THE JOURNAL OF ECONOMIC SCIENCES: THEORY AND PRACTICE

Scientific, Refereed, Biannual

Year: 21, Volume 72, #2/ 2015 ISSN 2220-8739

Contents

Actor-Augmented J-Curve…….....…..….M.R. Jamilov, R.M.Jamilov....4-23

Economy Agriculture Countries: Myanmar……..……...Y.V. Aleskerova....24-31

Economic Diversification Policy in Context of Azerbaijan's Accession to the WTO.....….....….V.Bayramov....32-42

The adaptation of the local private sector to the international standards' requirements…….…….....…. Z.Y.Aslanov, S.M. Abdullayeva....43-53

Model of a evaluation of an innovative capital of the subjects on the basis.....
…….....…...A.Huseynova, O.Mazanova....54-70

Influence of oil prices on innovation in renewable energy sector…….....
…….E.E.Gasimzade....71-84

The rise of New Institutional Economics and assessment its contributions to the Post Washington Consensus…….....B.N.Babayev....85-95

www.ecosciences.edu.az

THE JOURNAL OF ECONOMIC SCIENCES: THEORY AND PRACTICE	
Scientific, Refereed, Biannual	
Azerbaijan State University of Economics	
Year: 21, Volume 72, July – December 2015	
www.ecosciences.edu.az	**ISSN 2220-8739**
Publisher:	**Azerbaijan State University of Economics**
Editor-in-chief:	**prof., Dr. A.J.Muradov**
Editor:	**prof., Dr.A.I.Bayramov**
	a.bayramov@aseu.az
Managing Editor:	**associate prof., PhD, N.O.Hajiyev** **n.hajiyev@unec.edu.az; nazimxx@yahoo.com**
Title of Journal:	**The Journal of Economic Sciences: theory and practice**
Type of Journal:	**Periodical**
Time Period and Language:	**Biannual, English**
Directorial Address:	**AZ 1001, Baku, Azerbaijan Republic, Istiglaliyyat st. 6, room 414,** **Tel: (+994 12) 4926817; 4926411** **Fax: (+994) 4 92 59 40**
Printing House:	**AZ 1001, Baku, Azerbaijan Republic, Istiglaliyyat st. 6, room 30,** **Tel: (+994 12) 4925337; Fax: (+994 12) 4926509**
Place and Date of Print:	**Baku, Azerbaijan, 29.12.2015**
Abstracting-Indexing:	**Database of EBSCO, EconLit, SCOPUS, Turkish Education Index**

THE JOURNAL OF ECONOMIC SCIENCES: THEORY AND PRACTICE, V.72, # 2, 2015, pp. 4-23

FACTOR-AUGMENTED J-CURVE

Mahammad R. Jamilov
Ph.D., Azerbaijan State University of Economics (UNEC)

Rustam M. Jamilov
Ph.D., London Business School. Corresponding author. We are grateful to Mohsen Bahmani-Oskooee for providing the trade balance data. Opinion presented in this paper belongs solely to the authors and does not necessarily reflect the viewpoints of UNEC or LBS

Received 16 July 2015; accepted 16 December 2015; published online 29 December 2015

Abstract

We introduce the notion of the factor-augmented J-curve which substantially improves the presentation of and the intuition behind industrial J-curve analysis. Explorative factor analysis is performed on a large number of bilateral industry-level trade balances, and a small number of common factors is extracted. An Auto-Regressive Distributed (ARDL) model is then estimated for the bilateral exchange rate and the scores of the extracted factors. The new strategy is tested on a dataset of US-China bilateral trade over the 1981-2006 period. Factor analysis reduces the parameter dimension from 59 industries to 9 composite factors, to which we arbitrarily assign intuitive labels. Estimation of the trade balance model via ARDL reveals that for 3 factors, namely Total Trade, Heavy Metals and Organic Chemical Industries, and Agriculture and Non-Organic Chemical Industries, the trade balance improves in the long run following a depreciation in the exchange rate. Evidence for the presence of the J-curve effect in the short run is also found. According to the CUSUM and CUSUMSQ tests for parameter stability our results are stable and policy implications are robust. This analysis carries policy implications and is replicable for any bilateral trade dataset.

Keywords: J-curve; Marshall-Lerner Condition; Factor Analysis; ARDL Regression
JEL Codes: C38, F14, F31

Introduction

The methodological journey of the J-curve stream of literature has been long and extensive. The nexus between trade balance performance and exchange rate

management has remained a focal point of interest for empirical trade scholars during the past three decades. The theoretical foundations originate in Magee (1973) and Dornbusch and Krugman (1976), who postulated that a cheaper currency should carry a positive net impact on the balance of trade. The empirical complexity arises in the dynamic of simultaneous reactions of both exports and imports to an exogenous currency devaluation shock. It is generally expected that in the short run a devalued currency will be more flexible and trigger a decline in the value of exports and a rise in imports, due to the so-called "price effect". However, in the long run the selling power of exporters (because of the cheaper currency) increases, exportation expands, and eventually overpowers the rise in imports via the "quantity effect". If the volume effect dominates the price effect, or in other words – the long-run elasticity of the trade balance in response to the exchange rate shock is larger than unity – then we observe the so-called Marshall-Lerner condition. If plotted over time, the dynamic of the balance of trade will resemble the letter "J", leading to the now famous J-curve effect.

Bahmani-Oskooee (1985) provides a pioneering empirical investigation of the J-curve phenomenon using aggregated data [Some other examples of the aggregated approach include Narayan (2004), Halicioglu (2007), and Hsing (2008)]. The presumably infective aggregation bias, present in all aggregated approaches to the question, is solved in Rose and Yellen (1989), who proposed to treat the matter with disaggregated, country-specific bilateral trade balance data [Some of the papers belonging to the bilateral approach are Bahmani-Oskooee and Brooks (1999), Bahmani-Oskooee et al. (2006), Halicioglu (2008), Bahmani-Oskooee and Kutan (2009), Perera (2011), and Jamilov (2013)] . Starting from Ardalani and Bahmani-Oskooee (2007), however, literature has glided towards *further* disaggregation, now to the level of industry-specific balance of trade parameters [The industrial approach includes such titles as Bahmani-Oskooee and Wang (2008), Bahmani-Oskooee and Hajilee (2009), Bahmani-Oskooee and Hegerty (2009), Bahmani-Oskooee and Mitra (2009), Soleymani and Saboori (2012), Bahmani-Oskooee et al. (2013)]. Despite the plethora of empirical attacks at the J-curve question, results are still substantially heterogeneous across regions, time periods, and individual industries. A more thorough review of the J-curve literature is provided by Bahmani-Oskooee and Ratha (2004).

In spite of some mechanical precision of working with highly disaggregated data series, the industry-level J-curve studies are still not entirely intuitive, are often very spacious, and the results are rarely illustrative for policy purposes. First, contemporary industry-level studies fail to explicitly account for mutual commonality of the industries examined, neglecting the confounding factor of mutual dependency and

interconnectedness. In reality, however, it is very easy to see how such industries as, for example, "Metal plates", "Aluminum" and "Heavy Construction Materials" should possess some underlying common factor. It is possible that a single currency shock could carry a direct effect on the invisible *common factor*, which in turn indirectly initiates a subsequent chain reaction on the industries themselves.

Second, final results and baseline conclusions in most industry-level studies lack economic intuition and concrete policy relevance. Most papers conclude their respective analyses by claiming that, for example, 150 out of the 400 examined industries fulfill the M-L criteria in the long run or follow the J-curve pattern in the short run. However, the natural practical question to ask is: so what? Should the quantity 150 be considered as a positive or negative outcome? Does there exist some optimal ratio of criteria-fulfilling industries for a given economy? It is challenging to answer these follow-up questions if the number of industries gets sufficiently large, which is often the case in bilateral J-curve studies on large industrialized economies. It is even more challenging to convey a concise policy-relevant message when the referenced block of results counts hundreds of coefficient parameters, spacious and unfriendly for the most meticulous academic economists, let alone hasty and occupied policy-makers.

The answer to all of the issues raised and discussed above is the factor-augmented approach to J-curve estimation (FA-J). First, the FA-J method allows us to extract a small number of common factors from a large volume of industries, thus explicitly accounting for industrial commonalities and cross-correlation. Second, the large number of initial industries gets reduced to a more comprehensible number of common factors (in this paper, the reduction procedure transforms 59 industries into 9 factors). Third, intuition and policy-friendliness is greatly enhanced since authors can arbitrarily label the resulting 9 factors based on the observed factor loadings (the measure which shows how much each industry gets explained by at least one of the 9 factors). Finally, the test for the J-curve effect (positive long-run elasticity of the balance of trade, to be more precise), is a simple regression of the bilateral exchange rate on the obtained common factors. If the coefficient of impact is positive and significant, then the exchange rate devaluation will improve the bilateral balance of trade for this *particular* factor. If necessary, we return to the table with factor loadings and look at the industries which are most affected by our factor of interest.

Overall, we believe that this paper can at the very least provide a useful methodological alternative for policy-targeted empirical studies of the J-curve effect.

On the upper side, this study can open up a new stream of literature in this field, with a methodological framework to be followed and expanded upon in future studies. The remaining of this paper is structured as follows: Section 2 lays out the empirical strategy and describes the dataset. Section 3 reports the estimation results. Finally, Section 4 concludes.

1. Methodology and Data

Our empirical strategy consists of two fundamental components. First, we employ the rather conventional existing techniques of exploratory factor analysis [There are many good references on the general mechanics of factor analysis. Consult, for example, Vincent (1971) and Jae-on and Mueller (1978) for an excellent treatment of the subject. Hamilton (2006) is recommended for practical implementations on STATA]. Consider a generic function $Y = f(F_k(p))$, where F_k are unobserved random variables and p is a set of observable random variables x_p with means μ_p. Applying the generic formula to our study, the dependent variable becomes the bilateral exchange rate, p – the industry-specific trade balance volumes, and F_k – the unobserved common factors. The relationship between Y and p is indirect, with the factor matrix being the intermediary step. Our dimension reduction technique (factor analysis) will reduce the matrix p to F, thus bridging the association gap.

Further, suppose that for some unknown parameters a_{ij} and the unobserved variables F_j, with $i \in 1, \dots p$ and $j \in 1, \dots k$, and for every $k < p$, we impose:

$$x_i - \mu_i = a_{i1}F_1 + \cdots + a_{ik}F_k + \varepsilon_i \qquad (1)$$

Where ε_i are the error terms with zero mean, $E(\varepsilon) = 0$, and finite but heteroskedastic variance. The variance of ε_i is set at σ_i and is defined as:

$$\sigma(\varepsilon_i) = D_{i,j}(\sigma_1, \dots, \sigma_p) = \sigma \qquad (2)$$

Where $D_{i,i}$ is a diagonal matrix with all entries outside the main diagonal

$$x - \mu = A * F + \varepsilon \qquad (3)$$

Where capital A is the matrix of the of the unobserved coefficients a_{ij}.

Now, we assume that we have n observations so that the dimensions of the matrix components can be represented as x_{p*n}, A_{p*k}, and F_{n*k}. Matrix A is static across all cases, while columns x and F are observation-specific. We impose three binding

assumptions on the behavior of the parameter F in (3). First, the factorial zero-conditional mean rule, i.e. $cov(F, \varepsilon) = 0$. Second, the static zero mean assumption: $E(F) = 0$. Finally, zero correlation across the factor parameters F_k: $cov(F) = I$. Under the established constraints on F, component A is the factor loading matrix while the solution to (3) is the dimension-reduced factor.

