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Estimation of the Impacts of Non-Oil Traditional and Non-Traditional Export Sectors on Non-Oil Export of Azerbaijan

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Abstract | *The significant share of oil sector of the Azerbaijan export portfolio necessitates promotion of non-oil exports. This study analyzes weather the commodities which contain the main share (more than 70%) in non-oil export are traditional or non-traditional areas, using the so-called Commodity-specific cumulative export experience function, for the 1995-2015 timeframe. Then, the impact of traditional and non-traditional exports on non-oil GDP investigated employing econometric model. The results of the study based on 16 non-oil commodities show that cotton, tobacco, and production of mechanic devices are traditional sectors in non-oil export. The estimation results of the model indicate that both, traditional and non-traditional non-oil export sectors have economically and statistically significant impact on non-oil GDP.*

Key words | Azerbaijan, non-oil export, traditional and non-traditional sectors, diversification

JEL Codes: F43, O24, C22

1. Introduction

Oil sector shares considerable part of Azerbaijan's export portfolio. According to the figures of 2015, 88% of the country's export income revenues from the oil sector. Therefore, the research and estimation, and promotion of country's non-oil export have greater importance. While examining potential of the country's non-oil export it was investigated which areas are traditional and non-traditional for the non-oil export sectors in the country. The level of diversification of the country's non-oil exports has been determined on the basis of these results. The effects of vertical and horizontal diversification areas on these non-oil exports are known. In the non-oil export of the country, the vertical diversification comes light in the non-traditional sectors and the horizontal diversification in the traditional sectors. Valuing the influences of the

horizontal and vertical diversifications on the growth of the country's whole non-oil export is decisively important in the non-oil export of Azerbaijan. In the research, the impacts of the selected traditional and non-traditional products on the non-oil export of Azerbaijan has also been analyzed and evaluated. As the result, it was looked through on what direction of the level of diversification was focused in the stimulation of the non-oil export of the country.

2. Theoretical-methodological framework

Export diversification is explained as variety of the export appointed goods, in other words, as the mixed export oriented groups of products (Alwang and Siegel, 1991) or as not only one but also as scattering of the production and export on several sectors (Berthelemy and Chauvin, 2000) of the country. Methodologies like measurement of the diversification in the field of export and determination (Gutierrez *et al*., 1997) of the structural changes in the export sectors have been used. And the relationship among variables has been measured (Sibindi and Zingwevu, 2015) by methodology indicating economical influences between the export diversification and economic growth.

For a number developing countries export diversification as the basic component of the economic growth is understood in two main ways: traditional and non-traditional diversification of products in the country's export. In general, the provision of the country's export resources with the broadness and diversification eliminates the instability of achieved level of profitableness; gives an opportunity to reach economic rise through different channels; and also affects positively: on the improvement of scientific and technological innovations; on stimulating competitive production in various areas; on vying against negative global tendencies happening in prices of some products. Commodity-specific cumulative export experience function (CSCEF) will be used to measure the level of diversification in non-oil export and structural changes in export of groups of goods. Diversification level will be determined based on incomes from 16 significant groups of goods, in country's export portfolio, given in Table 1.

2.1. Non-oil export evaluation according to commodity-specific cumulative export experience coefficient

Commodity-specific cumulative export experience coefficient is used to define diversification level in the export and to assess structural changes on definite area in the export of the country. Assume that X_{it} represents exporting price of some i product in t time. In this case commodity-specific cumulative export experience (CSCEF) coefficient will be as follow (Samen, 2010; UN, 2004):

$$CSCEF_{it} = \frac{\sum_{t=t0}^{tc} Xit}{\sum_{t=t0}^{tT} Xit} \qquad (1)$$

Table 1. Revenues (in thousand USD) from the export of main commodity groups in 2015, and their proportions in total export (in percentage)

