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Investigation of Effective Factors on Bilateral Trade Costs of Agricultural Product

(Case Study: Iran's Bilateral Trade with Developing Countries)

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ABSTRACT: This study concerns with calculation of Iran's agricultural bilateral trade costs and major influential factors on it in Iran's Bilateral Trade with Developing countries group over the period 1995-2010. Main findings reveal that over the period 1995-2010 weighted average of agricultural trade cost with developing partner has declined by 44 percent. This reduction, however, was greater for UAE and Brazil from developing countries. Based on estimated regression, agricultural bilateral trade costs with distance, bilateral tariff rate and lag of agricultural bilateral trade costs variables are positively related whereas island and adjacency variables have the opposite effect on Iran s agricultural bilateral trade costs. Finally based on results is suggested that for increasing power contest of export, agricultural products must be destined based on trade costs.

KEYWORDS: Bilateral Trade Costs, Gravity, Agricultural Products, Panel Data.

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1. INTRODUCTION

The expansion of agricultural trade has helped to provide greater quantity, wider variety and better quality food to increasing numbers of people at lower prices (Pinstrup-Andersen and Babinard, 2001). Agricultural trade is also a generator of income and welfare for the millions of people who are directly or indirectly involved in it. At the national level, for many countries it is a major source of the foreign exchange that is necessary to finance imports and development; while for many others domestic food security is closely related to the country's capacity to finance food imports. The relationship between trade and output in general underlies the growing interdependence and integration of the world economies. This is the case also for agriculture. On a global basis, the long-term growth rate of agricultural trade has tended to be significantly greater than that of production. Agriculture is often the economic driving force in developing countries. In the course of globalization, foreign trade of Iran as a Caspian region countries and developing country is known with high dependence on a single export crop and foreign exchange earnings from oil exports and high imports. The need to avoid and get rid of the problems caused by the single-product exports, diversify export products, supply problems exchange for imports and increasing share in global trade and investment and international markets, clearly indicates The importance of exports, especially agricultural exports and imports depreciation. In between expanding and thriving business, especially agricultural trade would not be possible without regard to the costs associated and undoubtedly one of the most successful strategies and compete in the global arena can be attributed to a reduction in trade costs.

Novy (2012) in his article derived a micro-founded measure of bilateral trade costs that indirectly infers trade frictions from observable trade data. He showed that this trade cost measure is consistent with a broad range of leading trade theories including Ricardian and heterogeneous firms models. In an application he showed that U.S. trade costs with major trading partners declined on average by about 40 percent between 1970 and 2000, with Mexico and Canada experiencing the biggest reductions. Hoekman and Nicita (2011), reviewed some indices of trade restrictiveness and trade facilitation and compared the trade impact of different types of trade restrictions applied at the border with the effects of domestic policies that affect trade costs. Based on a gravity regression framework, the analysis suggested that tariffs and non-tariff measures continue to be a significant source of trade restrictiveness for low-income countries despite preferential access programs. The results also suggested that behind-the-border measures to improve logistics performance and facilitate trade are likely to have a comparable, if not larger, effect in expanding developing country trade, especially exports. Miroudot et al (2012) provided the first evidence linking lower international trade costs with higher productivity in services sectors. Baised on results, on average, lowering trade costs by 10% is associated with a gain in total factor productivity of around 0.5%, which is an effect of similar magnitude to that for goods sectors. Amiti et al (2008) examined the determinants of entry by foreign firms, using information on 515 Chinese industries at the provincial level during 1998–2001. The analysis was based on new economic geography theory and thus focused on market and supplier access within and outside the province of entry, as well as production and trade costs. The results indicated that market and supplier access were the most important factors affecting foreign entry. Access to markets and suppliers in the province of entry matters more than access to the rest of China, which was consistent with market fragmentation due to underdeveloped transport infrastructure and informal trade barriers. Reimer and Li (2010), developed a simulation model of world crop markets that was based upon Ricardian comparative advantage. They applied the model to twenty-three countries and provided measures of the degree of globalization in this sector, the gains from trade, and the elasticity of trade volumes to trade costs. The distribution of the gains from trade across countries was uneven due to important differences in openness to imports, productivity, and other factors, some of which appear to be related to a country's level of development. Distance limited the extent by which changes in one country were transmitted to others. Duan and Grant (2012)