The factor analysis procedure will produce a set of result tables, from which the primary ones we will now briefly discuss one by one. First, the communalities matrix, which will not be reported to preserve space, produces the coefficients of across-industrial correlation. It is believed that any post-extraction communality coefficient of above 0.8 can be considered as solid and sufficient. The so-called Kaiser method of sampling adequacy will also be presented as part of our factor analysis exploration stage. The adequacy test shows if our sample is suitable for the factor analysis approach in the first place. Any Kaiser adequacy coefficient of above 0.7 indicates a positive response.

Following the preliminary assessment, the principal components method with correlation matrices is chosen as the method of factor extraction. We extract only the factors with an eigenvalue greater than unity, which is a standard rule in literature. This shows that the percentage of variation in our parameters is better explained *after* the factor is introduced; if the eigenvalue is smaller than unity then the model is better off without dimension reduction. The maximum number of iterations is set at 1000, after which the procedure selects the optimal quantity of common factors (in our case, for example, 9 underlying factors were established). In theory, it is possible to parsimoniously select the number of factors by the author himself and force the procedure to load the observables on the imposed quantity of unobservable factors. However, we leave such experimentations for future research and resort to the rule-based selection procedure for now.

After obtaining the first baseline results, it is recommended to perform a rotation on the parameter matrix. We rotate the factor solution with the *oblique varimax* rotation method with Kaiser normalization. Matrix rotations straighten and improve factor loadings for interpretation purposes as well as for more precise arbitrary labeling. Oblique rotation is designed specifically for potentially cross-correlated variables, which is indeed the case in our model (under our assumption that industries are interconnected). Again, 1000 rounds of iterations was chosen as the maximum for

rotation convergence. The rotation matrix will report the important values of factor loadings of each industry on each of the previously extracted factors. We will suppress small factor score coefficients of below 0.1 in both the baseline and the rotated matrices. This allows us to focus our vision on the bigger coefficients, which correspond to better loadings on our extracted factors. Coefficient suppression is a rather common procedure in factor analysis literature. Finally, we save the rotated score matrix as a group of 9 separated series (in our case, it is the "factorial trade balances").

The second stage of our estimation strategy employs the Auto-Regressive Distributed Lag model approach to cointegration, which is best described in Pesaran et al. (2001). The ARDL methodology is beneficial on several levels and primarily because it allows us to estimate both the short-run effects and the long-run cointegrating equation estimates of a given model. In addition, this method solves the problem of variable endogeneity and the inability to test hypotheses on the estimated coefficient. Narayan (2005) claims that the performance of the ARDL-based bounds testing approach in small samples is superior to that of multivariate cointegration, a claim which is particularly useful for our case due to our small sample sizes. Moreover, ARDL regressions do not require the variables in the model to be non-stationary in level forms; ARDL works regardless of whether there exists a unit root in the regressors or not. However, we will still perform and present results from the Augmented Dickey-Fuller test (Dickey and Fuller, 1979; 1981). It is important to ensure that variables are stationary at least in first differences, since I(2) processes will not work with the ARDL framework.

We can now set up a very simple single-equation trade balance model in its ARDL form:

$$TB_{F,t} = \alpha_0 + \sum_{j=1}^{m} \alpha_{1F} \Delta \ln TB_{F,t-j} + \sum_{j=0}^{m} \alpha_{2F} \Delta \ln EXR_{t-j} + \alpha_3 TB_{F,t-1} + \alpha_8 \ln EXR_{F,t-1} + \nu_t \quad (4)$$

Where TB, EXR stand for the trade balance and the bilateral exchange rate parameters, respectively. Trade balance is defined as the ratio of exports to imports; the exchange rate is the ln-transformed USD/YUAN bilateral exchange rate. α_0, α_{2i} are the constant and the elasticity estimates, respectively. ν_t is the stochastic component. Small-cased F, t, m refer to the factor, time, and lag-length indexes,

respectively. Essentially, we regress each of the 9 factorial trade balances on the exchange rate variable, thus running 9 distinct ARDL regressions. A positive coefficient α_{2F} signals an improvement of the trade balance in response to devaluation for a particular factor, confirming the Marshall-Lerner hypothesis.

We can proceed with testing for long-run cointegration. The bounds testing approach presented in Pesaran et al. (2001) achieves this by presenting an F-statistic which tests the null hypothesis of no cointegration (H_0: $\alpha_5=\alpha_6=\alpha_7=\alpha_8=0$) against the alternative hypothesis (H_1: $\alpha_5\neq0$, $\alpha_6\neq0$, $\alpha_7\neq0$, $\alpha_8\neq0$). For every significance level there are two sets of critical values. If the F-statistic exceeds the upper-bound critical value, then the null hypothesis is rejected. If the F-statistic is below the lower-bound, then the null is accepted and we have no cointegration. Finally, if the F-statistic is between the two bounds then the test has no conclusive result. There is another way of testing for cointegration, which is looking at the error correction term in the ARDL's short-run representation via an error correction model (Kremers et al., 1992). If the error correction term is statistically significant and negative, it implies that the variables are quick on approaching their long-run stabilizing conditions.

The general form of the error correction model, which we need in order to review the short-run dynamics of the balance of trade model, is presented below:

$$TB_{F,t} = \alpha_0 + \sum_{j=1}^{m} \alpha_{1i} \Delta TB_{F,t-j} + \sum_{j=0}^{m} \alpha_{2i} \Delta \ln EXR_{t-j} + \lambda EC_{t-1} + u_t \qquad (5)$$

where λ is the coefficient of the speed of adjustment to long-run equilibrium and EC is the residuals obtained from the estimation of (4). We will therefore be able to simultaneously check on the long-run and the short-run behavior of our model. Should the lagged parameters $\Delta \ln EXR_{t-j}$ be negative and statistically significant, then we can argue for the fulfillment of the J-curve condition. In the end, after performing the tests for cointegration, presenting the long-run and the short-estimates of our factor-augmented trade balance model, we will present the stability checks of Brown et al. (1975), which are mostly known as cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests of the recursive regression residuals. Stability of the regression coefficients is proven if the plot of

the statistics falls within the 5% significance bounds. Evidence of robustness of our parameters will provide more relevance to our implications and conclusions.

The balance of trade dataset has been obtained from Mohsen Bahmani-Oskooee upon request. The exchange rate is taken from IMF's International and Financial Statistics. This paper will analyze bilateral industry-level trade balances between United States and China for the 1981-2006 period. All variables are in annual frequency. Here, "China" includes within itself the mainland China as well as Honk Kong, Taiwan, and Vietnam. 59 industries in total are analyzed. The sample has been cleaned from all missing variables, thus enabling the principle components procedure. The U.S. is taken as the "home country", and trade balance is defined as the ratio of exports from U.S. to China to Chinese imports to the U.S. We take the logarithmic transform of the exports/imports ratio for interpretation purposes. The bilateral exchange rate is in the USD/YUAN form. Under such specification, an increase in the variable constitutes an exogenous devaluation of the Dollar with respect to the Renminbi and should, in theory, be positively correlated with the trade balance improvement. The dataset was cleaned from missing values, which would otherwise deem the principal components-based factor analysis procedure impossible. If any missing values still remained in the reduced 1981-2006 period for 59 industries, we substituted them with the across-period series average, which is a normal procedure in statistical economics.

2. Empirical Results

We now begin to report our empirical results from the factor analysis stage. Table 1 presents the measurements of sampling adequacy as part of the required preliminary sample assessment. The total sample's Kaiser MSA is 0.71, which is above the traditionally accepted threshold of 0.7. This suggests that our sample of 59 industries fits into the factor analysis frame with a sufficient potential for discovering the underlying common factors. We can now proceed to the determination of the optimal quantity of the factors.

Table 2 presents the composition of the parameter variance explained by each of the 59 industrial components in our sample. Note that based on the selection rule of eigenvalues being strictly larger than unity, the optimal number of common factors is 9. Together, these 9 factors are able to explain up to 92% of the cumulative variation in our sample variables. In order to even out the explanatory power differential between the first factor, which accounts for 52% of the explained variance, and the

remaining factors, we rotate our industry matrix using the oblique varimax method and obtain the rotated sums of the squared loadings. We highlight that the total variance explained by the 9 factors remains unchanged, but the first factor's role has declined by 10%, thus raising the relevance of the other factors. Which is precisely what we wanted. We now investigate each industry's loading score on each of the 9 extracted factors in order to deduce their most intuitive labeling.

We will only report the factor loading estimates for the *rotated* matrix case, since this is more correct both for the technical and the intuitive reasons outlined earlier in the paper. Table 3 reports the rotated matrix's factor scores for each industry. Under the oblique varimax rotation and the principal components method of extraction, matrix rotation convergence was achieved after only 28 iterations. We first note that factor belongingness is not restrictive, meaning that certain industries can load on more than just one factor with equal degrees of score strength. We can also clearly notice that the first factor is loaded on by almost all industries, whereas factor 9 is the least responsive. Intermediary factors are all moderately influential. We are sticking to the eigenvalue selection rule and will not act by discretion and drop any of the least powerful factors, although such decision would have been justified.

Based on the factor score matrix we will now assign arbitrary factor-specific labels and thus complete the dimension reduction procedure (Table 4). Given the universal loading of basically every industry on factor 1, we label it simply as the "All Industries" factor. Careful scrutiny of the rotated factor scores have led us to assign the following names to the remaining 8 factors: "Non-Heavy Industries", "Communication and Utilities", "Textiles and Light Equipment", "Machinery, Vehicles, and Related Tools", "Heavy Metals and Inorganic Chemicals", "Storage and Infrastructure", "Agriculture and Organic Chemicals", and "Mineral and Quarrying Goods". We emphasize that in no way are our labels final and undisputable. It may well be that an attentive reader or future studies would detect an even better and more intuitive labeling strategy. However, this is the best we can offer, and we believe that the labels are broad and yet specific enough for implications and conclusions. We therefore save our extracted 9 factors as separate series and use them for the purpose of our balance of trade regression.

We continue the representation of results with the second and final phase of our empirical strategy: an ARDL analysis of the effect of exchange rate shocks on the common factors. Although the method does not require it, we still report the unit root test results in Table 5. Some of the variables possess a unit root, while all of the

variables are stationary in first-differences. In general, this is not existential for the purposes of ARDL modeling, as explained earlier in the paper. Nevertheless, this would have produced a spurious regression problem had we resorted to simple OLS techniques. We now run 9 ARDL regressions using the factorial balance of trade parameters as our dependents and the exchange rate as the main covariate.

Table 6 presents the preliminaries for the bounds-testing procedure. The F-statistic is statistically significant for 6 of the 9 cases, suggesting that in for those regressions long-run cointegration is achieved. For the case of the final factor – Mineral and Quarrying Goods – the F-stat is insignificant but the error correction term is both negative and significant. We can therefore conclude that cointegration is established for this 7^{th} factor as well. The average value of the error correction term is 0.7, suggesting that, on average, an exchange rate shock gets transmitted to the exports-imports relationship within 8 months. In other words, less than one calendar year is required for a devaluation to affect the balance of trade dynamic. The high, considering our small sample size and one single covariate, coefficients of determination – R-squared – simply imply that exchange rate works well as an explanatory variably of the total variation in egression outcomes. The lag order has been chosen according to the Schwarz-Bayesian criterion (SBC). In rare cases when the SBC suggested zero lags for the exchange rate, we forced one lag for reasons of short-run analysis.

Table 7 reports the main results of this paper. Three of the nine factors suggest the fulfillment of the Marshall-Lerner condition: the long-run elasticity of the exports-imports ratio in response to an exchange rate shock is positive and significant. For other factors, the impact is not significant at acceptable levels. Estimates of the lagged exchange rate variable are negative for almost all cases, and statistically significant for the 3 factors for which the Marshall-Lerner condition holds. This points at the presence of the J-curve effect: the collapse of the trade balance ratio in the short run due to the price effect and the volume-driven expansion in the long-run. All in all, negative values for the lagged exchange rate estimate and positive long-run elasticity estimates for factors 1, 6, and 8 suggest that both the M-L condition and the J-curve effect hold true for “All Industries”, “Heavy Metals and Inorganic Chemicals”, “Agriculture and Organic Chemicals” factors.

