistan, in both the short-run and long-run.

Key Words: Trade Liberalization, Tariff Rate, Trade Tax Revenue.
JEL Classification: F10, F13, H2.

I. Introduction

Trade liberalization is a comprehensive term; as it, not only encompasses the flow of goods and services but also consider the scientific and cultural ideas, and values across countries of the world. It also facilitates the flow of physical, financial, and even human capital across borders. Trade liberalization is linked to the process of gradual elimination of duties on traded goods and services; and the other non-tariff trade barriers, such as quotas and voluntary export restrictions. It is also related to elimination of trade-distorting policies, promotion of market access, removal of monopoly powers, and free movements of capital among countries. Trade liberalization has many forms, such as free trade zones, free trade areas, trade unions, and free trade agreements at bilateral, multilateral, or regional agreements.

Trade liberalization may create fiscal instability for developing countries because of high share of trade tax revenue in total tax collection. Domestic tax revenue (as a share of GDP) is usually low in developing economies because of unsophisticated tax

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administration, large informal sector, negligible agricultural income tax, high exemptions or tax holidays and widespread tax evasion [Gupta (2007)]. To search alternative resources of tax revenue against trade revenue loss, is not easy because they have no capability to bring further change in the domestic tax structure. This may create problems for public investment in physical infrastructure, while some expenditure components may be difficult to reduce; such as, politically-sensitive expenditure on military and social security spending [Khattry (2003)]. During liberalization, it is necessary for developing countries to formulate proper policy for generation or substitution of trade revenue so that public investment in physical plus social infrastructure may not be hurt. Public sector performance gained more importance due to foreign competition. According to Rodrik (1998), trade liberalization improve the government role, specially in developing economies in the form of public spending. Government spending for infrastructure development plays a risk-reducing role in those economies which bear heavy external risk in the form of foreign competition in trade sector. At the initial stages of trade liberalization, public sector provides protection to imperfect sectors in the form of different types of duties and subsidies. At a later stage, imperfect sectors attain comparative advantage due to public sector intervention.

There are many factors that affect the international trade tax revenue such as the degree of trade openness, subsequent variations in the foreign exchange rate, import demand behavior, the structural changes of the economy, level of development, and the most important factor, the domestic taxation structure. Kubota (2005) pointed out that the fiscal requirements are not fully occupied with domestic needs. The governments have a tendency to shift tax collection towards an easy form of tax collection due to unsophisticated administration infrastructure of tax collection system. This reason suggests that developing nations heavily depend on trade tax revenue because these are easy to collect. Further, Aizenman and Youthin (2006) drew the conclusion that trade liberalization has new fiscal challenges, especially for developing countries because they have low level of tax revenue to GDP ratio. Due to trade liberalization, developed countries are able to shift trade tax revenue loss on other form of domestic taxes because they have high level of institutional quality and efficient administration. But in the case of developing countries, they face both problems, like low institutional administration quality to tax collection and also low tax to GDP ratio. Therefore, these economies are not able to shift tax burden towards domestic indirect tax collection.

In the global context, ambiguity exists on relationship between trade openness and trade tax revenue. According to the theory, trade liberalization in the form of lower tariff rates causes revenue loss. Trade liberalization may cause to improve the import volume, and hence the tax base as well as the trade revenue; though, to measure the effect of tariff removal on trade revenue is ambiguous. It is mild to assume that revenue consequences of trade liberalization will depend on host economy, including the initial trade regime, nature of liberalization, economic, political, structural conditions and import demand behavior. Indeed, tax revenue will be least affected when trade liberal-

ization is complemented by domestic tax reforms and tax administration capacity building. Ebri ll, et al. (1999) investigated the impact of trade openness on fiscal balance in most of the developing countries. They also argued that trade revenue loss may create further problem in fiscal performance in developing economies because they are characterized with high budget deficit, revenue constraint and rising tendencies in non-development government expenditures. Thus, the successful trade liberalization implies that it does not have adverse impact on revenue generation of developing countries.

In case of Pakistan, the major share of total revenue during 1990s was generated through indirect taxes. Import duties or trade tax produced forty per cent of the total government revenue. After structural reforms, tax revenue (as a per cent of GDP) started declining and contributed to only fifteen per cent of the total government revenue [Zaidi (2005)]. Further reduction in tariff rate was expected to reduce the share of trade revenue in the domestic tax revenue. For long-run this may increase the burden on fiscal structure as well as, increase the budget deficit. Under the imperfect market conditions, the government has only the choice to overcome revenue loss through appropriate changes in domestic tax structure. Furthermore, the problem of budget deficit may be solved and stable economic growth may be achieved through domestic tax performance. Overall, Pakistan's trade policy makers have always adopted the supply side incentives to improve export performance, such as tax incentives and support prices, etc., but have focused less on removal of structural weaknesses, such as provision of basic infrastructure and quality control in exports.

Trade tax revenue may also depend on elasticity of prices for the import demand behavior and the elasticity of prices for supply of substitution for imported goods. According to Ebrill, et al. (1999) and Agbeyegbe, et al. (2006), if either the price elasticity of demand for imports or the price elasticity of supply of import substitutes is high enough, there may be revenue gain at later stage of liberalization. The main objective of this study is to analyze the macroeconomic determinants of trade revenue. The theory suggests that interaction between tariff level and tariff revenue is not clear because, tariff revenue is also determined by tariff buoyancy and elasticity of imports. Trade tax revenue may also be affected by other important variables, such as the level of economic development, trade liberalization policies, custom reforms, the exchange rate variation, price level, effectiveness of tax and customs administrations. In rest of the paper; literature review is discussed in Section II and theoretical framework in Section III. Estimation techniques/methodology is provided in Section IV, while the model, variables and data sources are presented in Section V. Empirical observations sum-up in Section VI and finally, the conclusion and policy implications are provided in Section VII.