Commodity Groups	Revenues from Export (in thousand USD)	Share in total export (in %)
Total Export	11424477,3	100%
Vegetables, root crops and tubers	91681,2	0,80%
Eatable fruits and walnut-nut, citrus plants	220247,8	1,93%
Animal/vegetable fats and oils	153335,3	1,34%
Sugar and confectioneries prepared from sugar	212207,5	1,86%
Alcoholic and non-alcoholic, vinegar	25829,5	0,23%
Mineral fuel, oil and oil refining products	9881866,8	86,50%
Chemical compounds	59931,7	0,52%
Plastics and plastic products	112451,5	0,98%
Pearls, bijous, ores, jewelry and coins	83224,7	0,73%
Aluminum and aluminum products	86148,0	0,75%
Nuclear reactors; boilers; machinery and mechanical equipment, and their parts	36392,2	0,32%
Electrical machinery and equipment, apparatus, and their parts	23103,6	0,20%
Cotton	19504,9	0,17%
Unprocessed hides (except fur) and tanned leather	12179,0	0,11%
Other ready textile products and trimmed clothes	10633,4	0,09%
Ferrous metals	18303,4	0,16%
Products from ferrous metals	16612,9	0,15%
Optical, photographic, measuring, checking, medical or surgical instruments (equipment) and apparatus	17437,4	0,15%
Coffee, tea, mate (Paraguay River) and spices	19505,5	0,17%

Source: table is prepared by authors based on official data from State Statistics Committee of Azerbaijan Republic (SSCAR) (6).

Here, t_0, t_c, and t_T represent the initial, current and terminal periods of the sample respectively. It should be noted that values of CSCEF take a minimal (near zero) value in the initial period and maximum 1 in the terminal period. While stating the values of selected primary 16 products of Azerbaijan's non-oil export, the initial year (t_0) was accepted as 1995 and the terminal (t_T) as 2015. These CSCEFs have been computed separately based on commodities and different indexes on years have been calculated. The found indexes of selected 16 products have been described in Figure 1. Note that according to these found indexes types of products prone to inclined left are marked as traditional, and types of products inclined more to the right are marked as non-traditional. As it is can be seen from the graphic, commodity groups tending to the left are cotton-growing, tobacco-cultivation and mechanical appliances (robots), while the rest have tended to the right. Hence it is clear that, commodities shifted more to the left

are grounded on traditional export, which in its turn indicates the importance of horizontal diversification, and on the other hand commodity groups tending to slip more to the right are based on non-traditional export, which in turn indicates the necessity of vertical diversification.

3. The evaluation of the influences of export diversification on non-oil export in Azerbaijan

In this section we investigated the impact of export diversification based on non-oil export sector on total non-oil export in Azerbaijan. It is known from the previous studies that two basic diversification factors: horizontal and vertical, have an impact on growth in non-oil export. Vertical diversification reveals itself in non-traditional groups of products, but horizontal diversification is mainly based on traditional export oriented product groups. According to the provided the estimation of the influences of both growth rate in non-traditional export sectors (ENTC) possessing vertical diversification and growth rate in traditional export sectors (ETC) possessing horizontal diversification on country's total growth rate in non-oil export (ENO) in Azerbaijan's non-oil export. Based on the given indexes in the section above we have investigated which commodity products are traditional or non-traditional on accordance of 16 non-oil sector products of Azerbaijan. Three kinds of commodity groups (cotton, tobacco and nuclear reactors, boilers, machinery and mechanical appliances, and their parts) have been accepted as traditional export oriented, and the rest thirteen as non-traditional export oriented groups of non-oil export of Azerbaijan. Provided data for the research are taken from unified source – based on SSCAR's information.

Econometric methodology to be used to apply modeling methodology concerning the objects of the study consists of three stages shown below:

1. Assignation of the hypothesis put in in the primary stage in form of stochastic equation and designation of the preliminary theoretical expectations about signs of the parameters included in. According to the hypothesis regression equation will be as follows:

$$eno = \alpha + \beta * entc + \gamma * etc \qquad\qquad (2)$$

Here:

eno is log of the growth rate of non-oil export;

α – intercept;