Note that the M-L and the J-curve hypotheses are supported for the trade sector as a whole since the factor “All Industries”, representing all 59 industries in the sample, improves following a dollar depreciation. As far as disaggregated factors

are concerned, our results suggest that an exchange rate devaluation would trigger an improvement in the balance of trade for such spheres as heavy metals, organic and inorganic chemicals, and the agricultural industries. These sectors are composites, i.e. consisting of a number of interconnected smaller industries. The interested reader can return to Table 3 to revise which industry loads stronger on Factors 6 and 8. For policy purposes, it is enough to refer to the two composite factors to convey a clear and concise message on which sectors of the domestic economy would most positively respond to a potential exchange rate devaluation.

We complete the representation of results with the CUSUM and CUSUMSQ tests for parameter stability in Figures 1 and 2. To preserve space, we report the illustrations for the case of Factor 6 ("Heavy Metals and Inorganic Chemicals)" only. Remaining graphs are available upon request. Note that policy implications for this particular factor are even stronger, since the short-run (J-curve) and long-run dynamic (M-L condition) are found to be recursively stable.

3. Conclusion and Advice for Future Research

This paper has introduced an innovative way on how to empirically investigate the J-curve hypothesis and the Marshall-Lerner condition. Exploratory factor analysis has been employed for the first time in this stream literature, and the posterior regression analysis establishes the trade balance-exchange rate nexus. We have applied the procedure to the bilateral industry-level trade between the United States and China. We have successfully compressed a large dataset of 59 industries into just 9 composite common factors. All assessment tests pass the necessary requirements. ARDL regressions reveal that for 3 of the 9 factors an exchange rate devaluation triggers a positive long-run response in the factorial balance of trade. Moreover, the J-curve effect is observed in the short run. The superiority of this paper's approach is that final results carry intuitive and clear policy implications, are not excessively spacious, and account for any underlying across-industry commonalities.

Future studies have great room for maneuvering and improvement on this paper's methodology. First, a factor-augmented approach could be applied to a variety of regions and time periods, in order to improve interpretation of the existing industry-level studies. Second, this paper has focused primarily on the eigenvalue-based rule of factor extraction. Future attempts can experiment with confirmative factor analysis, i.e. imposing a concrete amount of factors. Third, the factor-augmented approach is useful for testing the workability of an existing hypothesis. For example, we theorize that there

exist only 4 major clusters of industries which differ in terms of factor intensiveness: labor, capital, technology, and land oriented sectors. In the factor analysis stage we order the procedure to extract 4 common factors out of the set of N industries, and then examine the factor-specific loadings of each industry. If we observe that the industries which are supposedly labor-intensive (such as textile or clothing manufacturing, for example) do indeed load highly on one of the factors, and if a similar situation holds with the remaining factors, then we can argue that the theory is not only positive but also normative. Finally, while this paper's main contribution is in the introduction of the *factor analysis* approach, future studies should enhance the empirical strategy with further state-of-the-art regressions, such as the Dynamic OLS (DOLS), Two-State Least-Squares (2SLS), Cointegrated time-series, Vector Autoregressions (VAR), etc. The new frontier is there for the taking.

References

[1] Ardalani, Z., Bahmani-Oskooee, M. (2007), "Is there a J-Curve at the Industry Level?" *Economics Bulletin*, Vol. 6, No. 26 pp. 1-12.

[2] Bahmani-Oskooee, M, (1985). "Devaluation and the J-Curve: Some Evidence from LDCs," *The Review of Economics and Statistics*, 67(3), 500-504.

[3] Bahmani-Oskooee, M. and Brooks T. J. (1999), "Bilateral J–Curve between US and her Trading Partners," *Weltwirtschaftliches Archiv* 135: 156–165.

[4] Bahmani-Oskooee, M., Ratha, M. (2004), "The J-curve dynamics of US bilateral trade," *Journal of Economics and Finance* 28, 32–38

[5] Bahmani-Oskooee, M., Economidou, C., and Goswami, G. G. (2006), "Bilateral J-curve between the UK vis-à-vis her major trading partners," *Applied Economics* 38, 879-888.

[6] Bahmani-Oskooee, M and Kutan, A. M. (2009), "The J-curve in the Emerging Economies of Eastern Europe," *Applied Economics* 41, pp. 2523-2532.

[7] Bahmani-Oskooee, M. and Wang, Y. (2008), "The J-curve: Evidence from Commodity Trade between US and China," *Applied Economics*, 40: 2735-2747.

[8] Bahmani-Oskooee, M. and Hajilee, M. (2009), "The J-curve at Industry Level: Evidence from Sweden-US Trade," *Economic Systems*, 33: 83-92.

[9] Bahmani-Oskooee, M. and Hegerty, S.W. (2009), "The Japanese-US Trade Balance and the yen: Evidence from Industry Data," *Japan and World Economy*, 21: 161-171.

[10] Bahmani-Oskooee, M., Mitra, R. (2009), "The J-Curve at the industry level: evidence from U.S.-India trade ", *Economics Bulletin*, Vol. 29 no.2 pp. 1520-1529.

[11] Bahmani-Oskooee, M., Huseynov, S., Jamilov R. (2013), "Is there a J-Curve for Azerbaijan? New Evidence from Industry-Level Data," Unpublished Monograph.

[12] Brown, R. L., Durbin, J. and Evans, J.M. (1975) Techniques for testing the constancy of regression relations over time, *Journal of the Royal Statistical Society*, 37, 149-163

[13] Dickey, D.A., Bell, W.R., Miller, R.B., (1986). "Unit Roots in time series models: tests and implications", *American Statistician* 40, 12-26.

[14] Dornbusch, R., Krugman, P. (1976), "Flexible Exchange Rates in the Short Run," *Brookings Papers of Economic Act*ivity 3, 537-584.

[15] Hamilton, L., "Statistics with STATA", Thomson Books Publishing.

[16 Halicioglu, F. (2007), "The J-curve Dynamics of Turkish Bilateral Trade: A Cointegration Approach", *Journal of Economic Studies* 34, 103-119.

[17] Halicioglu, F. (2008) "The Bilateral J-curve: Turkey versus her 13 Trading Partners," *Journal of Asian Economics* 19, 236-243.

[18] Hsing, Y. (2008), "A Study of the J-curve for Seven Selected Latin American Countries", *Global Economy Journal*, 8: Article 6.

[19] Jae-on, K., Mueller, C.W. (1978), |Factor Analysis. Statistical Methods and Practical Issues", Sage Publications.

[20] Jamilov, R., (2013), "J-curve Dynamics and the Marshall-Lerner Condition: Evidence from Azerbaijan", *Transition Studies Review* 19, 313-323.

[21] Kremers, J. J. M., Ericson, N. R. and Dolado, J. J. (1992) "The power of cointegration tests," *Oxford Bulletin of Economics and Statistics*, 54, 325-348.

[22] Magee, S. P. (1973) Currency contracts, pass through, and devaluation, *Brookings Papers of Economic Activity*, 1, 303-325.

[23] Narayan, P. K. (2004) "New Zealand's Trade Balance: Evidence from the J-curve and Granger Causality," *Applied Economics Letters* 11, 351-354.

[24] Perera, W. (2011) "Bilateral J-curve between Sri Lanka and its major trading partners", Central Bank of Sri Lanka Staff Studies, North America, 39.

[25] Pesaran, M. H., Shin, Y. and Smith, R. J. (2001), "Bounds Testing Approaches to the Analysis of Level Relationship," *Journal of Applied Econometrics*, 16: 289–326.

[26] Rose, A.K., Yellen, J.L. (1989) "Is there a J-curve?" *Journal of Monetary Economics* 24, 53–68.

[27] Soleymani, A., Saboori B. (2012), "The J-curve: Evidence from Commodity Trade Between Malaysia and Japan", *International Journal of Applied Economics and Finance* 6 (2): 64-73.

[28] Vincent, J. (1971), "Factor Analysis in International Relations. Interpretation, Problem Areas and Application", University of Florida Press, Gainsville.

Table 1: Sample Adequacy Testing

	MSA		MSA
Alcoholic beverages	0.84	**Telecommunications apparatus**	0.62
Household equipment	0.56	**Machines for special industries**	0.82
Manufactures of metal	0.67	**Clothing except fur clothing**	0.38
Textile and leather machinery	0.81	**Tubes ,pipes and fittings of iron**	0.81
Furniture	0.74	**Metalworking machinery**	0.69
Musical instruments	0.57	**Iron and steel scrap**	0.75
Articles of paper & paperboard	0.83	**Synthetic goods**	0.86
Domestic electrical equipment	0.77	**Leather**	0.57
Other inorganic chemicals	0.64	**Equipment for electricity**	0.71
Sanitary, plumbing, heating	0.81	**Other electrical machinery**	0.74
Glass	0.83	**Printed matter**	0.76
Articles of artificial plastic mate	0.90	**Office machines**	0.71
Paper and paperboard	0.63	**Petroleum products**	0.72
Agricultural machinery	0.41	**Chemical materials and products**	0.46
Manufactured articles	0.62	**Plastic materials**	0.81
Veneers, plywood boards	0.74	**Pulp & waste paper**	0.79
Power generating machinery	0.68	**Inorg. chemicals**	0.42
Articles of rubber	0.76	**Wood manufactures**	0.81
Electric power machinery	0.76	**Organic chemicals**	0.78
Soaps, cleansing polishing tools	0.66	**Pigments, paints, varnishes**	0.62
Aircraft	0.71	**Ships and boats**	0.86
Watches and clocks	0.65	**Hand Tools**	0.69
Crude vegetable materials	0.41	**Aluminium**	0.71
Pharmaceutical products	0.79	**Clay and refractory construction**	0.89
Special textile fabrics and related	0.44	**Universals, plates of iron**	0.82
Nails, screws, nuts, bolts	0.76	**Copper**	0.88
Developed cinematographic film	0.50	**Metal containers for storage**	0.79
Scientific, medical, optical tools	0.44	**Finished structural parts**	0.48
Machinery and appliances	0.21	**Road motor vehicles**	0.76
		Mineral manufacturing	0.70
Kaiser's MSA	0.7137		

Note: MSA stands for Measurement of Sampling Adequacy. Kaiser's total sample MSA of above 0.7 passes the test of sample appropriateness.

Table 2: Total Variance

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	30.48	51.67	51.67	24.30	41.19	41.19
2	9.09	15.41	67.09	8.89	15.06	56.25
3	3.90	6.61	73.70	8.12	13.76	70.02
4	3.40	5.76	79.47	3.34	5.66	75.69
5	2.25	3.82	83.29	2.77	4.69	80.39
6	1.94	3.29	86.58	2.35	3.99	84.38
7	1.30	2.21	88.80	1.75	2.97	87.35
8	1.22	2.07	90.87	1.73	2.93	90.28
9	1.15	1.95	92.82	1.49	2.53	92.82
10	.70	1.19	94.01			
11	.64	1.10	95.11			
12	.48	.82	95.94			
13	.45	.77	96.72			
14	.41	.70	97.42			
15	.29	.50	97.92			
16	.27	.46	98.39			
17	.24	.41	98.80			
18	.19	.32	99.13			
19	.13	.22	99.36			
20	.12	.21	99.57			
21	.08	.15	99.72			
22	.06	.10	99.82			
23	.05	.08	99.91			
24	.03	.05	99.97			
25	.01	.02	100.00			
26	1.287E-	2.182E-15	100.00			
…	1.087E-	1.842E-15	100.00			
59	-	-2.325E-15	100.00			

Note: Extraction method is Principal Component Analysis. Number of factors is determined by the Kaiser method. The extracted 9 factors explain up to 93% of the total variation of the industry values.