II. Literature Review

The economic literature on this study presents a variety of views regarding economic, political, social and fiscal implication of trade liberalization. On one hand, it is

viewed as an important engine of economic growth and on the other hand, it is criticized on the grounds that it may have negative impact on lives of people of developing nations. For example, it creates social ills, such as poverty, macroeconomic imbalances and environmental deterioration [Bhagwati (2004a)]. Bevan (1995) analyzed the influence of trade openness on macroeconomic variables for developed and developing countries. He concluded that there exists an inverse relationship between liberalization and economic instability. Bhagwati (2004b) and Taylor (1994) also determined the inverse relationship between trade openness and macroeconomics performance. Furthermore, these studies decided that the trade-off behavior between trade openness and economic performance is also responsible for fiscal instability, especially for developing nations.

On relationship of trade liberalization and fiscal performance, the earlier work by Melvin (1970) concluded that limited administrative capacity of government, level of corruption and a narrowness of tax base were hurdles for the collection of tariff revenue. In general, most countries shifted towards a replica, whereby the government depends on non-trade taxes as major source of revenue, as compared to trade tax. Tanzi (1989) explored many factors that affected the free trade tax revenue for developed and developing nations. These factors included prices, fiscal imbalances, rate of exchange and local tax revenue. The results described that the rate of exchange, import prices, and fiscal policy were inversely related to trade taxes. On tariff exemptions, Pritchett and Geeta (1994) found that high tariff rates are necessary for high trade tax revenue. They further concluded that in some cases the lower tariff rates may not bring a decrease in trade tax revenue.

Rajarm (1992) explained that Pakistani government was not well aware of rhe tariff structure imposed by WTO. Thus, inadequate consideration was paid to revenue and trade liberalization effects. He suggested that before making any tariff reforms, the government of Pakistan should have strictly investigated the tariff policy. Anderson (1996) raised the question whether there is existence of any relationship between tariff and fiscal performance? This may be possible when tariff reforms are correctly administered and highlight the existence of corruption and tax evasion. Rodrik (1998) investigated the empirical links between the level of economic development and trade tax revenue. The results showed that there was a significant negative relationship between per capita income and trade tax as a share of total tax revenue. He also concluded that an increase by US$ 1,000 in per capita income was connected with a decrease by 3.7 percentage points in the share of trade tax revenue.

For the Sub-Saharan African countries, Adam, et al. (2001) used the dynamic Generalized Method of Moment (GMM) panel data technique. The empirical results showed that trade liberalization increased trade tax revenue in the CFA countries. Another study by Agbeyegbe, et al. (2006), empirically analyzed the relationship between trade, exchange rate and tax revenue for Sub-Saharan Africa. They used a panel data set for 22 countries over the time period 1980 to 1996. The estimated results showed that trade liberalization, is positively linked with trade revenue, while there is a weak association

with income tax. They also supported that the exchange rate has no significant impact on revenue; while, domestic price level has significant and negative impact on tax revenue. Fisman and Shang (2001) concluded that tariff reduction may cause to raise trade revenue because the cost for tax evaders is higher to trade tax revenue evasion.

Kowalski (2005) examined the relationship between trade openness and revenue for 12 nations and concluded that in most cases the trade revenue reductions are relatively small during trade liberalization. The trade liberalization provided maximum advantages to those economies which are more efficient in their fiscal performances; while in some cases, fiscal adjustment is more difficult by decreasing tariff rates further. Most of the developing countries are not well aware of opportunities linked with open market. Some researchers have also pointed out that potential tariff or trade revenue loss is the main difficulty for reducing their tariff level, without a favorable change in the domestic tax structure.

Ebrill, et al. (1999) investigated the relationship between tariff level and trade revenue. They found that trade revenue may depend on price elasticities of demand and supply of traded goods and services. Further, the cut in tariff rate may cause reduction in trade revenue if price elasticity of demand and supply is less elastic. On the other hand, cut in the tariff rate may cause less revenue loss due to more elastic price elasticity of demand and supply. Keen and Ligthart (2001) suggested that if increase in domestic consumption tax is equal to the tariff cut, it may provide equal compensation to domestic consumer due to trade liberalization. Trade liberalization increased the real income of consumer through reduction in the world price of goods and services. Moreover, trade liberalization increased efficiency of production and might improve trade revenue for government.

For small open economies, Peters (2002) investigated the impact of trade liberalization on trade revenue and found that cut in tariff rate in developing countries produce unclear results for trade revenue. He claimed that trade revenue was generally dependent on many factors; such as tariff policy, level of development and the degree of import elasticity of substitutions. Finally, he concluded that trade tax revenue was reduced in developing countries, due to the above factors. Matlanyane and Harmse (2002) examined the relationship between trade liberalization and trade revenue for South Africa and concluded that trade liberalization influenced the trade revenue, significantly. The empirical results suggested that tariff rate has negative impact on trade revenue. For future policy implications; they argued that favorable macroeconomic framework is required for healthy effect of trade liberalization on trade revenue. Khattry and Rao (2002) investigated the relationship between trade liberalization and tax revenue for 80 developed and developing countries, over the period 1978 to 1999. The results indicated that trade revenue is negatively linked with trade liberalization, especially in developing countries, and argued that its loss may be compensated with favorable changes in the domestic tax revenue. They also pointed out that some structural factors play a significant role in determining the trade tax revenue as a share of GDP. For ex-

ample, the level of economic development is positively linked with tax to GDP; while trade revenue is negatively related to development.

Brafu-Insaidoo and Camara (2012) analyzed the effect of trade liberalization on tariff revenue in Ghana and estimated the imports elasticity and exchange elasticity before and after liberalization. They indicated that trade revenue is negatively related to exchange rate depreciation. Moreover, the import tariff liberalization is also inversely linked to trade revenue due to less elastic import demand and exchange rate. Popongsak (2009) investigated the association between trade liberalization, tax, and government revenue for some Southeast Asian countries. The result indicated that free trade had inverse relationship with tax revenue. The trade liberalization provided maximum advantages to those economies which were more efficient in their fiscal performances. The study concluded that most developing countries were not well aware of the opportunities of free trade. Therefore, for fiscal adjustment it was more difficult to move towards trade liberalization for these countries. Hisali (2012), investigated the impact of trade policy reforms on custom revenue for Uganda. The empirical results showed that depreciation of exchange rate caused reduction in custom revenue in the long-run due to higher domestic import prices. Higher domestic import prices may cause to reduce trade volume in the long-run, but the relationship may reverse in the short- run. Spearot (2013) examined the tariff liberalization and trade revenue with heterogeneous demand elasticities of imports. The results showed that less elastic demand produced more trade revenue under the environment of trade liberalization. On the other hand, more elastic demand produced less trade revenue as a reduction in tariff rate. Epaphra (2014) empirically examined as to how the trade liberalization influenced the import duty revenue and the domestic tax conditions in Tanzania. The empirical results showed that trade revenue, as a share to GDP was positively linked to tariff rates. This implied that trade liberalization produced considerable loss of import duty revenue in Tanzania.