estimated an indirect measure of multilateral trade costs for tradable goods in agriculture. Using production and bilateral trade data along with plausible values of the elasticity of substitution, they found that median global agricultural trade costs were 285 percent in 1965, on an ad-valorem equivalent basis, before declining dramatically to a 118 percent ad-valorem equivalent in 2010. There was considerable variation in agricultural trade costs, bilaterally, and within various policy arrangements such as regional integration and the GATT/WTO. Statistical analysis of the determinants of agricultural trade costs largely confirmed this variation: bilateral and regional free trade initiatives lowered international trade costs by 36 percent on average, whereas GATT/WTO membership lowered trade costs by nearly 20 percent.
Sourdin and Pomfret (2009), developed an Index of Trade Costs for ASEAN Member Countries, 1990-2007 based on the gap between cif and fob values of ASEAN exports to Australia. The cif/fob gap is a commonly used aggregate measure of trade costs, and Australia is a useful benchmark for ASEAN countries because it is a large trading partner whose major ports of entry are roughly equidistant from the ASEAN countries. The case for using this Index as a measure of trade costs was set out in the first section. The second section examined the raw data for the ASEAN countries. The third section reported econometric analysis of the cif/fob measure to better understand why trade costs vary across countries and to compare the ASEAN members' record to the global average during the period 1990-2007. The final section presented the two versions of the Index, discussed some reservations to using the cif/fob measure of trade costs, and suggested how the Index could be upgraded, maintained and extended.
Accordingly, the present study sought to measure the cost of bilateral trade of agricultural products in Iran with partners in developing partners and to survey effective factors on it.

2. MATERIAL AND METHODS

2.1. Measure of Bilateral Trade Costs

Anderson and van Wincoop (2003) develop a multi-country general equilibrium model of international trade. Each country is endowed with a single good that is differentiated from those produced by other countries. Optimizing individual consumers enjoy consuming a large variety of domestic and foreign goods. Their preferences are assumed to be identical across countries and are captured by constant elasticity of substitution utility.

As the key element in their model, Anderson and van Win coop (2003) introduce exogenous bilateral trade costs. When a good is shipped from country i to j, bilateral variable transportation costs and other variable trade barriers drive up the cost of each unit shipped. As a result of trade costs, goods prices differ across countries. Specifically, if p_i is the net supply price of the good originating in country$i$, then $p_{ij} = p_i t_{ij}$is the price of this good faced by consumers in country j, where $t_{ij} \geq 1$ is the gross bilateral trade cost factor (one plus the tariff¤ equivalent).

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Based on this framework Anderson and van Win coop (2003) derive a micro-founded gravity equation with trade costs:

$$x_{ij} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{\pi_i P_j}\right)^{1-\sigma} \qquad (1)$$

Where x_{ij}denotes nominal exports from i to$j$, y_i is nominal income of country i and y^w is world income defined as$y^w = \sum_{j=1}^{n} y_j$. $\sigma > 1$ is the elasticity of substitution across goods. π_i And P_j are country$i$'s and country$j$'s price indices.