Table 3: Rotated Component Matrix

	Component								
Industry	1	2	3	4	5	6	7	8	9
Alcoholic beverages	.928	.115	-.231						
Household equipment	.921	-.107		.116					
Manufactures of metal	.918	.280							
Textile and leather machinery	-.906		-.327		.119				
Furniture	.900	.221	.175	.250				.138	
Musical instruments	.898	.325							.138
Articles of paper & paperboard	.897	.347			-.131			.170	
Domestic electrical equipment	.890	.229				.293			
Other inorganic chemicals	-.873			.220		.114	.214	.200	
Sanitary, plumbing, heating	.868	.150	.269	.106				.195	.235
Glass	.867	.375	-.192					.186	
Articles of artificial plastic mate	.861	.259	-.160	.113	-.198		.110	.159	.132
Paper and paperboard	-.854	-.467		-101					
Agricultural machinery	-.835	-.281	-.133			-105		-.292	.185
Manufactured articles	.807	.370		.241	-.113			.199	
Veneers, plywood boards	.804	.545						.140	
Power generating machinery	-.798		-.352	-291	.211				
Articles of rubber	.777	.337	.148	.428		.137			
Electric power machinery	.771	.548		.169			.180		
Soaps, cleansing polishing tools	.753	.405		.406	-.266				
Aircraft	-.746		-.396	-381	.165	.119			
Watches and clocks	.743	-.163	.411	-126			.176	-.164	
Crude vegetable materials	.741	.346	.409		-.115			.237	.124
Pharmaceutical products	.730	.424	.116		-.195		.165	.301	
Special textile fabrics	.730	.386		.320	.118	.157			
Nails, screws, nuts, bolts	.727	.338	.250	.225	-.150	.233		.212	-.267
Developed cinematographic film	-.712	-.378	.439		.102			-.145	
Scientific, medical, optical tools	.696	.631	.236	.182					

Machinery and appliances	.668	.657	-.118	.216		.101	.153		
Telecommunications apparatus	.653	.522	-.453						.175
Machines for special industries	-.637		.154	-178	.347		-241	-.468	.259
Clothing except fur clothing	.612	.575	-.319	.223	-.168		.230	.101	
Tubes ,pipes and fittings of iron	.595	.427			-.135	.525			
Metalworking machinery	.224	.919							
Iron and steel scrap	.349	.844	.169	.231		-170			.127
Synthetic goods	-.532	-.695	.241	.209	.223			-.133	.101
Leather	-.597	-.618	.325	-245		-105		-.220	
Equipment for electricity	.273	.568	-.520	-.446		.126			.122
Other electrical machinery			.974						
Printed matter		-.165	.922	-199			.173		
Office machines	.199	.115	.903	.173	-.127		.147		
Petroleum products		.304	-.703	.287		-120			-.380
Chemical materials	.410	-.485	.671	.189		.138	-209	.101	
Plastic materials	.225	-.240	.648	.544	-.154				.180
Pulp & waste paper	-.494	-.479	-.645		.115	.156	-113		
Inorg. chemicals	.339	.278	.606			.346	-208	.421	
Wood manufactures	.459	.556	-.603			-135			.238
Organic chemicals	.240	.287		.780		.268		.192	
Pigments, paints, varnishes	.523	.381	-.307	.605					
Ships and boats	-.283	-.131	-.257	.225	.814				
Hand Tools	.237		.519	-105	.715			-.269	
Aluminium			-.397	-400	.666		-407		
Clay and construction	.392	.394	-.189	.143	-.550	.478			
Universals, plates of iron	-.330	-.149	.180			.798	.162	.143	
Copper	.346	-.100	-.194	.198	-.266	.706		-.101	-.355
Metal containers for storage	.518				-.119	.176	.730	.119	.224
Finished structural parts	.332	-.173	-.348	-136	.122	-102	-657		.318
Road motor vehicles	-.585			-148	.262		-224	-.648	
Mineral manufacturing	.178	.556				-103			.702

Note: Extraction method is Principal Components Analysis. Rotation choice is oblique varimax with Kaiser normalization. Matrix rotation convergence achieved in 28 iterations. Factor loadings of below 0.1 have been suppressed.

Table 4: Factor Labeling

Factor	Factor Label	Cumulative Variance Explained, %
1	All Industries	51.67
2	Non-Heavy Industries	67.09
3	Communication and Utilities	73.70
4	Textiles and Light Equipment	79.47
5	Machinery, Vehicles, and Related Tools	83.29
6	Heavy Metals and Inorganic Chemicals	86.58
7	Storage and Infrastructure	88.80
8	Agriculture and Organic Chemicals	90.87
9	Mineral and Quarrying Goods	92.82

Note: Factor labels are put arbitrarily, based on the authors' analysis of the rotated component matrix.

Table 5: Unit Root Test Results

	Level		First-Differences	
	t-stat	P-value	t-stat	P-value
Exchange Rate	-1.97	0.59	-2.05	0.07*
All Industries	-2.65	0.26	-2.91	0.06*
Non-Heavy Industries	-5.23	0.00**	-3.95	0.01
Communication and Utilities	-0.67	0.96	-2.52	0.02**
Textiles and Light Equipment	-2.61	0.28	-7.86	0.00**
Machinery, Vehicles, and Related Tools	-3.59	0.05	-3.93	0.01**
Heavy Metals and Inorganic Chemicals	-4.20	0.02**	-6.19	0.00
Storage and Infrastructure	-4.38	0.01**	-5.42	0.00
Agriculture and Organic Chemicals	-3.56	0.06	-5.19	0.00**
Mineral and Quarrying Goods	-2.66	0.26	-3.66	0.01**

Note: Regressions in Level form include the Time Trend and the Intercept. Regressions in First-Differences include the Intercept only. 1 lag has been chosen in all cases. *,**- indicates rejection of the null hypothesis of unit root at the 10% and 5% levels, respectively.

Table 6: ARDL Cointegration Testing

	F-Stat	ECT	R-squared	Lag Order
All Industries	9.73**	-0.51**	0.54	1.2
Non-Heavy Industries	5.63*	-0.57**	0.36	1,0
Communication and Utilities	3.39	0.02	0.25	1,0
Textiles and Light Equipment	8.80**	-0.60**	0.48	1,0
Machinery, Vehicles, and Related Tools	14.85**	-1.76**	0.78	3,0
Heavy Metals and Inorganic Chemicals	9.05**	-0.81**	0.58	1,1
Storage and Infrastructure	7.73**	-0.90	0.46	1,1
Agriculture and Organic Chemicals	4.72	-0.59	0.31	1,0

Mineral and Quarrying Goods	3.96	-0.54**	0.29	1,0

Note: F-stat is the F-statistic for the bounds-test of cointegration. ECT is the error correction term. R-squared is the coefficient of determination from the error correction regression. Lag order is the optimal lag length according to the Schwarz-Bayesian criterion. *,**- indicate statistical significance at the 5% and 1% level, respectively.

Table 7: ARDL Regression Estimates

Factors	Estimate	Constant	D(EXR)
All Industries	**2.18**	**-3.58**	**-1.23**
Non-Heavy Industries	-0.30	0.87	-0.17
Communication and Utilities	-3.19	6.46	0.55
Textiles and Light Equipment	-0.77	1.59	-0.46
Machinery, Vehicles, and Related Tools	-0.17	0.28	-0.30
Heavy Metals and Inorganic Chemicals	0.13	0.43	**-3.96**
Storage and Infrastructure	0.34	-0.68	1.14
Agriculture and Organic Chemicals	0.44	-0.77	**-0.25**
Mineral and Quarrying Goods	-0.59	1.15	-0.32

Note: Dependent variable is factor-specific trade balances. Independent variable is the ln-transformed US/YUAN bilateral exchange rate. Estimates in column 2 refer to the long-run elasticity of the factorial balance of trade parameters in response to a 1% shock in the exchange rate. D(EXR) is the lagged exchange rate variable indicating the short-run dynamics.

Figure 1: CUSUM Test for Heavy Metals and Inorganic Chemicals

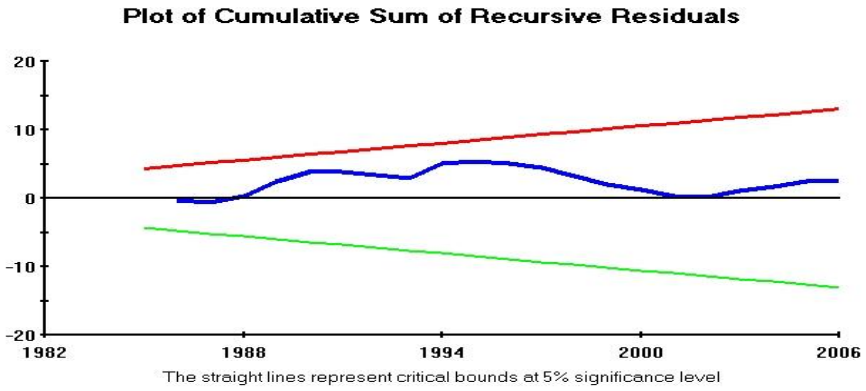
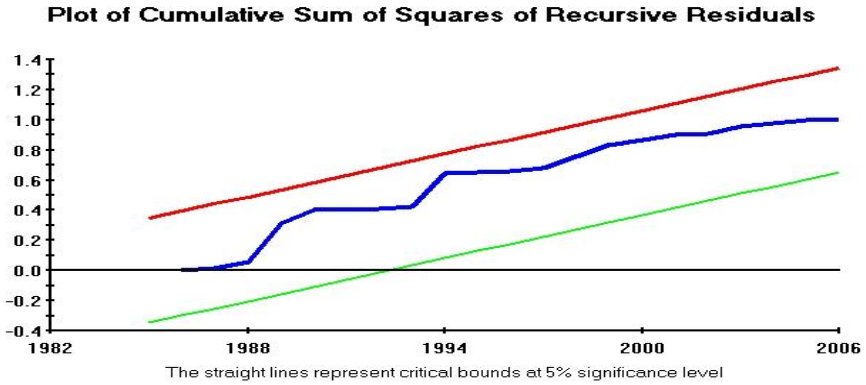


Figure 2: CUSUMSQ Test for Heavy Metals and Inorganic Chemicals



ECONOMY AGRICULTURE COUNTRIES: MYANMAR

Y.V. Aleskerova
candidate of economic sciences, senior staff scientist,
National scientific center Institute agrarian economy;
Kyiv, Ukraine
Mob. +380964201983
tuv@email.ua

Received 26 June 2015; accepted 10 November 2015; published online 29 December 2015

Abstract

The aim of this study is a comparative characteristic of the rural economy countries, namely Myanmar. The study found that the main problem existing in agricultural economics is to support agriculture at the state level and the natural climatic and political conditions. This paper analyzes the agricultural economy of Myanmar for several years. The scientific novelty of the research lies in the fact that the author has made specific proposals and recommendations on the modernization of the rural economy of Myanmar, taking into account the state support, the natural climatic and political conditions.

Key worlds: Agriculture, change, Myanmar, the economy, the agricultural market, price.