After going through the literature on trade liberalization and trade revenue, hardly any study was found in-depth for Pakistan. Foreign exchange markets also influence the trade tax revenue and depreciation of floating exchange rate has negative impact on trade tax revenue. Some studies reflect macroeconomic determinants of tax and public expenditures and other reflect economic consequences, independently. In literature, most studies focus on only developed nations for empirical investigation. This issue gained more importance for developing world because these countries move rapidly towards trade liberalization without considering their fiscal conditions.

III. Theoretical Framework

Economies which have used the international trade liberalization policy without considering their fiscal conditions, have suffered revenue loss to meet their domestic expenditures [Keen and Ligthart (2001)]. If developing economies reduce the level of trade restriction, it may cause increase in total imports of such countries and may also

reduce tax revenue from the imports [Ebrill, et al, 1999)]. The graphical and functional presentation of tariff effect on partial equalibrium and the general equilibrium for a small country case has been presented by Feenstra (2002) and later, Salvatore (2013) stated that trade revenue initially depends on quantities of exports and imports. This may be represented as:

$$TTr = t \times Qm + t \times Emt > 0 \quad (1)$$

TTr = Trade revenue,
Qm = Quantity of imports,
Em = Qantity of exports,
T = Tariff rate,
t×Qm = Trade revenue collected from imports,
t×Em = Trade revenue collected from exports.

For simplicity, it is assumed that trade revenue depends on custom revenue, as well as on the price and quantity of imports. Most developing countries follow the export promotion policy because these countries export the primary and semi-manufactured items on zero tariff rate policy. In case of this study, export price and export quantity produce zero trade revenue. Thus, Equation (1) can be written as:

$$TTr = t \times Q_m \; t > 0 \quad (2)$$

The functional form of trade revenue and its determinants may be represented as:

$$TTr = f(Q_m, P_m, y, P_s, E_x, t) \quad (3)$$

where,

TTr = Trade revenue,
Q_m = Quantity of imports,
t = Tariff rate,
P_m = Price of imports,
y = Real income level of consumers,
P_s = Price of substitution of imports,
E_x = Exchange rate.

How can we find the rate of change of the function f (Q_m, P_m, y, P_s, E_x, t) when Q_m, Pm, y, P_s and E_x are related to t ? $TTr = f(Q_m, P_m, y, P_s, E_x, t)$; while, $Q_m = g(t)$, $P_m = h(t)$, $y = k(t)$, $P_s = l(t)$ and $E_x = m(t)$. The answer lies in the concept of total derivative. For general framework, it is considerd as a function; $y = f(x, w)$, where $x = g(w)$. The two functions f and g can also be combined into a composite function; $y = f[g(w), w]$.

The three variables *y, x, w* are related to one another. It is clearly seen that *w*, the ultimate source of change, can affect y through two channels: first, indierctly via *g* and *f* function. Second, *w* affect *y* directely via *f* function. The direct effect can simply be represented by partial derivate but the indirect effect can only be expressed by a product of total derivatives.

$$\frac{dy}{dw} = f_x \frac{dx}{dw} + f_w \; or \; \frac{dy}{dw} = \frac{\partial y}{\partial x}\frac{dx}{dw} + \frac{\partial y}{\partial w} \; .$$

Applying the above framework of total derivative on the constructed functional form model for trade revenue, Equation (4) is obtained.

$$\frac{dTTr}{dt} = \frac{\partial TTr}{\partial Q_m}\frac{dQ_m}{dt} + \frac{\partial TTr}{\partial P_m}\frac{dP_m}{dt} + \frac{\partial TTr}{\partial y}\frac{dy}{dt} + \frac{\partial TTr}{\partial P_s}\frac{dP_s}{dt} + \frac{\partial TTr}{\partial E_x}\frac{dE_x}{dt} + \frac{\partial TTr}{\partial t} \quad (4)$$

Ebrill, et al. (1999) and Kowalski (2005) pointed out the nature of price elasticity of imports demand behavior that affects the trade revenue. When a country has less elastic import demand conditions, further trade restriction policy may produce more trade revenue as compared to more import demand elasticity conditions. Change in quantity of import is relatively less in low import demand countries, as compared to more elastic import demands. On the other side, if country adopts trade liberalization policy with low elastic, import demand may face more welfare loss as compared to more elastic import demand [Kowalski (2005)]. For more details on revenue effect of trade liberalization (see, Appendix, Table A-1). More importantly, elasticity of price, income and substitution may influence the trade revenue. Thus, for elasticities, Equation (3) can be re-written as Equation (4).

$$\frac{dTTr}{dt} = \frac{TTr}{Q_m}\frac{Q_m}{TTr}\frac{\partial TTr}{\partial Q_m}\frac{dQ_m}{dt} + \frac{TTr}{P_m}\frac{P_m}{TTr}\frac{\partial TTr}{\partial P_m}\frac{dP_m}{dt} + \frac{TTr}{y}\frac{y}{TTr}\frac{\partial TTr}{\partial y}\frac{dy}{dt} + \frac{TTr}{P_s}\frac{P_s}{TTr}\frac{\partial TTr}{\partial P_s}\frac{dP_s}{dt}$$
$$+ \frac{TTr}{E_x}\frac{E_x}{TTr}\frac{\partial TTr}{\partial E_x}\frac{dE_x}{dt} + \frac{\partial TTr}{\partial t} \quad (5)$$