β, γ - regression coefficients;

entc – log of the growth rate of non-traditional commodity groups in non-oil sector;

etc – is log of the growth rate of traditional commodity groups in non-oil sector.
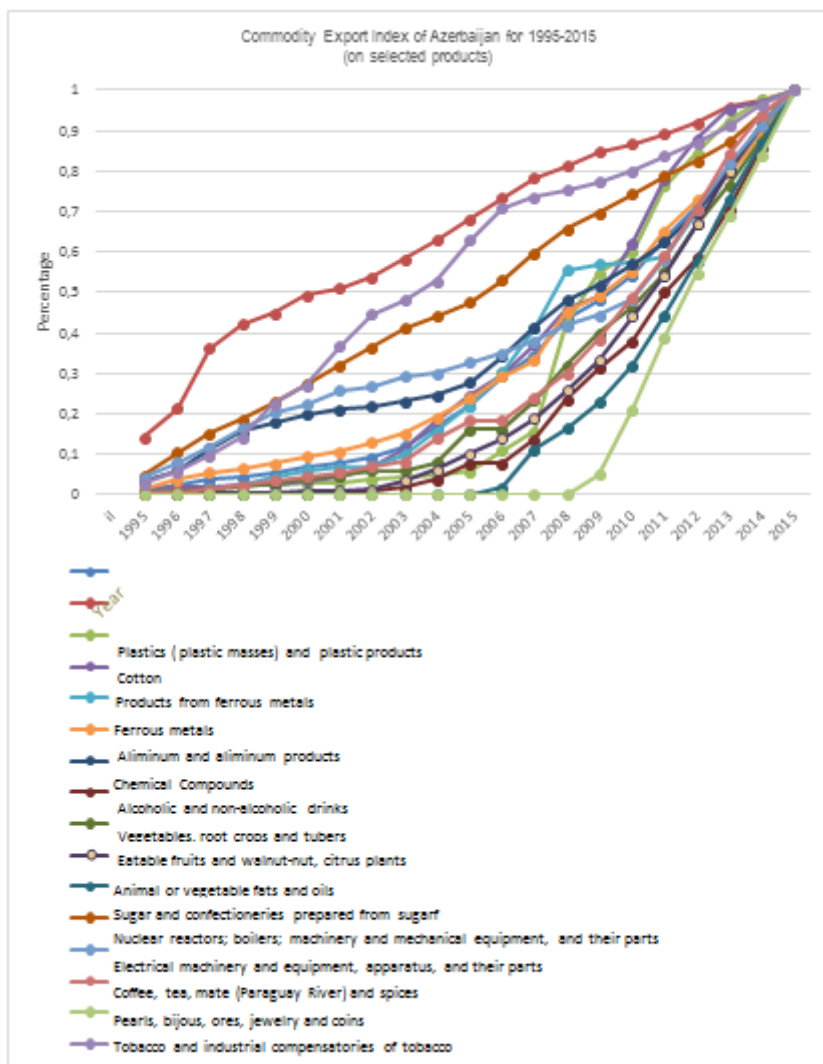
Figure1. Commodity-specific cumulative export experience functions in the non-oil export of Azerbaijan (on selected products)

Source: Figure is prepared by authors based on official data from SSCAR.

2. In the second stage by means of econometric method regression coefficients will be evaluated gathering statistical information on variables. The given information for the assessment is from data about export of commodity groups between 1995-2015 and country's general non-oil export between 1995-2015. Gathered data according to SSCAR are included in the model. The relationship among the variables was analyzed employing Canonical Co-integration Regression approach. Figure 2 depicts the graphs of the variables in log form.
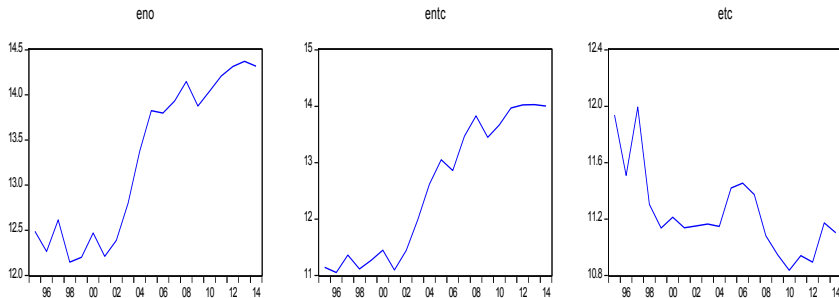

Figure 2. The graphs of logarithms of variables over the time, 1995-2015

3. In the final stage appropriate tests will be carried out in order to verify the compliance of coefficients got from regression model with economic, statistic and econometric measures. Note that in this phase is examined whether the initial theoretical expectations put in the model prove itself or not. In the acceptable significance level it is tested if parameters of the model are significant or not. Recovery of the important econometric assumptions in regression ratio is being looked through. It is investigate whether the explanation of the changes happened in main variables about the changes in dependent variable is satisfactory or not. Here is built and tested the following hypothesis on the influences of main variables *entc* and *etc* on dependent variable *eno* under each three criteria.