JEL classification: Q13; Q14; Q18

Introduction. Myanmar is agriculture-based country. About 40 percent of the gross domestic product (GDP) comes from agricultural sector and more than 60 percent of the people live in rural areas. Agriculture sector contributes major source of foreign exchange, and supplies of the bulk of basic food. Agricultural output of the country rose starting from 1990 at an annual average rate of one percent per year. The linkage between agriculture sector and other sectors of the country' economy stimulates for growth and income generation. According to the Asian Development Bank (ADB), Myanmar's population for year 2000 was nearly 48 million and it reached 51 million in year 2005 and nearly 60 million in 2010 (CSO). The population was composed of 29.48 percent in the 0-14 age group, 65.58 percent in the 15-64 age group and 4.94 percent in the 65 and above age groups in 2005. It is indicating that nearly 66 percent of the population can be considered as potential human resources for the economic

development of Myanmar. The demographic structure of the country's population has changed overtime. The economically active group, between 15 and 64 years old, accounted for 55.31 percent of the population in 1980, and 25 years later this cohort comprised nearly 66 percent of the total population. Nearly 63 percent of the population was engaging in the agriculture sector in 2010. It was about 67 percent in 1980. These figures are indicating that Myanmar economy is still much depending on agriculture sector. At the same time, employed labor force in service sector stands within 20 to 25 percent from 1980-2010. This is also implying that sectored contribution of services remains unchanged for 30 years. If we also look at the industry sector, we will see not much change during this time. It was nearly 10 percent in 1980 and 12.2 percent in 2010. Generally speaking, the employment distribution of the different sectors reflects their respective contribution to GDP. The share of the agriculture sector in total GDP was 46.54 percent in 1980 and it was increased to 60.1 percent in 1995 and decreased again to 57.23 percent, 42 percent and 36 percent in 2000, 2005 and 2010, respectively. This figure also indicating that the sector plays still important for Myanmar economy.

Main part. Steadily declining of agriculture's contribution, from 1995 to 2010, to job creation is to be expected as the economy moved to development, but the industry share in total GDP was declining from 1985 to 2010. Thus, industry sector failed to absorb the labor force of agriculture sector. On the other hand also, share of service sector in total GDP was declining from 1980 to 1995. But it was increasing from 1995 to 2010 indicating that labor force in agriculture sector moved to the service sector after 1995. In overall, agriculture sector is still the largest provider of jobs in Myanmar economy. According to the ADB data, per capita GDP in Myanmar has been growing since 1980. In 1980 per capita income was Kyat 3726 while in 2005 it was Kyat 167205. However, if we divide the per capita income in 2005 by market exchange rate, which is about Kyat 1200 per one US dollar in average, it is about US$ 160. This income is far less than if comparing with other developing countries those are neighbor to Myanmar (ADB). The share of agricultural export of some commodities (for example, rice) from Myanmar to the world market has fluctuated from 185 million US dollars in 1980-1982 to about 84 million US dollars in 2000-2002, and 400 million US dollars in 2010. But market share of other products such as peas and beans and shrimps and prawns has increased because of rapid expanding demand of beans from India and shrimps and prawns from Japan. But Myanmar' agricultural export largely consists of a few low

value-added primary commodities. On average, these two export items, which are predominantly primary agricultural commodities, account for more than 60 percent of total agricultural export earnings. Moreover, because of the sanction practiced by EU and US, Myanmar' exports are concentrated particularly on only a few markets of which Thailand is by far largest, followed by China, India, and Japan. Intra-ASEAN trade is not so much in volume compared with trade of those countries. Starting from 1980, with the growing integration of markets due to globalization and trade liberalization, economies of the less developed countries face a more fiercely competitive external trading environment. Myanmar is also not an exceptional country. Myanmar continue to export a limited range of primary commodities that are highly vulnerable to instability in supply, demand and a decline in terms of trade before 1988 under the then centrally controlled Burmese socialist government. Given the context of political and economic reforms, Myanmar could assess larger and more affluent market like Japan favors growth and development through trade after 1990 but still facing many internal supply side constraints associated with its underdeveloped economy which renders its exports uncompetitive. But after 1980s, globalization brought outward-looking policies in the world. Since then it became popular policy prescription among economists and policy makers. Many developing countries liberalized their trade and harvested the benefits of such openness. At the same time, another hypothesis related to structural changes of exports and diversification of the exports was used to debate in the trade literature. Many economists have been argued that a more diversified export mix may enable a country to be stable in economic growth (Ali and others 1991; Gutierrez de Pineres and others 1997). In this context, Honma (2003) noted that for a small country, the price elasticity of demand for exports of a homogeneous commodity is large and there is a huge potential to be gained if it is successful in reducing the export price by more efficient production. Therefore, least developed countries and/or developing countries should create markets for their agricultural commodities with large price and income elasticities of demand to achieve sustainable long-term growth by means of export diversification. For many least developed countries and developing countries, agricultural trade remains an important part of overall economic activity and continues to play a major role in domestic agricultural production employment. But greater reliance on a small number of primary exportable commodities for export earnings is a challenging issue for those countries. Johnston and Mellor

(1961) reported that expansion of agricultural exports is considered one of the most promising means of increasing income and augmenting foreign exchange earnings, particularly for a country stepping up its development efforts. In the international trade literature, a number of empirical studies have been undertaken in this context (Michaely 1977; Feder 1983; Hsiao 1987; and Dutt and Ghosh 1996).

The Past Trade Policy Context The then Myanmar Socialist Government pursued closed-door policy for many years which actually suited the centrally-planned socialist economic system. Many analysts agree that the economic policy of Myanmar during the socialist period (1962-1988), especially up to the early 1970s, was essentially a policy of agricultural exploitation, with heavy emphasis on rice production (Soe and Fisher 1990; and Thein 1997). Because of the economic and political deterioration of socialist system, popular uprising was happened in 1988. As a consequence, military took the power by coup in the same year. Starting from the late 1980s and 1990s, Myanmar initiated economic reforms and exportoriented policies. The State Peace and Development Council (SPDC) further encouraged state economic enterprises (SEEs) to form the joint ventures with private entrepreneurs. However, the export growth has declined slightly in the late 1990s and early 2000s because of the heavy reliance on very few commodities and regional financial crisis and deterioration overall macroeconomic conditions inside the country. Asian financial crisis leaded to the reduction of the inflow of foreign direct investment into the country. Consequently it increased the trade deficit because imports are increasing while exports are stagnant due to decrease in demand of export. Myanmar implemented a series of reforms since late 1980s. It liberalized the agriculture sector, expanded the private sector for trade to some extent, opened the border trade and allowed foreign investments to inflow into the country. These were done by the licensing of private bank operations, the legitimizing of foreign exchange transactions in the parallel market, the privatizing of SEEs and the simplifying of the tariff system. The country's GDP grew by more than 6 percent between 1993 and 1996. But after 1997, its economic growth was slowed to 4 percent per annum due to adverse weather conditions, the regional financial crisis and deterioration in overall macroeconomic conditions. Myanmar signed PTA with Malaysia in 1998 whereby Myanmar received crude oil on beneficial terms in exchange for agricultural products. Foreign trade is engaged in Myanmar both by public and private sector. All public sector exports and imports are recorded using the official exchange rate, even though actual transactions

may use one of several exchange rates. Private sector imports require import licenses for each transaction and are financed through the importers' foreign trade account. Private sector trade is transacted at the parallel market rate, although a range of other exchange rates may be applied.

Myanmar entered AFTA on January 1998 a year after being a membership in ASEAN. Under this scheme, imports are classified under several lists: the inclusion list, temporary exclusion list, sensitive list and general exception list. About 43 percent of all imports were on the inclusion list which consisted of commodities on the fast track (0-5 percent tariff rate within 5-8 years) and normal track (0-5 percent tariff rate within 10 years). Products on the temporary exclusion list (about 55 percent) were phased into the inclusion list by 2015. The government practiced an unrealistic official exchange rate to overvalue the Kyat. Although the official rate has remained fixed at Kyat 8.5 per Standard Drawing Right (SDR) since 1977, the market rate of the Kyat has significantly depreciated and business transactions are conducted at market rate. SEEs are required to record their transactions at the official rate as well as foreign firms are also. This practice distorts the accounts and reduces transparency. In 1993, the government introduced foreign exchange certificates which have been used in external trade and selected invisible private sector transactions (means unrecorded business transactions). Despite moves to encourage foreign trade and investment, extensive regulations and procedures tend to hinder commercial activities in the country. The procedure for requesting permits that required for exports, imports and other business activities has been cited as not being transparent and the list of prohibited exports has been frequently changed. Commercial disputes are handled solely under the arbitration among the persons involved in the disputes. As a result, business involved in disputes tend to seek settlement informally rather than legal system. The government partially liberalized rice production in 1996 and encouraged the farmers to diversify the crop production away from so-called industrialized crops such as pulses, sugarcane and cotton. However, the restrictions on rice export made the domestic prices far lower than international prices. In 2004, government announced that domestic rice marketing and export of rice are freed. But unfortunately, export of rice has been again prohibited to stabilize the rice prices inside the country. As a result, the export capabilities in Myanmar are restrained by the unintended effects of agricultural and trade policies as well as by political situations in the past.

The scientific novelty of the research lies in the fact that the author has made specific proposals and recommendations on the modernization of the rural economy

of Myanmar, conducted an analysis of the rural economy in recent years and offered recommendations for its improvement.

Conclusions. Myanmar's economy was hurt due to its neighboring countries' economies slowdown by global financial crisis and the impact of Cyclone Nargis in 2008. Economic growth was recovered to 5.5 percent in 2010 as FDI inflow into the country and as domestic investment, construction and services increased up. The ADB said that the country needs to reduce its poverty rate based on the joint survey made by United Nations Development Program (UNDP) and Integrated Household Living Conditions Assessment (IHLCA, 2007) done by Myanmar government. The overall poverty rate for the country was 32 percent though the rural poverty rate was 36 percent and urban poverty was 22 percent in 2007. The country's poverty rate was decreased to 26 percent in 2010 from its level of 36 percent in 2004. There were also positive indicators such as increases in net school enrollment rate, vaccination of under 5 years children against measles, births given with skilled medical staff, and access to safe water, and decrease in lack of food supply and death toll of pregnant women.

Myanmar's government, parliament, private sector and civil society must decide collectively whether they aspire to pursue a Long Game or a Short Game agricultural growth strategy. By definition, government commitment to key structural and policy reforms constitutes a prerequisite for a Long Game strategy. So the first question any potential donor must ask is whether or not the Government of Myanmar is prepared to increase public funding for agricultural support institutions and at the same time ramp up the process of institutional and policy reforms necessary to raise productivity, lower volatility and increase predictability. Private sector, civil society and donors can then adjust their aspirations accordingly. In the absence of government commitment to key institutional and policy reforms, the private sector, civil society and donors will be confined to Short Game interventions. Within the Short Game, early actions in the areas outlined above can help to lay the foundation for quick gains while at the same time providing a bridge to Long Game structural reforms. As a result, gains in a Short Game can help to pave the way for much greater gains in a Long Game. Our team strongly advocates a strategy focused on the Long Game, particularly a set of early actions necessary for enabling necessary structural reforms, but complemented by Short Game interventions that help to increase incomes, assets, farmer skills and water management systems that expand productive potential in the Long Game. By piloting models for effective bottom-up research and extension, actions in a Short Game can help to set up a

successful Long Game. A balanced attack, centered on the Long Game but complemented by Short Game interventions, will likewise help to demonstrate to rural communities that the GOM and its development partners are seriously committed to improving the agriculture sector.

This multi-pronged approach addresses the needs of rural communities for early visible change while at the same time remaining committed to necessary structural re-engineering of institutions and policies. Myanmar's neighbors and competitors in Thailand, Vietnam, Bangladesh, Malaysia, India and China have all committed to high-productivity Long Game strategies. Without similar commitment from Myanmar, we find it difficult to see how Myanmar's farmers will be able to compete in increasingly competitive regional and global markets – including those at home. Because two-thirds of Myanmar's population and three-fourths of its poor live and work in rural areas, broad-based agricultural growth offers a uniquely powerful instrument for accelerating economic growth and improving the welfare and food security of vulnerable households. Myanmar's current highly skewed distribution of land, its growing levels of landlessness and increasingly contentious disputes over land access not only pose dangers to vulnerable household welfare but also risk inflaming social tensions and conflict. As a result, we consider the Long Game reforms outlined here imperative for agricultural productivity growth as well as long-term political stability.