In the above equation, $Q_m/TTr \;\; \partial TTr/\partial Q_m$ stands for import quantity responsiveness for trade revenue, denotes as η_m; $p_m/TTr \;\; \partial TTr/\partial P_m$ is price elasticity of imports which denotes as η_p; $y/TTr \;\; \partial TTr/\partial y \;\; \eta_Y$ stands for income elasticity of import and is denoted as η_p; $y/TTr \;\; \partial TTr/\partial y$ is income elasticity with respect to trade revenue and can be denoted as η_γ; $P_s/TTr \;\; \partial TTr/\partial P_s$ stands for price elasticity of substitution of import, denoted as η_s; and, η_E stands for exchange rate elasticity of imports $E_x/TTr \;\; \partial TTr/\partial E_x$. Putting the above denoted value in Equation (5), it can be re-written as below:

$$\frac{dTTr}{dt} = \frac{TTr}{Q_m}\eta_M\frac{dQ_m}{dt} + \frac{TTr}{P_m}\eta_P\frac{dP_m}{dt} + \frac{TTr}{y}\eta_Y\frac{dy}{dt} + \frac{TTr}{P_s}\eta_S\frac{dP_s}{dt} + \frac{TTr}{E_x}\eta_E\frac{dE_x}{dt} + \frac{\partial TTr}{\partial t} \quad (6)$$

Now, Equation (6) can be written as:

$$\frac{dTTr}{dt} = \frac{TTr}{Q_m}\eta_M g'(t) + \frac{TTr}{QP_m}\eta_P h'(t) + \frac{TTr}{y}\eta_\gamma k'(t) + \frac{TTr}{P_s}\eta_S l'(t) + \frac{TTr}{E_x}\eta_E M'(t) + \frac{\partial TTr}{\partial t} \quad (7)$$

When a country has less elastic import demand condition, further trade restriction policy may produce more trade revenue as compared to more import demand elasticity condition. Change in quantity of import is relatively less in low import demand countries as compared to more elastic import demand. On the other side, if country adopts trade liberalization policy with low elastic import demand, it may face more welfare loss as compared to more elastic import demand [Khattry and Mohan (2002)]. Gupta (2007) investigated the determinants of tax efforts for developing economies using structural variables like administration, political stability and level of corruption. He also mentioned that such type of factors have direct and significant role on fiscal position of developing economies.

IV. Estimation Techniques/Methodology

The empirical estimation of economic theory is meaningless without testing the unit root problem of variables [Granger and Newbold (1974)]. Empirical validation of economic theory has gained more importance in the economic literature and stationary of the data is a prerequisite for Ordinary Least Square (OLS) method. The results are reliable if variables are stationary at level and difference at stationary. Autoregressive Distributed Lag Approach (ARDL) has been used to investigate the individual models of the study.

1. Dickey-Fuller Generalized Least Square (DF-GLS) De-trending

A large number of tests are used to examine the stationarity properties of the series, such as Augmented Dicky-Fuller (ADF), P-P, DF-GLS and Ng-Perron. The ADF and P-P unit root tests do not provide reliable results when data sample is small. These tests are extensively used in economic literature but their explaining properties are poor. To avoid this problem, it is preferred to use DF-GLS developed by Elliot, et al. (1996). Moreover, the traditional unit root tests are unable to explain the exact approximation of indexes or qualitative variables. It is necessary to test the stationarity property of variable X_t. For this, Elliot et al., (1996) enhanced the efficiency of ADF time trended unit root test by applying de-trending process. DF-GLS test helps to estimate the null hypothesis as $H_\circ: \delta_\circ = 0$ in the regression equation.

$$\Delta X_t^d = \alpha + \beta t + \delta_\circ X_{t-1}^d + \delta_1 \Delta X_{t-1}^d + ... + \delta_{p-1} \Delta X_{t-p+1}^d + e_t \quad (8)$$

Here X_t^d is supposed to be the de-trended series and a null hypothesis of estimated test is that X_t has a drift, possibility of a random walk trend, as followed in Equation (8).

2. Autoregressive Distributed Lag Model (ARDL) to Co-integration

This study employs the Cointegration test to investigate the presence of long-run relationship between dependent and independent macroeconomic variables. The notion of co-integration test was developed by Engle and Granger (1987) for time series residual. After that, this test was augmented by Stock and Watson (1988), Johansen (1991), (1992), (1995), Johansen and Juselius (1990), Pesaran, et al. (2001) and Paresh (2005). This study uses the bound testing approach to cointegration, developed by Pesaran, et al. (2001) and Paresh (2005); for the long- and short-run association among the macroeconomics variables. The ARDL bounds testing approach to cointegration is preferable over previous cointegration approaches due to two reasons. First, this approach is more appropriate for different order of integration of variables; such as I(0), I(1) or I(0)/I(1). Second, the ARDL cointegration technique is more preferable for small sample size. Pattichis (1999) described that due to estimates of Unrestricted Vector Error Correction Model (UVECM), this approach is consired to have good statistical properties by not restricting the short-run and long-run dynamics to the residual term which is similar to the Engle–Granger technique.

A simple linear transformation of residual term is used to derive Unrestricted Vector Error Correction Model (UVECM) for short-run movement towards long-run equilibrium [Banerjee, et al. (1998)]. The ARDL bounds testing approach combines the long- and short-run without losing information regarding long-run relationship. The unrestricted error correction model (UECM) of the ARDL version is modeled as:

$$\Delta y_t = \lambda_1 + \lambda_2 y_{t-1} + \lambda_3 z_{t-1} + \lambda_4 x_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta y_{t-1} + \sum_{j=0}^{q} \alpha_i \Delta x_{t-j} + \sum_{s=0}^{r} w_i \Delta z_{t-s} + u_t \qquad (9)$$

where, λ_t is considered as constant and u_t is error term which is assumed to be normally distributed. The ARDL cointegration approach calculate the number of regressions following $(m + 1)^k$ formula which helps in choosing appropriate lag order. To test the presence of cointegration, Pesaran, et al. (2001) produced two bounds, i.e., upper critical bound (UCB) and lower critical bound (LCB). The formulation of hypotheses for Equation (9) is given below. The null hypothesis $H_\circ = \lambda_2 = \lambda_3 = \lambda_4 = 0$ shows no cointegration between the series while cointegration exists, if alternative hypothesis $H_1 = \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq 0$ is found to be significant.