H_0- Changes in growth rate in both non-traditional and traditional commodity groups' export in non-oil sector define the change in growth rate of general non-oil export. The same dependence can be determined through econometric method.

H_1- Changes in growth rate in both non-traditional and traditional commodity groups' export in non-oil sector cannot define the change in growth rate of general non-oil export. It is impossible to determine this dependence through econometric method.

4. Econometric methodology

4.1. Unit Root Test

It is essential to examine the integration order of variables through Unit Root (UR hereafter) Test before conducting a cointegration analysis. To do that, we use Augmented Dickey-Fuller (ADF hereafter, Dickey and Fuller, 1981). The test takes the null hypothesis of non-stationarity of a given time series.

For a variable y, the ADF statistics is the t-ratio on b_1 in the regression below:

$$\Delta y_t = b_0 + \psi trend + b_1 y_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta y_{t-i} + \varepsilon_t$$

(3)

Here, Δ and k represent the first difference operator and number of the lags respectively, b_0 is a constant term, *trend* and ε_t are linear time trend and white noise residuals; *i* is lag order.

We will skip discussing this test here because of space limitation. Advantages and disadvantages of univariate UR tests, in particular ADF have been discussed by Dickey and Fuller (1981), Stock and Watson (1993), Dolado *et al.* (1990), de Brower and Ericsson (1998) and Enders (2010, p.237-239) among others.

4.2. Canonical cointegrating regression[1]

It is well known that many economic time series are difference stationary. In general, a regression involving the levels of these I(1) series will produce misleading results, with conventional Wald tests for coefficient significance spuriously showing a significant relationship between unrelated series.
Engle and Granger (1987) note that a linear combination of two or more I(1) series may be stationary, or I(0), in which case we say the series are *cointegrated*. Such a linear combination defines a *cointegrating equation* with *cointegrating vector* of weights characterizing the long-run relationship between the variables.
We will work with the standard triangular representation of a regression specification and assume the existence of a single cointegrating vector (Hansen 1992, Phillips and Hansen 1990). Consider the $n + 1$ dimensional time series vector process (y_t, X_t'), with cointegrating equation:

$$y_t = X_t'\beta + D_{1t}'\gamma_1 + u_{1t}$$

(4)

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[1] This section adopted from the EViews 9 Users Guide II.pdf

Where $D_t = (D'_{1t}, D'_{2t})'$ are deterministic trend regressors and the n stochastic regressors X_t are governed by the system of equations:

$$X_t = \Gamma'_{21} D_{1t} + \Gamma'_{22} D_{2t} + \varepsilon_{2t} \tag{5}$$

$$\Delta \varepsilon_{2t} = u_{2t}$$

The p_1-vector of D_{1t} regressors enter into both the cointegrating equation and the regressors equations, while the p_2-vector of D_{2t} are deterministic trend regressors which are included in the regressors equations but excluded from the cointegrating equation (if a nontrending regressor such as the constant is present, it is assumed to be an element of D_{1t} so it is not in D_{2t}).