Literature

[1] Abbott, Philip. 2009. "Development Dimensions of High Food Prices." OECD Food, Agriculture and Fisheries Working Papers No. 18. Paris: OECD Publishing.

[2] Abdulai, A. and W,Huffman. 2000. "Structural Adjustment and Economic Efficiency of Rice Farmers in Northern hana," Economic Development and Cultural Change 48: 503- 520.

[3] ADB. Asian Development Bank. Country Economic Data (Myanmar). 2010.

[4] Aigner, D. J; C. A, Knox Lovel, and P, Schmidt. 1977. ''Formulation and Estimation of Stochastic Frontier Function Models,'' Journal of Econometrics 6 (July): 21–37.

[5] Ali, M. and Byerlee, D. 1991. "Economic Efficiency of Small Farmers in a Changing World: A Survey of RecentEvidence," Journal of International Development, Volume 3, Issue 1: 1-27.

[6] Ali, M. and Flinn, J, C. 1989. "Profit Efficiency among Basmati Rice Producers in Pakistan Punjab," American Journal of Agricultural Economics, Volume 71, Issue 2: 303-310.

[7] Ali, F; A. Parikh, and M. K. Shah, 1994. ‘‘Measurement of Profit Efficiency Using Behavioral and Stochastic Frontier Approaches,’’ Applied Economics 26 (February): 181–88.

[8] Ali, F; S. C. Kumbhakar, and A. Bhattacharyya. 1992. ‘‘Price Distortions and Resource-Use Efficiency in Indian

[9] Agriculture: A Restricted Profit Function Approach,’’ Review of Economics and Statistics 74 (February): 231–239.

[10] Battese, G.E. and T. Coelli. 1995. “A model of Technical Inefficiency effects in a Stochastic frontier production Function for Panel Data”, Empirical Economics, 20: 325- 332.

[11] Chirwa, E. W. 2007. “Sources of Technical Efficiency among Smallholder Maize Farmers in Southern Malawi,”AERC Research Paper: African Economic Research Consortium, Nairobi.

[12] Nguyen, C. T. and Singh, B. 2006. “Trend in Rice Production and Export in Vietnam,” Omonrice 14, 111-123.

[13] Okamoto, Ikuko. 2005. “Transformation of the Rice Marketing System and Myanmar’s Transition to a Market Economy”, IDE Discussion Paper 43, Institute of Developing Economies: Japan External Trade Organization.

[14] Okamoto, Ikuko, 2005. Rice Marketing in the Transition to a Market Economy in Myanmar, in Fujita Koichi Ed.

[15] Myanmar’s economy in transition. Chiba. Institute of Developing Economies, JETRO, pp. 231-271.

ECONOMIC DIVERSIFICATION POLICY IN CONTEXT OF AZERBAIJAN'S ACCESSION TO THE WTO

Vugar Bayramov

Ph.D., ASEU
Email: vugarbayramov@cesd.az Tel: (012) 5970691

Abstract

The main objective of this article is the analysis of the accession of Azerbaijan to the WTO, the advantages and disadvantages associated with this accession, the macroeconomic effects, CGE modeling, and analyzing the outcomes obtained through endogenous combinations. This paper will also enable to determine the positive influential elements as a result of the WTO accession, the changes in tariffs during import and export, and the impact on the domestic entrepreneurial entities and employment.

Key words: WTO, macroeconomic effects, CGE modeling, import and export, entrepreneurship, employment.
JEL classification: F13, L25,

As a Republic of the Soviet Union, Azerbaijan has experienced the economic integration to the common market for 70 years. The disbandment of the Soviet Union, and Azerbaijan gaining sovereignty and independence over its resources and market was seen as a historic achievement by many. Azerbaijan started its way of progressing toward a free market economy in a turbulent economic environment. The difficulties accompanied by the detaching from a common economic area - high figures of inflation, rapidly declining levels of production, a lack of food, high unemployment and a general decrease in welfare - can be one of the reasons explaining the negative perception of greater integration into the multilateral trade system.

In this context, the in-depth analyses of the WTO accession is needed to understand the advantages and disadvantages of the WTO accession in Azerbaijan. The similar analyses were carried out for the CIS country group on the political and economic consequences (see for instance Bayramov 2008; Tumbarello 2005; Roberts and Wehrheim 2001). There also similar papers of qualitative studies

reviewing the path towards WTO accession for Azerbaijan (Hasanov and Zeynalov 2013; Kavass 2008; Fariz 2007). Nevertheless, it should be noted that, none of these studies simulate the macroeconomic consequences of WTO accession for the economy of Azerbaijan.

In addition, the above-mentioned studies have been conducted to simulate the macroeconomic effects of WTO accession using computable general equilibrium (CGE) models. For instance, in the case of China (Fan and Zheng 2001), Ukraine (Pavel et al. 2004) and the completion of the Doha Round (Hertel and Winters 2006). The lack of comparable study case of Azerbaijan makes it harder to forecast the disadvantages and the advantages of the WTO accession.

In order to analyze the macroeconomic effects WTO accession would cause for the Azerbaijani economy, a Computable General Equilibrium (CGE) model was chosen for the empirical part of this study. The idea of "general equilibrium" builds on the assumption that all markets, sectors and industries are linked with each other. CGE models can be applied to come up with numerical forecasts by obtaining results for endogenous variables based on certain assumptions about exogenous variables, their functional forms, and parameter values.

It also should be taken into account that CGE models have become a standard tool for empirical analysis and are particularly suitable to assess the aggregate welfare implications of economic policies. They are also used to study the effects of external shocks such as accession to an international organization. Studies using CGE models focus on different policy areas including development economics (De Maio et al. 1999; Robinson 1989), fiscal policy (Shoven and Whalley 1984), currency devaluation (Thissen and Lensink 2001), and social and environmental policy (O'Ryan et al. 2005; Bouvenberg and Goulder 2002) [1].

The modeling principle of CGE rests on neo-classical economic assumptions. In an economic system, consumers are assumed to maximize their utility against a budget constraint (demand side). Producers are assumed to maximize their profit given the prices of goods and production costs (supply side). As a result, the equilibrium condition for the market price is calculated for each good and production factor where demand equals supply.

Furthermore, neoclassical models assume that all commodities are tradable and that all commodities are perfect substitutes. Thus, the "law of one price" must hold, i.e. all commodities should have the same price in all markets. It is also assumed that a

country is small enough not to influence world market prices, i.e. it faces fixed world prices for exports and imports.

The CGE model employed in this paper is commonly known as a 1-2-3 model. The model developed in this paper, thus, refers to one country with two producing sectors and three goods. The commodities produced by a country are an export good *E* which is not demanded domestically and sold to foreigners. The second one is a domestic good *D* which is sold in the country domestically. Finally, the third good is an imported good *M* which is not produced domestically but imported from abroad.

There are three actors in the model which are: a producer, a household, and the rest of the world. The equation below is the most achievable combinations of $\boldsymbol{E}$ and $\boldsymbol{D}$ that can be realized:

$$\overline{\boldsymbol{X}} = \boldsymbol{G}\ (\boldsymbol{E}, \boldsymbol{D}^{\boldsymbol{s}};\ \Omega\ )$$

with Ω describing a constant elasticity of transformation (CET).

The composite commodity existing of $\boldsymbol{D}$ and $\boldsymbol{M}$ is consumed by the single consumer domestically. In multisector models we extend this treatment to many sectors, assuming that imported and domestic goods in the same sector are imperfect substitutes: an approach which has come to be called the Armington assumption. Following this treatment, we assume the composite commodity is given by a constant elasticity of substitution (CES) aggregation function of $\boldsymbol{M}$ and $\boldsymbol{D}$:

$$\boldsymbol{Q}^{\boldsymbol{s}} = \boldsymbol{F}(\boldsymbol{M}, \boldsymbol{D}^{\boldsymbol{D}};\ \mu)$$

with μ describing the elasticity of substitution, i.e. consumers maximize utility which is equivalent to maximizing Q in this model.

Equations (1) to (22) below illustrate an extended version of the 1-2-3 model to include government revenue and expenditure as well as savings and investment. Most governments use taxes and subsidies as well as expenditure policy to adjust their economy. Therefore, four tax instruments are included: an import tariff, an export subsidy, an indirect tax on domestic sales, and a direct tax rate.

The single household saves a fixed fraction of its income. Public savings (budgetary deficit or surplus) is defined as the balance of tax revenue plus foreign grants and government expenditures (all assumed to be determined exogenously). The Current Account balance, taken to represent foreign savings, is the residual of imports less exports at world prices adjusted for grants and remittances from abroad. Output is fixed. Foreign savings are also presently fixed, i.e. the model is savings-driven. Aggregate investment adjusts to aggregate savings.

In total, there are twenty equations and nineteen endogenous variables. According to Walras's Law, one of the equations, say the savings-investment identity, can be dropped.

Real Flows:

(1) $\overline{X} = G\ (E, D^s;\ \Omega\ )$

(2) $Q^s = F(M, D^D;\ \mu)$

(3) $Q^D = C + Z + \overline{G}$

(4) $E/D^s = g_2\ (P^e, P^d)$

(5) $M/D^D = f_2\ (P^m, P^t)$

Nominal Flows:

(6) $T = t^m * R\ * pw^m * M + t^s * P^q * Q^D + t^y * Y - t^e * R * pw^e * E$

(7) $Y = P^x * \overline{X} + tr * P^q + re * R$

(8) $S = \bar{s} * Y + R * \overline{B} + S^g$

(9) $C * P^t = (1 - \bar{s} - t^y) * Y$

(10) $P^m = (1 + t^m) * R * pw^m$

(11) $P^e = (1 + t^e) * R * pw^e$

(12) $P^t = (1 + t^s) * P^q$

(13) $P^x = g_1(P^e, P^d)$

(14) $P^q = f_1(P^m, P^t)$

(15) $R \equiv 1$

(16) $D^D - D^S = 0$

(17) $Q^D - Q^S = 0$

(18) $M - pm^e * E - ft - re = \overline{B}$

(19) $P^t * Z * S = 0$

(20) $T - P^q * \bar{G} - tr * P^q - ft * R - S^g$

Accounting Identities

(21) $P^x * \bar{X} \equiv P^e * E + P^d D^s$

(22) $P^q * Q^s \equiv P^m * M + P^t D^d$

Table 1. Endogenous variables and Exogenous variables

Endogenous variables		Exogenous variables	
E	Export	World price of exported good	World price of exported good
M	Import	World price of imported good	World price of imported good
Supply of domestic good	Supply of domestic good	Tariff rate	Tariff rate
D^D	Demand for domestic good	Sales tax	Sales tax
Q^s	Supply for composite good	Direct tax rate	Direct tax rate
Q^D	Demand for composite good	tr	Government transfers
Y	Total income	ft	Foreign transfers to government
Domestic price of exported good	Domestic price of exported good	re	Foreign remittances to private sector
Domestic price of imported good	Domestic price of imported good	Average savings rate	Average savings rate
Domestic price of domestic good	Domestic price of domestic good	Aggregate output	Aggregate output
P^t	Sales price of composite good	Real government demand	Real government demand
Price of aggregate output	Price of aggregate output	Balance of trade	Balance of trade
Price of composite good	Price of composite good	μ	Import substitution elasticity
R	Exchange rate	Ω	Export transformation elasticity
T	Tax		

S^g	Government savings		
C	Aggregate consumption		
S	Aggregate savings		
Z	Aggregate real investment		

Source: The Author's calculations, 2015

The data used for the quantitative analysis were collected from the World Bank Database, the International Monetary Fund's annual report, State Statistics Committee's sources, the Ministry of Finance database, official documents of the World Trade Organization and CESD reports on macroeconomic issues

Tables 7 to 9 describe the base data used to calibrate the model as well as its parameters and exogenous variables. Table 10 describes the values for the endogenous variables and Table 11 shows the results for each of the equations.