The decision of hypothesis testing is based on F-Statistic established by Pesaran, et al. (2001) and after that Narayan (2005) augment for small data set samples. If F-statistic calculated value is more than the tabulated value of upper bound then the existence of cointegration among the concerned variables is indicates; while, if the calculated F-statistic is less than lower critical bound, then it suggests that there is no cointegration among the variables of interest. Rejection of null hypothesis means that results confirmed the existence of long-run cointegration among the variables. The next phase is to investigate the short-run behavior of the concerned variables through error correction

mechanism (ECM). For this purpose, the following equation has been formulated:

$$\Delta y_t = \sum_{i=1}^{p} \lambda_i \Delta y_{t-1} + \sum_{j=0}^{m} \beta_i \Delta x_{t-1} + \sum_{k=0}^{n} \beta_k \Delta z_{t-k} + \eta ECT_{t-1} + \varepsilon_t \quad (10)$$

Equation (10), ECT_{t-1} represents the lagged error correction term which indicate the speed of adjustment towards long-run equilibrium. The stability and diagnostic tests are carried out to test goodness of the fit of autoregressive distributive lag model (ARDL). Furthermore, the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMsq) are used to test the constancy of ARDL parameters.

V. Model, Variables and Data Sources

Most of the studies which have analyzed the influence of trade liberalization on tax revenue are based on cross country or country specific analysis. In this context, this study empirically investigate the impact of trade liberalization on trade revenue in Pakistan. This study includes some macroeconomic and trade policy variables, i.e., import value, size of underground economy, tariff rate and elasticity of imports. In the light of Ebrill, et al. (1999), Agbeyegbe, et al. (2006) Spearot (2013) and Epaphra (2014) the equation of basic model is constructed. Two new determinants of trade tax revenue such as size of the underground economy and imports value index have also been included in the study. The model is given in Equation (11) to examine the impact of trade liberalization on trade tax revenue:

$$TTr = f(UGE, PCG, IMV, AT, EXC) \quad (11)$$

where, TTr is Trade tax revenue as a share of total tax revenue, UGE Underground economy as a share of GDP, PCG GDP per capita growth [annual (per cent)], IMV Import value index, AT Tariff rate weighted mean, all products (per cent), EXC Official exchange rate. To measure the macroeconomic determinants of trade tax revenue, this study uses import value, exchange rate, policy of trade liberalization, level of economic development, real effective exchange rate of economy and different types of imports elasticities. Normally, trade tax revenue is collected through custom duties on free trade. In Pakistan, almost 95 per cent trade tax revenue is collected from the custom duties. Other trade revenues are also collected in the form of non-tariff barrier. Non-tariff trade revenue was not included for analysis, due to two reasons. Firstly, it has less share in trade revenue; and secondly, time series study needs regular values of data over time. In case of non-tariff revenue, it has missing values in case of Pakistan over time.

The size of underground economy is defined as an approximation of the undocumented volume of the economy which is used as a proxy for administration capacity of tax collection, as well as corruption level of the economy. If size of an underground

economy increases, its link may be expected negative with trade tax revenue. For size of the underground economy of Pakistan, the data estimated by [Gulzar, et al. (2010) is used by this study showing moving average for remaining four years observations. Data has been taken from the Handbook of Statistic on Pakistan Economy by the State Bank of Pakistan (2010); the Pakistan Economic Survey (2015) published by Ministry of Finance, Government of Pakistan; and the World Development Indicators (2015) by the World Bank.

VI. Empirical Observations

The study employed both the descriptive and correlation matrix approaches among the concerned variables. The descriptive results suggest that there is a positive correlation between trade liberalization, total volume of imports and level of economic development, and trade tax revenue. This represents that a reduction in tariff rate causes a loss in trade tax revenue. The higher level of economic development leads to increase the import volume. Thus, the increase in import volume may further improve the trade tax revenue; while, depreciation of exchange rate and size of the underground economy are negatively correlated with trade tax revenue. The results are presented in Appendix Table A-1.

Various econometric approaches are used to test relationship between the variables. The empirical estimation of economic variables is meaningless without testing the unit root problem of variables. The DF-GLS unit root test was used for investigating the unit root problem in the time series data. The results of DF-GLS are shown in Table 1. The results shows that at level, only GDP per capita growth is stationary. Whereas, trade tax revenue as a share of tax revenue, underground economy as share of GDP, Import value index, trade liberalization and official exchange rate are not stationary at level; but, by taking the first difference all the variables of the model become stationary.

TABLE 1

Unit Root Estimation

Variables	DF-GLS test at Level		DF-GLS test at 1st Difference	
	Calculated values	Lags	Calculated values	Lags
TTr	-0.3115	1	-2.0656**	1
UGE	-0.5330	0	-3.8227**	1
PCG	-2.1837**	1	-6.0624*	1
IMV	-0.6861	1	-4.4511*	1
AT	-0.4988	1	-3.6011*	1
EXC	1.5858	1	-3.4410	1

Note: * (**) *** show significance at 1% (5%) 10% level.
Source: Authors' calculation.

TABLE 2

ARDL Bounds Testing Co-integration Test

Critical Value	Dependent Variable TTr			
	F-Statistics 4.6455		W-statistic 27.9730	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
95 per cent	2.9955	4.3630	17.3691	26.1778
90 per cent	2.4920	3.6944	14.9519	22.1667

Source: Authors' calculation.

The results of ARDL bound testing approach are presented in Table 2. For testing the null hypothesis of no cointegration, F-statistic and W-statistic are used. The calculated F-statistic (4.6455) is greater than the upper bound (4.3630) value of Pesaran et al, (2001) at 5 per cent and the calculated W-statistic (27.9730) is greater than the upper bound (26.1778) at 5 per cent. Therefore, the null hypothesis of no co-integration is rejected and alternative hypothesis is accepted. This confirms that all concerned variables used in the study have cointegration in case of Pakistan.