Following Hansen (1992), we assume that the innovations $u_t = (u_{1t}, u'_{2t})'$ are strictly stationary and ergodic with zero mean, contemporaneous covariance matrix Σ, one-sided long-run covariance matrix Λ, and covariance matrix Ω, each of which we partition conformably with u_t

$$\Sigma = E(u_t u'_t) = \begin{bmatrix} \sigma_{11} & \sigma_{12} \\ \sigma_{21} & \sigma_{22} \end{bmatrix}$$

$$\Lambda = \sum_{j=0}^{\infty} E(u_t u'_{t-j}) = \begin{bmatrix} \lambda_{11} & \lambda_{12} \\ \lambda_{21} & \lambda_{22} \end{bmatrix} \tag{6}$$

$$\Omega = \sum_{j=-\infty}^{\infty} E(u_t u'_{t-j}) = \begin{bmatrix} \omega_{11} & \omega_{12} \\ \omega_{21} & \omega_{22} \end{bmatrix} = \Lambda + \Lambda' - \Sigma$$

In addition, we assume a rank n long-run covariance matrix Ω with non-singular submatrix Ω_{22}. Taken together, the assumptions imply that the elements of y_t and X_t are I(1) and cointegrated but exclude both cointegration amongst the elements of X_t and multicointegration. Discussions of additional and in some cases alternate assumptions for this specification are provided by Phillips and Hansen (1990), Hansen (1992), and Park (1992).

It is well-known that if the series are cointegrated, ordinary least squares estimation (static OLS) of the cointegrating vector in Equation (4) is consistent, converging at a faster rate than is standard (Hamilton 1994). One important shortcoming of static OLS (SOLS) is that the estimates have an asymptotic distribution that is *generally* non-Gaussian, exhibit asymptotic bias, asymmetry, and are a function of non-scalar nuisance parameters. Since conventional testing procedures are not valid unless modified substantially, SOLS is generally not recommended if one wishes to conduct inference on the cointegrating vector.

Park's (1992) Canonical Cointegrating Regression (CCR) employs stationary transformations of the (y_t, X_t'), data to obtain least squares estimates to remove the long run dependence between the cointegrating equation and stochastic regressors innovations. CCR estimates follow a mixture normal distribution which is free of non-scalar nuisance parameters and permits asymptotic Chi-square testing.

The first step in CCR is to obtain estimates of the innovations $\hat{u}_t = (\hat{u}_{1t}, \hat{u}_{2t}')'$ and corresponding consistent estimates of the long-run covariance matrices $\hat{\Omega}$ and $\hat{\Lambda}$. CCR requires a consistent estimator of the contemporaneous covariance matrix $\hat{\Sigma}$. Following Park, we extract the columns of $\hat{\Lambda}$ corresponding to the one-sided long-run covariance matrix of $\hat{u}_t$ and (the levels and lags of) $\hat{u}_{2t}$

$$\hat{\Lambda}_2 = \begin{bmatrix} \hat{\lambda}_{12} \\ \hat{\Lambda}_{22} \end{bmatrix} \tag{7}$$

And transform the (y_t, X_t') using

$$X_t^* = X_t - (\hat{\Sigma}^{-1}\hat{\Lambda}_2)'\hat{u}_t$$

$$y_t^* = y_t - (\hat{\Sigma}^{-1}\hat{\Lambda}_2\hat{\beta} + \begin{bmatrix} 0 \\ \hat{\Omega}_{22}^{-1}\hat{\omega}_{21} \end{bmatrix})'\hat{u}_t \tag{8}$$

where the $\hat{\beta}$ are estimates of the cointegrating equation coefficients, typically the SOLS estimates

used to obtain the residuals $\hat{u}_{1t}$. The CCR estimator is defined as ordinary least squares applied to the transformed data

$$\begin{bmatrix} \hat{\beta} \\ \hat{\gamma}_1 \end{bmatrix} = (\sum_{t=1}^{T} Z_t^* Z_t^{*'})^{-1} \sum_{t=1}^{T} Z_t^* y_t^* \tag{9}$$

where $Z_t^* = (Z_t^{*'}, D_{1t}^{*'})'$.

Park shows that the CCR transformations asymptotically eliminate the endogeneity caused by the long run correlation of the cointegrating equation errors and the stochastic regressors innovations, and simultaneously correct for asymptotic bias resulting from the contemporaneous correlation between the regression and stochastic regressor errors. Estimates based on the CCR are therefore fully efficient and have unbiased, mixture normal asymptotic.

5. Estimation and interpretation of the results

As independent and dependent variables are time series variables we should test them for stationarity. As it can be seen from the Table 2 Based on the ADF unit root test all

the variables are stationary at first difference, they are I(1) processes. Table 2 below reports the ADF test results.