The gravity equation implies that all else being equal, bigger countries trade more with each other. Bilateral trade costs t_{ij} decrease bilateral trade but they have to be measured against the price indices π_i andP_j. Anderson and van Win coop (2003) call these price indices multilateral resistance variables because they include trade costs with all other partners and can be interpreted as average trade costs. π_i Is the outward multilateral resistance variable, whereas P_j is the inward multilateral resistance variable.

$$x_{ij} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{\pi_i P_j}\right)^{1-\sigma} \qquad \text{And} \qquad x_{ii} = \frac{y_i y_i}{y^w}\left(\frac{t_{ii}}{\pi_i P_i}\right)^{1-\sigma}$$

$$\pi_i P_i = \left(\frac{x_{ii}/y_i}{y_i/y^w}\right)^{\frac{1}{1-\sigma}} t_{ii} \qquad (2)$$

As an example supposes two countries i and j face the same domestic trade costs $t_{ii} = t_{jj}$ and are of the same size $y_i = y_j$but country i is a more closed economy, that is, $x_{ii} > x_{jj}$. It follows directly from (2) that multilateral resistance is higher for country$i$, $(\pi_i P_i > \pi_j P_j)$. Equation (2) implies that for given t_{ii} it is easy to measure the change in multilateral resistance over time as it does not depend on time-invariant trade cost proxies such as distance.

The explicit solution for the multilateral resistance variables can be exploited to solve the model for bilateral trade costs. Gravity equation (1) contains the product of outward multilateral resistance of one country and inward multilateral resistance of another country, $\pi_i P_j$, whereas equation (2) provides a solution for$\pi_i P_i$. It is therefore useful to multiply gravity equation (1) by the corresponding gravity equation for trade flows in the opposite direction, x_{ji}, to obtain a bidirectional gravity equation that contains both countries' outward and inward multilateral resistance variables:

$$x_{ij} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{\pi_i P_j}\right)^{1-\sigma} \qquad \text{And} \qquad x_{ji} = \frac{y_j y_i}{y^w}\left(\frac{t_{ji}}{\pi_j P_i}\right)^{1-\sigma}$$

$$x_{ij} x_{ji} = \left(\frac{y_i y_j}{y^w}\right)^2 \left(\frac{t_{ij} t_{ji}}{\pi_i P_j \pi_j P_i}\right)^{1-\sigma} \qquad (3)$$

Substituting the solution from equation (2) and rearranging yields:

$$\frac{t_{ij} t_{ji}}{t_{ii} t_{jj}} = \left(\frac{x_{ij} x_{ji}}{x_{ii} x_{jj}}\right)^{\frac{1}{1-\sigma}} \qquad (4)$$

As shipping costs between i and j can be asymmetric $(t_{ij} \neq t_{ji})$ and as domestic trade costs can differ across countries$(t_{ii} \neq t_{jj})$, it is useful to take the geometric mean of the barriers in both directions. It is also useful to deduct one to get an expression for the tariff¤ equivalent. I denote the resulting trade cost measure asτ_{ij}:

$$\tau_{ij} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{1/2} - 1 = \left(\frac{x_{ij}x_{ji}}{x_{ii}x_{jj}}\right)^{\frac{1}{2(1-\sigma)}} - 1 \quad (5)$$

Where τ_{ij} measures bilateral trade costs $t_{ij}t_{ji}$ relative to domestic trade costs$t_{ii}t_{jj}$. The measure therefore does not impose frictionless domestic trade and captures what makes international trade more costly over and above domestic trade.

The intuition behind τ_{ij} is straightforward. If bilateral trade flows $x_{ij}x_{ji}$ increase relative to domestic trade flows $x_{ii}x_{jj}$, it must have become easier for the two countries to trade with each other relative to trading domestically. This is captured by a decrease in τ_{ij} , and vice versa. The measure thus captures trade costs in an indirect way by inferring them from observable trade flows. Since these trade flows vary over time, trade costs τ_{ij} can be computed not only for cross-sectional data but also for time series and panel data.

This is an advantage over the procedure adopted by Anderson and van Win coop (2003) who only use cross-sectional data. It is important to stress that bilateral barriers might be asymmetric $(t_{ij} \neq t_{ji})$ and that bilateral trade flows might be unbalanced$x_{ij} \neq x_{ji}$. τ_{ij} Indicaters the geometric average of the relative bilateral trade barriers in both directions.