The next step is to examine the long-run relationship when trade tax revenue (as a share of total tax revenue) is dependent variable. The long-run results of the model are presented in Table 3. The results show that in Pakistan underground economy (as share of GDP) has negative and insignificant relationship with trade tax revenue. The estimated results show that in case of Pakistan GDP per capita growth has positive and significant relationship with trade tax revenue, as a share of total tax revenue. The results shows that in Pakistan, at 1 per cent increase in GDP per capita growth brings 0.3289 per cent increase in trade tax revenue, as a share of total tax revenue; and this

TABLE 3

Long Run Coefficient of ARDL Regression

Variable	Dependent Variable = TTr		
	Coefficient	Std. Error	T.Ratio [Prob]
Constant	26.4005*	2.1244	12.4272[0.000]
UGE	-0.7993	0.48314	-1.6545[0.108]
PCG	0.3289**	0.12699	2.5905[0.014]
IMV	0.0786*	0.016397	4.7947[0.000]
AT	0.3822*	0.061057	6.2602[0.000]
EXC	-0.2621*	0.033998	-7.7112[0.000]

Note: *(**) ***show significance at 1% (5%) 10% level.
Source: Authors' calculation.

relationship is significant at 5 per cent level. The coefficient of import value index shows that there is positive and significant relationship between import value index and the trade tax revenue as a share of total tax revenue. The above results are consistent with Ebrill, et al. (1999), Khattry and Rao (2002) and Agbeyegbe, et al. (2006)]. For Pakistan, the results show that 1 per cent increase in import value index increases the trade tax revenue by 0.07862 per cent because our imports are less elastic in prices and more elastic in income. The results of price, income and substitution elasticities are shown in Appendix, Table A-2.

Trade liberalization has positive and significant relationship with trade tax revenue as a share of total tax revenue. These findings support the arguments of Epaphra (2014) and Brafu-Insaidoo and Camara (2012). The coefficient of trade liberalization shows that in Pakistan, 1 per cent increase in tariff rate brings 0.3822 per cent increase in trade tax revenue as a share of total tax revenue. It means that trade liberalization produces adverse impact on trade tax revenue. It can be seen that elasticity of import, income, substitution and exchange rate results illustrate the imports as less price elastic and more income elastic. It means that low tariff has adverse impact on trade tax revenue (Appendix, Table A-1). The estimated results shows that official exchange rate has inverse and significant relationship with trade tax revenue. The coefficient of official exchange rate shows that 1 per cent increase in official exchange rate brings 0.2621 per cent decrease in trade tax revenue as a share of total tax revenue. This result supports the Hisali (2012) findings.

After finding the long-run relationship, the short-run relationship among variables of the model can be calculated. The short-run results of the model are presented in Table 4. The empirical results show that underground economy, as share of GDP has negative and insignificant relationship with trade tax revenue as a share of total tax revenue. In case of Pakistan, the short-run estimated results show that GDP per capita growth has positive and significant relationship with trade tax revenue as a share of total tax revenue. The results show that 1 per cent increase in GDP per capita growth brings 0.5682 per cent increase in trade tax revenue as a share of total tax revenue. The coefficient of import value index shows that there is positive and significant relationship between import value index and trade tax revenue as a share of total tax revenue. The short-run results show that 1 per cent increase in import value index brings 0.0162 per cent increase in trade tax revenue as a share of total tax revenue.

The results shows that trade liberalization has positive and significant relationship with trade tax revenue as a share of total tax revenue. The coefficient of trade liberalization shows that 1 per cent increase in trade liberalization brings 0.4223 per cent increase in trade tax revenue as a share of total tax revenue. The official exchange rate has negative and significant relationship with trade tax revenue as a share of total tax revenue. The short-run coefficient of official exchange rate shows 1 per cent increase in official exchange rate and brings 0.2903 per cent decrease in trade tax revenue as a share of total tax revenue. The negative sign of coefficient of ECM_{t-1} is

TABLE 4

Short Run Coefficient of ARDL Regression

Variables	Dependent Variable = TTr		
	Coefficient	Standard Error	Ratio[Prob]
Constant	-0.0655	0.4265	-0.1537 [0.878]
DUGE	-0.0582	0.1081	-0.5384 [0.591]
DPCG	0.5682*	0.1217	4.6688 [0.000]
DIMV	0.0162*	0.0030	5.3210 [0.000]
DAT	0.4223*	0.1085	3.2483 [0.002]
DEXC	-0.2903**	0.1085	-2.6746 [0.012]
ECM_{t-1}	-0.31373**	0.12276	-2.5636 [0.025]
R-Squared	0.6964	R-Bar-Squared	0.6357
DW-statistic	2.7364	F-Stat.	11.471 [.000]
AIC = 4.0347		SBC = 4.3395	

Note: *(**) ***show significance at 1% (5%) 10% level.
Source: Authors' calculation.

-0.31373 which is statistically significant. The coefficient of error term of short-run shows convergence speed towards the long equilibrium path. It is found that in case of Pakistan, short-run deviations of previous period can be corrected by 0.31373 per cent, in future period.

After estimation of the short and long-run cointegration test, the Pairwise Granger Causality Tests is applied for the direction of association among the concerned variables. The results of Pairwise Granger Causality Tests have been presented in Table A-4, Appendix. The empirical result shows that bidirectional causality existed between the trade revenue and size of underground economy. All other variables have unidirectional causality with trade revenue. The diagnostic tests are used to check the serial correlation, functional form, normality and heteroscedasticity among variables of the model. The results of diagnostic tests are reported in Table 5 which shows that results show that there is no serial correlation and heteroscedasticity problem in data. Moreover, variables of the model have correct functional form and data is normally distributed.

Brown, et al, (1975) proposed the hypothesis testing of Cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMsq) for the stability of coefficients of the entire regress model. This study has also contracted these plots of above model to conformation of stability of long-run coefficients. The empirical results of (CUSUM) and (CUSUMsq) are presented in Figures 1 and 2, respectively. The empirical results also approve the stability of coefficient (all four models) at 5 per cent of significant.

TABLE 5

Diagnostic Tests

Test Statistics	LM Version	F Version
A. Serial Correlation	0.19205 [0.661]	0.15747 [0.694]
B. Functional Form	0.25355 [0.615]	5.6837 [0.623]
C. Normality	1.6330 [0.442]	Not applicable
D. Heteroscedasticy	0.50160 [0.479]	0.48156 [0.492]

A: Lagrange multiplier test of residual serial correlation.

B: Ramsey's RESET test using the square of the fitted values.

C: Based on a test of skewness and kurtosis of residuals.