Table 2. The ADF test results

Variable	Panel A: At the level		Panel B: At the first difference		Conclusion
	k	Actual value	k	Actual value	
eno	0	-2.163508	0	-4.129053**	I(1)
etc	0	-3.101535	1	-6.261541***	I(1)
entc	0	-2.050384	0	-4.093221**	I(1)

Notes: Maximum lag order is set to two and optimal lag order (k) is selected based on Schwarz criterion; *, ** and *** indicate statistical significance at the 1%, 5% and 10% significance levels respectively; The critical values are taken from MacKinnon (1996). Estimation period: 1995-2015.

As the results showed all variables are I(1), therefore we can move to the testing for cointegration. Table 3 gives results of the Park's cointegration test – Park added variables. Here we added linear and quadratic trends, and as it known "0" hypothesis of this test is: series are cointegrated. Based on the p-values of the test statistics we conclude that the series are cointegrated.

Table 3. Results of the Park's Cointegration test

	Value	df	Probability
Chi-square	4.003017	2	0.1351

Since there is a long-run relationship among the variables we can run the model which relates them. The results of the estimated model employing CCR procedure are given in the Table 4.

Table 4. The results of Canonical Cointegration Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
entc	0.762155	0.013361	57.04352	0.0000
etc	0.392216	0.055030	7.127345	0.0000
c	-0.682534	0.723715	-0.943098	0.3597

Notes: Dependent variable is *eno.* Estimation period: 1995-2015.

As it can be seen from the Table 4 both of the variables has the positive sign which is in line with the expected ones. The coefficients are statistically significant at 1% significance level. It is worth to note that the estimated model's residuals satisfy main

Qauss-Markow assumptions, namely no perfect multicollinearity, no heteroscedasticity, no serial correlation, correct specification and normality assumptions. The results of the tests are not given here but can be obtained under the request.

The variables are in log form, hence, they are elasticity. According to the results of the model 1% rise in growth rate of non-traditional commodity groups export in non-oil sector increases total growth rate of non-oil export to 0.76%, while 1% rise in growth rate of traditional commodity groups export in non-oil sector increases total growth rate of non-oil export to 0.39%.

6. Conclusion and policy suggestions

It is known from the results of carried out investigations that non-oil export sectors have shared significant part of the non-oil export of Azerbaijan in 1995-2015. This in its turn expresses prevalence of the vertical diversification in export sector. But it is known that the level of the vertical diversification shows its quality creating additional value in superior development of the scientific and technological capacious areas and in the production as well. From this point if we pay attention, we can see that, although we have horizontal diversification in our country it shows itself too weak. In the background of the fast raise of oil revenues of Azerbaijan, especially after the launch of the Baku-Tbilisi-Ceyhan oil pipeline from 2006, the achieving development in non-traditional areas of non-oil sector was able to increase the level of vertical diversification rapidly. On the other hand, the non-oil export in the comparison with oil export is too little. Therefore, the involvement of local and foreign investments on non-oil should take durable character, state support for ownership must be in high-level, together with non-traditional areas, and the process of horizontal diversification should be expanded in traditional areas as well, new relationships should be formed with export partner countries, the problems in the access of local companies to the international market should be investigated and eliminated and economical activities like this should be implemented. In the final count of carried out analyses it is expedient to offer following suggestions:

1. In the account of not considering oil production as permanent field of high quantity the domination of oil-gas sector in the area of economy can slow down diversification process. Moreover, if to take into account the case of oil as being exhausted richness the significance of diversification of non-oil export is essential.

2. To go into the question of diversification of non-oil sector in Azerbaijan, first of all it is advisable to preference to the vertical diversification and in the next step to the horizontal diversification.

3. The stimulation of export of the science and technology involved industrial products in non-traditional export can be considerable as appropriate economic activity.

Supplying the extension of the fertility by engaging new technologies to the traditional export areas is important as well.

4.   The stimulation of manufacturing and exporting in the sector cotton-growing that is traditional export area seems expedient.

5.   In the direction of improving the rise of the non-oil GDP in non-oil sector should be given an importance to the production and export of commodity groups representing vertical diversification. On that score the case of Malaysia can be looked through.

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