2.2. Panel Regression

In addition, panel regressions was run to understand whether the trade cost measure is sensibly related to common trade cost proxies from the gravity literature. Those proxies can be divided into two groups. The first group consists of geographical variables including logarithmic bilateral distance between the two countries in an observation, a dummy variable that indicates whether the two countries are adjacent and share a land border, and an island indicator variable that takes on the value 1 if one or both of the trading partners is an island, and 0 otherwise. The second group consists of institutional variables capturing various historical and political features. They include a common language dummy, currency union dummy, the free trade agreement dummy and a tariff variable combining the ratings of tariff regimes for the two trading.

2.3. Data

As an illustration of the relative trade cost measure τ_{ij} derived in the previous section, measure was computed for Iran's major developing partners using annual data for the period 1995 to 2011. Table 1 reports trade share of each country in agricultural product group.

Table1- Trade share of each partner (percent) in agricultural products

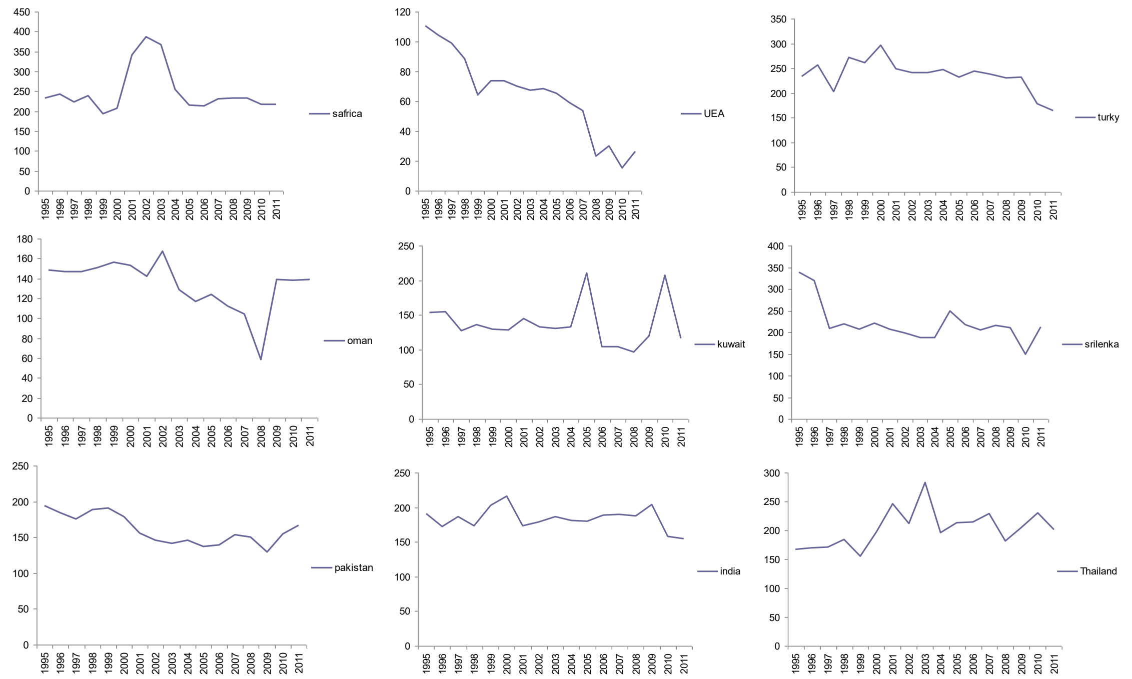
Developing countries	
Kenya	0.16
South Africa	0.43
Brazil	4.46
China	3.38
Korea, Republic of	0.38
Indonesia	0.31

Philippines	1.79
Thailand	5.38
India	5.98
Pakistan	4.92
Sri Lanka	1.79
Kuwait	2.27
Oman	1.24
Turkey	1.29
United Arab Emirates	24.63
	58.32