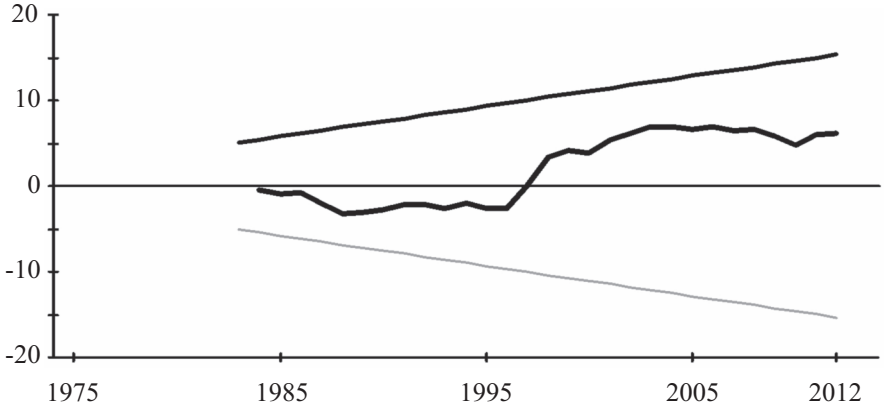
D: Based on the regression of squared residuals on squared fitted values.

Source: Authors' calculation.

VII. Conclusions and Policy Implications

Trade liberalization has many implications for economic, social and political changes for developing world. Fiscal implication of trade liberalization is one of them; which gain more importance for developing economies because most of these nations have considerably liberalized their borders without evaluating fiscal consequences. This study tries to empirically investigate the hypothesis that quantitative restrictions (tariff rate) on free trade have negative impact on trade tax revenue. According to the economic theory, the main determinants of trade tax revenue are volume of tariff, volume of imports and exports, and different types of elasticities. For open economy exchange rate, volatility of exchange rate, domestic price level and domestic consumer demand are also considered as determinants of trade tax revenue.

The empirical results show that trade liberalization is positively linked with trade tax revenue. It means that if volume of tariff rate is improved, it may cause to increase the trade tax revenue for Pakistan in both the short-run and long-run. The import value index has positive and significant impact on trade tax revenue because major share of imports are based on less price elastic demand behavior. Due to less price elastic demand for imports, consumer behavior shows that trade tax revenue is positively linked with domestic consumer demand in short and long-run. On the other hand, the size of underground economy has negative impact on trade tax revenue because this variable captures the role of administration capacity and the corruption level of economy. Exchange rate has also negative impact on trade tax revenue because the major tools of monetary policy like domestic price level, interest rate, as well as flexible exchange rate; causes to reduce trade tax revenue in long run.

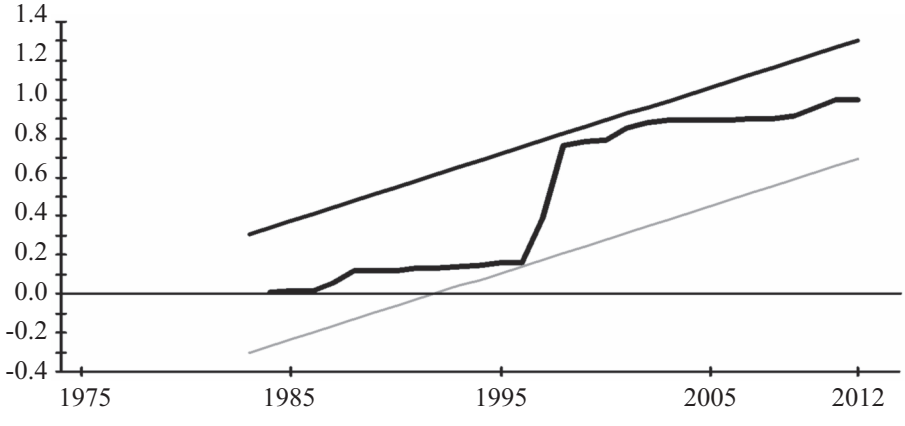


Note:The straight lines represent critical bounds at 5% significance level.
Source: Authors' estimation.

FIGURE 1

Plot of Cumulative Sum of Recursive Residuals
for the Regression Estimates

For future policy implication, Pakistan should improve the average tariff rate or quantitative restriction to increase the trade tax revenue because the imports of Pakistan are less elastic in prices. The government should control the depreciation of local currency or exchange rate with the help of tight monetary base policy in the short-run. Moreover, administration inefficiency should be overcome through well designed custom administration for the efficient collection of trade tax revenue. In the short-run,



Note:The straight lines represent critical bounds at 5% significance level.
Source: Authors' estimation.

FIGURE 2

Plot of Cumulative Sum of Squares Recursive Residuals
for the Regression Estimates

high tariff rate should protect the domestic infant industries from the foreign competition; and this may be able to produce import substitution at domestic level. This policy may improve the comparative advantages in domestic production in the long-run.

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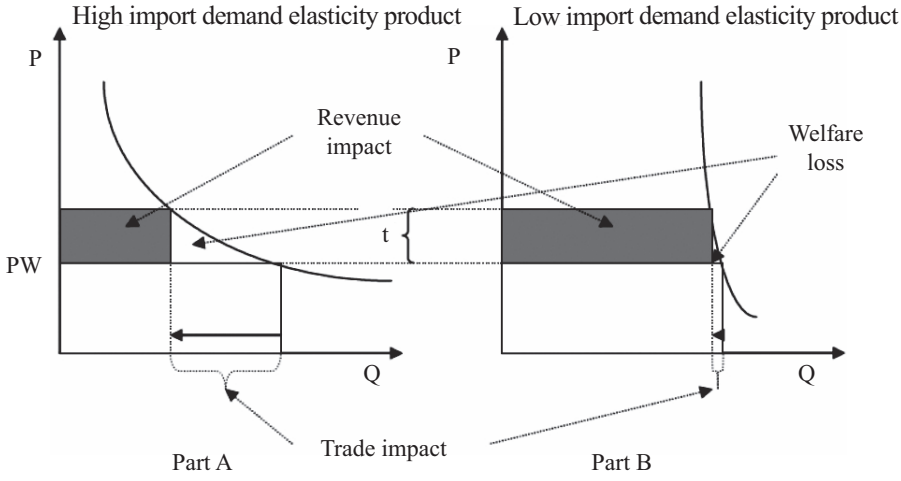
APPENDIX



Source: Kowalski (2005).