Table 2. Base data to run the 1-2-3 Model

1. National Accounts			**3. Fiscal Account**		
Output (Value Added)	64.8	1.00	Revenue	29.1	0.45
Wages (income of the population)	34.7	0.54	Non-Tax	0.7	0.01
GDP at market prices	70.2	1.08	Current Expenditure	12.1	0.19
Private Consumption	27.2	0.42	. Goods & Services		
Public Consumption	7.4	0.11	. Interest Payments		
Investment	25.7	0.40	. Transfers & Subsidies		
Exports	36.7	0.57	Capital Expenditure	10.3	0.16
Imports	16.9	0.26	Fiscal Balance	7.4	0.11
2. Tax Revenues			**4. Balance of Payments**		
Sales & Excise Tax	2.5	0.04	Exports - Imports	23.757	0.37
Import Tariffs	0.2830957	0.00	Interest Payments	-1.1	-0.02
Export Duties	0.0009868	0.00	Net Private Transfers	-0.083	0.00
Payroll Tax	1.8	0.03	Net official Transfers	0.71	0.01
Personal Income Tax	1.04	0.02	Current Account Balance	15.78443	0.24
Capital Income Tax	3.8	0.06	External Debt	7.608	0.12
Total	9.4	0.15	Debt Service Payments	1.9	0.03

Source: The State Statistics Committee of Azerbaijan and Author's calculations, 2015

Table 3. Parameters

Elasticity for CET (st)	0.600000
Elasticity for CES/Q (sq)	0.600000
Scale for CET (at)	2.029108
Share for CET (bt)	0.391679
Rho for CET (rt)	2.666667
Scale for CES/Q (aq)	1.905786
Share for CES/Q (bq)	0.304895
Rho for CES/Q (rq)	0.666667

Table 4. Exogenous variables

World Price of Imports (wm)	0.9835083	0.98351
World Price of Exports (we)	1.0000269	1.00003
Import Tariffs (tm)	0.0167683	0.01677
Export Duties (te)	0.0000269	0.00003
Indirect Taxes (ts)	0.0548408	0.05484
Direct Taxes (ty)	0.0893227	0.08932
Savings rate (sy)	0.4790908	0.47909
Government Consumption (G)	0.1084236	0.10842
Govt. Transfers (tr)	-0.0108309	-0.01083
Foreign Grants (ft)	0.0109568	0.01096
Net Priv Remittances (re)	-0.0175272	-0.01753
Foreign Saving (B)	-0.2985652	-0.29857
Output (X)	1.0000000	1.00000

Source: The State Statistics Committee of Azerbaijan and Author's calculations, 2015

Table 5. Endogenous variables

Export Good (E)	0.56566	0.17953	0.31739
Import Good (M)	0.26491	0.27225	1.02772
Supply of Domestic Good (Ds)	0.43434	0.82047	1.88899
Demand of Domestic Good (Dd)	0.43434	0.82047	1.88899
Supply of Composite Good (Qs)	0.69925	1.09272	1.56270
Demand of Composite Good (Qd)	0.69925	1.09272	1.56270
Tax Revenue (TAX)	0.12952	0.15101	1.16593
Total Income (Y)	0.97164	1.07912	1.11062
Aggregate Savings (S)	0.20388	0.22564	1.10673

Consumption (Cn)	0.39755	0.76869	1.93359
Import Price (Pm)	1.00000	0.99900	0.99900
Export Price (Pe)	1.00000	0.99900	0.99900
Sales Price (Pt)	1.05484	1.02912	0.97562
Price of Supply (Pq)	1.00000	0.99900	0.99900
Price of Output (Px)	1.00000	0.99900	0.99900
Price of Dom. Good (Pd)	1.00000	0.99900	0.99900
Exchange Rate (Er)	1.00000	0.99900	0.99900
Investment (Z)	0.37599	0.21925	0.58315
Government Savings (Sg)	0.03694	0.03811	1.03174
Walras Law (Z-S)	0.19273	0.00000	

Source: The State Statistics Committee of Azerbaijan and Author's calculations, 2015

Table 6. CGE Equations

Eq.#	Equations	Value
	Real Flows	
1	CET Transformation (CETEQ)	1,38749
2	Supply of Goods (ARMG)	1,01801
3	Domestic Demand (DEM)	1,09637
4	E/D Ratio (EDRAT)	1,30233
5	M/D Ratio (MDRAT)	0,60990
	Nominal Flows	
6	Revenue Equation (TAXEQ)	0,16075
7	Total Income Equation (INC)	0,97067
8	Savings Equation (SAV)	0,25684
9	Consumption Function (CONS)	0,45256
	Prices	
10	Import Price Equation (PMEQ)	0,99900
11	Export Price Equation (PEEQ)	0,99900
12	Sales Price Equation (PTEQ)	1,05379
13	Output Price Equation (PXEQ)	0,99900
14	Supply Price Equation (PQEQ)	0,99900
15	Numeraire (REQ)	1,00000
	Equilibrium Conditions	
16	Domestic Good Market (DEQ)	0,00000
17	Composite Good Market (QEQ)	0,00000
18	Current Account Balance (CABAL)	0,09479
19	Government Budget (GBUD)	0,06120

Source: The State Statistics Committee of Azerbaijan and Author's calculations, 2015

Results and Implications

The generated macroeconomic consequences of WTO accession for the Azerbaijani economy based on the results of our model. According to the results, WTO accession will exert a positive impact on all three measures of general welfare, i.e. income, consumption and aggregate savings. Both income and aggregate savings are forecasted to increase by approximately 11 percent in case Azerbaijan joins the World Trade Organization. Most interestingly, consumption is predicted to increase by a stunning 93 percent compared to the benchmark value. Our analysis suggests that households would be the primary beneficiaries of WTO accession [4].

Table 7. Macro Indicators

Income	0,97164	1,07912	11,06
Consumption	0,39755	0,76869	93,36
Aggregate Savings	0,20388	0,22564	10,67

Source: The State Statistics Committee of Azerbaijan and Author's calculations, 2015

Table 16 shows the likely results of WTO accession on other macroeconomic indicators, i.e. government savings, tax revenue, exports and imports. Exports are forecasted to decrease by 68 percent compared with a relatively modest increase in imports of 3 percent. Although revenues through customs and tariffs are likely to drop after WTO accession, tax revenue is projected to increase by 17 percent due to higher levels of consumption and increased household incomes. The results implicate that Azerbaijani exports will plummet in the case of WTO accession which is likely to trigger wide ranging consequences for the Azerbaijani oil industry. [3]

Table 8. Macro indicators, continued

Government Savings	0.03694	0.03811	3.17
Tax Revenue	0.12952	0.15101	16.59
Exports	0.56566	0.17953	-68.26
Imports	0.26491	0.27225	2.77

Source: The State Statistics Committee of Azerbaijan and Author's calculations, 2015

Implications

As the result of our model, we can state that consumers in the domestic markets will enjoy lower prices, among other, due to reduced import tariffs from Azerbaijan's accession to the WTO. The consumption will be stipulated by the

higher disposable income. An important insight from our study is that the average consumer will be better off in case Azerbaijan joins the WTO.

At the same time, it should be noted that the Azerbaijani oil industry, which is the main source of the income, would experience a severe setback given the forecasted drop in exports. Recall from early chapters that the energy industry contributes almost half to total Azerbaijani GDP and that oil accounted for 95 percent of Azerbaijani exports in 2013. Considering the share of the oil revenues in the budget, these insights are important because they suggest harsh opposition from the Azerbaijani oil industry when it comes to WTO accession. Additionally, this paper makes it clear that diversifying Azerbaijani economy before joining the WTO is a critical point.

The WTO accession and its consequences of for local business are ambiguous. Nevertheless, local entrepreneurs will be incentivized to import certain parts of machinery and innovative technology from abroad for their own domestic manufacturing thanks to the better market access for foreign equipment. In addition, WTO accession is likely to stimulate technology transfer from abroad, which could also benefit domestic production not only of machinery and equipment but also of agricultural products. With factors of production projected to be decreasing, the overall costs of production will also be lower and domestic manufacturing could become more competitive. Hence, by becoming more competitive in the local market and improving the quality of the produced goods, they also will be incentivized to export the products to the world market.

By way of contrast, the potential negative consequences also should be considered, and the positive impacts on WTO accession on domestic manufacturing must be weighed against. After accession, foreign capital and qualified products will get access to the domestic market and their market power could potentially force further local enterprises out of business. In the long run, direct subsidies provided by the government to protect an infant manufacturing industry would be prohibited under WTO regulations. As a result of WTO membership, competition with foreign products could harm domestic production. The positive effects generated by Azerbaijan’s accession to the WTO at the first stage can fade out through decreased levels of production and higher unemployment.

Nevertheless, it worth mentioning that, under the WTO regulations, new member countries can carry out certain measures for shielding infant industries in a

transition period. In fact, WTO policy is only to commit the government to implement strategies for a prudential tariff policy in the future. This would allow the Azerbaijani government to not decrease the tariffs dramatically after accession. At the same time, it should be noted that, once WTO regulations take full effect, the accession would dramatically increase the pressure for a more diversified economy to avert negative welfare implications.

Alongside the domestic manufacturing industry, a more diversified economy can also be achieved by increasing agricultural production. Diversification of the economy, in this case, is the key to all expected disadvantages. Some types of subsidies will be impermissible under WTO regulation. Azerbaijani farmers fear that after WTO accession, they will lack the financial means previously granted through government subsidies to compete with cheaper agricultural products from abroad. Again, whether the agricultural sector will benefit or lose from WTO accession will depend on how competitive the industry will become during the transition period when certain agricultural subsidies can still be carried out [5].

For the time being, in Azerbaijan, there is a lack of specialized experts in the service market. The securities market has not developed yet. By international standards, the Azerbaijani banking system is not competitive and is of minor importance in the international financial markets. Lack of competition hinders the development of new financial products and innovations. Again, the Azerbaijani finance industry has to rapidly adjust to a new market environment to compensate for a potential drop in oil revenues. The WTO accession will increase competition from foreign companies in this sector, too.

Reference

[1] Computable General Equilibrium Modeling: İnfluencing Debates, June, p 110-114

[2] Regional *Economic Diversity and Regional Economic Stability: Research Results and Agenda,*International Regional Science Review, p. 156-175, October 2013

[3] Bernhard Pfaf, VAR, *SVAR and SVEC Models: Implementation Within R Package vars*, Journal of Statistical Software, p 35-45, 2010

[4] Akio Matsumoto, Ugo Merline ad Ferenc Szidarovsky, *Some notes on applying the Herfindahl-Hirschman Index*, University of Arizona Press, pages 120-145, 2010

[5] Merlin Hackbart and Donald Anderson, *On Measuring Economic Diversification*, Land Economics Journal, vol 54, February, p 86-120, 1978

THE ADAPTATION OF THE LOCAL PRIVATE SECTOR TO THE INTERNATIONAL STANDARDS' REQUIREMENTS

Zabit Yunus Aslanov

PhD., assoc. prof., UNEC
E-mail: aslanov.zabit@mail.ru

Sevinj Museib Abdullayeva
Candidate for PhD, UNEC
E-mail: sevinc120483@gmail.com

Received 26 June 2015; accepted 10 November 2015; published online 29 December 2015

Abstract

The national standardization system of the Republic of Azerbaijan has been undergoing the significant reforms to meet the requirements of accession to the World Trade Organization and the process of integration into the European Union. In accordance with these reforms, existing national regulations are being replaced by strict international standarts. In this process, it is necessary to bring the private sector in line with the new principles of standardization system, which is not easy and requires large investments. In the paper the authors analyses the changes applied to the existing national system of standartization, as well as aspects related to such a reform.