All bilateral aggregate data are taken from the UNCTAD in U.S Dollars. Data for intra-national trade x_{ii} are not directly available but can be constructed following the approach by Shang-Jin Wei (1996). Due to market clearing intra-national trade can be expressed as total income minus total exports, $x_{ii} = y_i - x_i$, where total exports x_i are defined as the sum of all exports from country i, $x_i = \sum_{i\neq j} x_{ij}$. Total agricultural production in dollars was taken in constructing y_i. The trade cost measure potentially depends on the elasticity of substitution σ , Anderson and van Win coop (2004) survey estimates of σ and conclude that it typically falls in the range of 5 to 10. Given these estimates I proceed by following Anderson and van Win coop (2004) in setting σ = 8.

3. Results

Figure 1, illustrates the relative Iran s agricultural bilateral trade cost measure for sample countries.



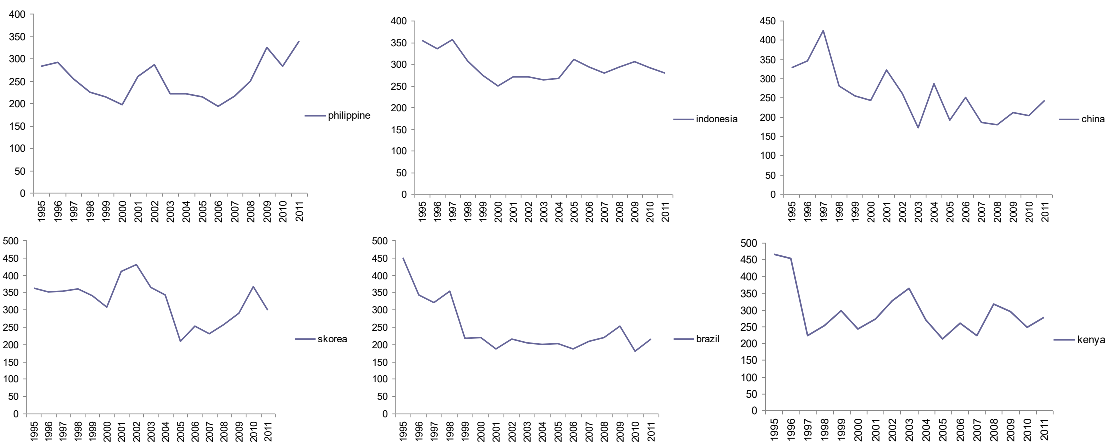


Figure1-The Iran's relative bilateral trade cost measure in trade of agricultural products with developing countries (1995-2011)

Stability and instability of the bilateral trade cost trading partners was realized from figure 1. Based on results, Iran s trade cost with Turkey, Pakistan, India and Indonesia were more stable. Based on costs of bilateral trade of agricultural products between Iran and UAE and Brazil, despite the instability has been decreasing.

Table 2 reports level and percentage variation in Iran relative bilateral trade cost measure between 1995 to 2011 with developing partner in trade of agricultural.

Table 2- The trade cost measure (percent in tariff equivalent)

Country	1995	2011	Variation
Kenya	465	277	-40
South Africa	234	218	-7
Brazil	449	214	-52
China	327	243	-26
Korea, Republic of	361	299	-17
Indonesia	354	279	-21
Philippines	282	339	20
Thailand	167	202	21
India	190	154	-19
Pakistan	194	167	-14
Sri Lanka	339	213	-37
Kuwait	153	116	-24
Oman	148	139	-7
Turkey	234	165	-29
United Arab Emirates	110	26	-76
Simple Average	267	203	-22
Weighted Average	192	124	-44

It is important to stress that these numbers represent a measure of bilateral relative to domestic trade costs. For example, take the result that Iran.-Turky measure of agricultural products stands at 165 percent in the year 2011. Suppose that a particular good produced in the Iran costs $10.00 and A domestic consumer could therefore buy the product for $10, whereas a consumer abroad would have to pay $26.5 ($t_{ij}$=2.65). Of course, this particular example is based on an aggregate average and should be interpreted as such. In practice, trade costs can vary considerably across goods and across countries. For instance, perishable goods are more likely to be transported by air freight instead of less expensive truck or ocean shipping (see Chen and Novy, 2011).