FIGURE A-1

Price Elasticity of Imports and Trade Tax Revenue

Figure A-1 shows that in Part-A (high import demand elasticity) and Part-B (low import demand elasticity) using equal reduction in tariff rate caused low price level and ultimately reduction in trade revenue for both cases. More elastic import demand curve faced less revenue loss (Part-A) as compared to less elastic import demand curve (Part-B) which faced more revenue loss. For imposition of tariff or trade restricted policy, results for Part- B with less price elasticity of import demand yield more trade revenue as compared to Part-A with more price elastic import demand.

TABLE A-1

Descriptive Statistics and Correlation Matrix of Variables

	AT	PCG	IMV	UGE	EXC	TTR
Mean	20.8646	2.23793	304.339	27.4915	36.5863	25.2230
Median	24.1988	1.95588	223.320	25.5400	28.1071	25.3000
Maximum	36.0961	6.57382	941.720	39.4100	92.0000	39.2000
Minimum	7.53478	-1.63303	107.670	15.6800	9.90000	11.3000
Std. Dev.	8.87432	1.88192	216.029	7.08835	25.7610	10.2619
Skewness	-0.1788	0.31353	1.46718	0.03408	0.62466	0.01970
Kurtosis	1.59146	2.62804	4.31888	1.71850	2.11703	1.30999
Jarque-Bera	3.43175	0.86379	16.8187	2.67619	3.80326	4.64371
Probability	0.17980	0.64927	0.00022	0.26234	0.14932	0.09809
Sum	813.720	87.2796	11869.2	1072.17	1426.86	983.700
Sum Sq. Dev.	2992.63	134.581	177340.	1909.30	25217.9	4001.64
Observations	41	41	41	41	41	41

	AT	PCG	IMV	UGE	EXC	TTR
AT	1					
PCG	0.105428	1				
IMV	0.592409	-0.178156	1			
UGE	-0.785207	-0.164801	0.393706	1		
EXC	-0.890244	-0.135261	0.672937	0.881474	1	
TR	0.368241	0.167783	-0.489783	-0.907740	-0.946379	1

Source: Authors' calculation.

TABLE A-2

Lag Order Selection Criteria Based on VAR

Lag	FPE	AIC	SC	HQ
0	4.03010	41.4465	41.7058	41.5344
1	4109755.*	32.2284*	34.0576*	32.8732*
2	5557106.	32.3702	35.7664	33.5670

* indicates lag order selected by the criterion, FPE:
Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Authors' calculation.

TABLE A-3

Different Elasticities of Imports of Pakistan
(Year, 1972 to 2013)

Years	Income elasticity of imports	Price elasticity of imports	Substitution elasticity of imports	Exchange rate elasticity of imports
1971	1.028685	-0.09684	0.518020	NA
1972	1.050465	-0.20720	0.903982	0.034007
1973	1.052307	-0.31763	0.875149	2.895250
1974	1.039424	-0.26665	0.637047	1.030250
1975	1.032826	-0.25582	0.508996	0.000000
1976	1.039477	-0.24802	0.582121	0.000000
1977	1.039813	-0.04076	0.564769	0.000000
1978	1.038805	-0.03676	0.509473	0.000000
1979	1.032805	-0.02920	0.415093	0.000000
1980	1.030576	-0.02771	0.351028	0.000000
1981	1.031788	-0.02953	0.338160	0.000000
1982	1.035543	-0.01730	0.354909	0.751597
1983	1.041985	-0.01959	0.392617	0.417421
1984	1.045605	-0.01936	0.405908	0.768160
1985	1.049294	-0.01977	0.407786	0.483803
1986	1.056428	-0.02065	0.442453	0.901844
1987	1.065757	-0.02239	0.484353	1.167950
1988	1.065266	-0.02341	0.446678	1.410990
1989	1.067290	-0.02334	0.438769	1.284326
1990	1.076209	-0.02726	0.475712	1.775654
1991	1.082338	-0.02915	0.489208	0.210150
1992	1.080492	-0.02409	0.444026	1.769288
1993	1.082686	-0.02356	0.448251	1.629147
1994	1.112685	-0.01451	0.588868	0.885553
1995	1.110939	-0.01139	0.552332	1.813860
1996	1.110993	-0.01383	0.527061	1.434085
1997	1.126170	-0.01492	0.593114	0.976025
1998	1.163549	-0.01730	0.749708	0.085945
1999	1.192534	-0.02084	0.851409	1.950990
2000	1.229357	-0.02211	0.972807	0.941220

Continue.....

TABLE A-3 *(Continued)*

Different elasticities of imports of Pakistan
(Year, 1972 to 2013)

Years	Income elasticity of imports	Price elasticity of imports	Substitution elasticity of imports	Exchange rate elasticity of imports
2001	1.242495	-0.02448	1.008534	0.636821
2002	1.266139	-0.02541	1.072294	1.059830
2003	1.246569	-0.02229	0.947527	1.103072
2004	1.223571	-0.02006	0.800187	1.724714
2005	1.195011	-0.01677	0.648264	1.241143
2006	1.164835	-0.01417	0.516071	1.354634
2007	1.175507	-0.01427	0.519932	2.312697
2008	1.158388	-0.01392	0.461848	0.467028
2009	1.225817	-0.01998	0.635614	1.704741
2010	1.263574	-0.02142	0.713950	3.615000
2011	1.288072	-0.02142	0.761919	0.242570
2012	1.316414	-0.02266	0.798228	1.614104
2013	1.345122	-0.02541	0.862314	2.012301

Source: Authors' calculation.

TABLE A-4

Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
UGE does not Cause TTR	41	3.41846	0.0522
TTR does not Cause UGE		5.32184	0.0273
PCG does not Cause TR	41	5.12551	0.0262
TR does not Cause PCG		0.06184	0.8051
IMV does not Cause TR	41	0.70824	0.4059
TR does not Cause IMV		6.34161	0.0167
EXC does not Cause TR	41	9.44103	0.0042
TR does not Cause EXC		0.12554	0.7253
AT does not Cause TTR	41	8.09349	0.0075
TTR does not Cause AT		0.16500	0.6871

Source: Authors' calculation.