Based on the results of measuring the costs of bilateral trade of agricultural products, the costs of Iran's trade with the UAE and Brazil during the period 2011-1995 had the greatest reduction. In the costs of agricultural trade, Iran's Kuwait, Oman and the UAE in both periods of Arabic has been minimal.

Table 3 presents the regression results of the trade cost measure on observable trade cost proxies. The dependent variable is the logarithmic relative trade cost measure, ln($\boldsymbol{\tau_{ij}}$).

Table 3: Regressing the trade cost measure on observable trade cost proxies

trade cost proxies \Selected model	Pooled
Ln(distance)	0.03 (0.03)
Adjacency	-0.12* (0.06)
Island	-0.03 (0.60)
Ln(tariff)	0.04* (0.02)
Ln($\boldsymbol{\tau_{ij}}$)(-1)	0.77** (0.05)
$\boldsymbol{R^2}$	0.81
F	112.92**

The dependent variable is the logarithmic tariff equivalent ln (τ_{ij})), robust OLS estimation.
Standard errors given in parentheses. Constants not reported.
** And * indicates significance at the 1 and 5 percent level, respectively
Due to not variation, common language dummy, currency union dummy, the free trade agreement dummy in both regressions was eliminated.

The explanatory power of the trade cost proxies is fairly high, with the $\boldsymbol{R^2}$ ranging between 81 percent. The repressors have the expected signs Distance is positively related to trade costs, whereas adjacency is associated with lower trade costs. Moreover, trading relationships involving island countries are also associated with lower trade costs since those countries have easy access to the sea and traditionally tend to be relatively heavily involved in international commerce. Tariffs and lag of relative trade cost measure, ln(τ_{ij}) are naturally associated with higher trade costs.

4. Discussions

Considering the importance of agribusiness management, we aimed to measure the pattern of Iran's trade with developing countries and its effective factors accordingly, the following results were obtained:

Main findings reveal that over the period 1995-2010 weighted average of agricultural trade cost with developing partner has declined by 44.

Based on results, Iran s trade cost with Turkey, Pakistan, India and Indonesia were more stable.

Based on the results of measuring the costs of bilateral trade of agricultural products, the costs of Iran's trade with the UAE and Brazil during the period 2011-1995 had the greatest reduction.

The results showed in the costs of agricultural trade, Iran's Kuwait, Oman and the UAE in both periods of Arabic has been minimal.

The results showed, Iran's agricultural trade costs in developing countries, is positively related with distance, agricultural bilateral tariff rate and lag of agricultural trade costs and is negatively related with, adjacency and island dummy.

According to the results of bilateral trade costs of agricultural has experienced a downward trend.

Therefore, some of the main suggestions are offered as follows:

Due to the high dependence on import to oil export And the impact of bilateral trade costs on commodity prices and Resulting in the withdrawal of currency, It is recommended that in trade of different products, different markets are selected according to bilateral trade costs between countries.

It is recommended that costs of bilateral trade in goods are calculated a more detailed groups and trade of products is navigation based on calculated bilateral trade costs.

Based on relationship between Iran's agricultural trade costs and common trade cost proxies, It is recommended that in order to expand agricultural trade with developing countries, Tariffs and trade costs through preferential trade agreement letters was changed.

The effect of lag of agricultural trade costs the needs to perform different actions on decrease the bilateral trade costs are shown.

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ETHICAL CONSIDERATION

Authenticity of the texts, honesty and fidelity has been observed.

AUTHOR CONTRIBUTIONS

Planning and writing of the manuscript was done by the authors.

CONFLICT OF INTEREST

Author/s confirmed no conflict of interest.

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