Key words: national standardization system, private sector, World Trade Organization, European Union, international requirements.
Jel Classification Codes: L15

As known, in relation to the membership of the World Trade Organization (WTO) and integration to the European Union (EU) the national standardization system of Azerbaijan has to be adapted to the requirements of those organizations. This will result in significant changes to the current system. Thus, unlike the current system, in the market economy system only the safety of products is regulated by the state. The quality of the products is regulated by the market itself. Therefore, the

requirements on the safety of products, called technical regulations, are mandatory for implementation. The product quality requirements are reflected in standards and application of the standard is voluntary. Enterprises that want to improve the quality of products and thus get ahead of the competition are voluntarily applying these standards. At the same time the government limits its control by security of products. Another important change is taking foodstuffs control out of the national standardization system. In order to fulfill all these requirements the thousands of the existing Azerbaijan standards will be renewed as mentioned to meet international standards.

The aspects of adaptation of the national standardization system to meet international requirements

In general, the adaptation of the national standardization system to the international requirements will be implemented according to the following aspects:

• Adapting of the system itself to the principles of the market economy. Thus, in accordance with the market economy the standardization as technical regulation providing and applying of the mandatory requirements to the safety of the products and standardization defining voluntary requirements to the quality of products should be divided into two parts. This, according to the state control over the economy and the quality of the products safety regulation limiting the market makes it necessary to release the law of supply and demand;

• standards that form the basis of the system requirements for the products to adapt to the requirements of international standards. It is redesigning the existing standards to meet international standards. This is the most difficult element of the adaptation of the standardization system. Because of the fact that standards in former Soviet republics do not meet international requirements the tens of thousands of the existing standards have to be redesigned;

• product safety requirements for each product, product group and its overall safety record for technical regulations is to be developed. The former GOST standards include safety and quality requirements for each product, and this requires the development of standard for each product. But in international practice the security requirements of the product are defined in terms of security parameters, not in terms of product. So, whatever product has a security parameter this product is applied to the relevant technical regulations;

• identification of general requirements to the products in the technical regulations and liberalization of methods to meet these requirements. Along with determination of the requirements for products in the former soviet republics' standards, there a single mechanism to meet these requirements is also reflected. In international practice technical regulations specifies the security requirements only, but how they've met is carried out according to the rules shown in referenced standards or defined by the manufacturers itself. The manufacturers shall be deemed to satisfy the requirements of the technical regulations in case of at least one of the standards or the self-defined method is applied;

• institutional reforms in the management of standardization system. One of the major changes brought by adaptation is change of the structure and authority in government agencies responsible for the management of the national standardization system. So that, is required to carry out the necessary reforms to identify requirements of state bodies' authorities for security of products and limitation of these requirements by ensuring, preparation of standards and liberalization of the authority use, conformity assessment carried out by the private sector, in order to ensure one-sidedness, transparency and public participation;

• improving the safety and quality performance of products in conformity assessment system. According to the former soviet standardization system almost all products are mandatory certified and certification is carried out by state authorities. In addition, compliance with both the production and the market is under state control. But compliance with international standards requires that only high-risk products must be mandatory certified, compliance assessment of low-risk and mid-risk products shall be carried out by the manufacturers themselves, conformity assessment activities shall be carried out not by the state, but by the conformity assessment bodies accredited in accordance with international standards [Aslanov Z.Y. 2009. p. 436-439; WTO. World Trade Report. 2005. p. 127].

Apparently, it is necessary to carry out the significant changes in the current system to adapt to international standards.

One of the key elements of harmonization of national standardization system with international requirements is taking into consideration the interests and potential of the private sector in Azerbaijan. Thus, the producers are the object of standardization. Those are parties who use the new norms. Therefore, changes made will affect manufacturers in the first place. Therefore, coordination should focus the

private sector as well. Thus, the adaptation of the private sector should be kept in the center of attention as well.

Private sector related issues in the process of harmonization of national standards with international requirements

There are the following private sector related issues in the process of harmonization of national standards with international requirements:

- to involve the private sector to the development of new technical regulations and standards;
- to educate the private sector about the new technical regulations and standards;
- to provide transitional period for adaptation to the new requirements, technical support, concessional loans and assistance to the private sector;
- to support of the establishment of private enterprises which will carry out activities on the national standardization system;
- to adjust the consumer market to the new products.

Now, let's comment each of these issues separately:

1. The involvement of the private sector to the preparation of new technical regulations and standards to the possible extent. As mentioned above, involvement of the private sector to the development of technical regulations and standards gives it a lot of benefits. So, by this participation they fully adopt the applied requirements, achieve taking into account its interests in these documents, learn other manufacturers' views and suggestions on this standard, get without investigation expenses scientific and technical progress achievements included in the standard etc. Therefore, according to the international experience it is considered appropriate that a most effective mechanism to adapt the private sector to the new rules is to involve it to the preparation of these rules. Although relative progress has been made in this area in recent years in our country, there are still problems in terms of unformed mechanism and lack of understanding of the importance of this issue by the private sector. In order to involve the private sector in this process the sectors or technical committees for products should be established. In the first phase it must be involved to develop mandatory subsequently applied technical regulations.

As known, the aim of the development of technical regulations is to ensure safety of products for people, animals and plants. While scientific achievements and innovations, best practices and higher requirements on the quality of the products are

considered when processing standards, whereas product safety indicators have taken as a basis when processing technical regulations. Therefore, accordingly the aim of participation of the private sector in processing of technical regulations should be development of safety requirements determined for its own products and while study of mechanisms to ensure it, the aim of participating in the development of standards should be in obtaining of the scientific achievements and new technologies and thus in improvement of the quality and competitiveness of their products. However, fulfillment of the safety requirements in technical regulations leads to safe and competitive manufacturers' products, and this in turn leads to increased confidence in their products and being more competitive. That is, in both cases the private sector achieves economic benefit when participated in the preparation of these documents [Kleinemeyer J. 1995. p.7-8; Grindley P.C. 1995. p.223].

In addition to the participation of the private sector in the national technical committees, its participation in the development of international standards and national standards of foreign countries should be encouraged. This is important either being a requirement of the WTO or taking into account the interests of the national economy in international standards and facilitate subsequent application of international standards in the country. On the other hand, the most important aspect which makes necessary the participation of the private sector in the development of regulatory documents is their contribution to how the provisions of the international standards, taken as a basis, complies with the interests of the national economy, and which adaptations should be made in the national technical regulations and standards adopted on the basis of this international standard in terms of local climate, geographical, technological, environmental and economic factors. Because, there might be such requirements of international standards, direct application of which, due to the above factors, is not appropriate in our country. In this regard, what adaptations should be justified by the private sector to substantiate its position [International Trade Center. 2004. p. 24]. So, involvement of the private sector in both technical committees, either created under the State Committee on Standardization, Metrology and Patents of Azerbaijan for development of the technical regulations, or under Azerbaijan Institute of Standardization and Certification for preparation of national standards, is a very important issue.

To ensure the participation of the private sector in the development of regulations the extensive educational work should be carried out first and then the

benefits provided by such participation should be delivered to them. Some countries practiced to use premium payments and awards as promotional tools to motivate the participation of the private sector. Although it is advisable to carry it out for the development of technical regulations in our country, but it can be difficult to apply for the development of standards. In many countries, however, private sector pays the membership fee for participation in the development of standards.

In addition to the participation of the private sector in the national technical committees their participation in the development of international standards and national standards of foreign countries should be encouraged. This, in addition to being a requirement of the WTO, is either important in terms of taking into account the interests of the national economy in international standards and further easier application of international standards in the country [Vries H.J. 2006. p. 11].

For this purpose, in accordance with the relevant technical committees of international standardization organizations an appropriate "mirror" committees should be established and discussion of international standards by these committees should be provided through the participation of local experts and the private sector. For this purpose, it is necessary to allocate funds from the state budget. At the same time, using the center of the inquiry and notification established on the basis of the WTO request the technical regulations of the WTO member states, the obtained projects of conformity assessment procedures passed to the private sector and review of these documents during the given period from the national interests point of view by the private sector must be provided.

2. To educate the private sector about the new standardization system. In our country, the representatives of the private sector are misinformed about the new approach due to operation based on the national standardization system requirements stand on Soviet era. While the national standardization system is in line with international requirements based on the proposed mechanism the private sector should be also well-informed about the nature of the new system. Thus, they must be tanned that the safety is the subject of regulation, but the quality is the subject of the market and they must be explained that implementation of either safety or quality requirements is the subject of competition and customer satisfaction in the market economy. It could be considered as a new approach for producers forced by the state to carry out such requirements for a long time. Therefore, the action plan to educate

the private sector to be developed and the essence of the new system to be delivered to them through the followings:

- by organization of public events, conferences and seminars;
- by setting up the Training and Consulting Center under Standardization, Metrology and Patents Committee and by providing through it a free training to the representatives of the private sector on the nature and requirements of the new system;
- by giving free consulting to the manufacturers on new technical regulations and standards for their products, as well as on their application using the established center;
- by creating an information portal on technical regulations and standards;
- by preparation of the guidance on the application of any adopted technical regulation and by placing it on the website;
- by creating a system of national awards for safe and quality products production;
- by preparing of training and printed materials on the new standardization system and distributing to the private sector through the Institute for Standardization, universities and research institutes;
- by organizing regular activities and events in the press to raise awareness about the new system;
- by implementing joint events and projects along with public and business associations and other non-government organisations (NGO) etc.

3. Providing the transitional period, technical support, soft loans and aids for the private sector to adapt to the new requirements. We've noted that one of the most difficult moments in adaptation of national standardization system to international requirements and in ensuring the transition to the new system is namely application of the new technical regulations and standards to the private sector. So, for a long time the producers operating in Azerbaijan have established their production process in accordance with the current standards of their products. Being tougher and different than in QOST standards the requirements of the new technical regulations and standards must satisfy the requirements of the new regulatory documents based on international standards by making a significant investments. This first of all includes the means of production, in particular, the equipment, raw materials, renewing of the production environment, training for updating

knowledges of professionals for new requirements, the assessment of compliance with the new requirements and other operating expenses.

In international practice the transition period is given for the application of new technical regulations by the private sector. In our country within the process of WTO accession both for national standardization system to meet international requirements, as well as for the provision of new requirements by the private sector 7-year transition period has requested. After Ukraine has adopted the new technical regulations, except for the necessary safety measures, 1-3 year transition period has allowed for its' mandatory application. During this period the manufacturers are gradually applying the new requirements to their production processes. During this period, the current standards also remain in force [Reforms on the way to the European Market. 2011. p. 81]. It is considered appropriate to apply this experience in our country. During the voluntary implementation period it's important for the government to help manufacturers to understand requirements and application of new technical regulations by constant education, as well as by providing of free training and consultancy services.

Another important point is provision of grants and soft loans to the producers, applying new technical regulations. For example, in this regard, the special state's financial aid program is carried out in Slovakia. So, within this program the government is covering the 65% of the expenses required to meet the guidelines of the European Union by producers [Reforms on the way to the European Market. 2011. p. 85]. This experience could be applied in our country in regard to manufacturers of the products which have a priority for the economy and export potential. Primarily, it would be advisable the fulfillment of the general requirements of technical regulations and compliance assessment to be met by these manufacturers. On the other hand, to apply technical regulations the preferential loans can be applied to the producers who guaranteed the safety of products and interested in the export of products. Thus, producers will be able to get preferential credit when they applied for it by noting that it aimed to apply the new technical regulations and standards. One of the main advantages of giving either soft loans or grants is safe and quality manufacturing of own products by manufacturers having such a support and by this to promote the government to manufacture the safe products in the local market. Therefore, it is necessary to use these experiences within the financial opportunities of our country. This should be done in close

cooperation with international organizations and financial institutions. Because, some of those agencies are carrying out these types of activities. For example, there is the program of the European Bank for Reconstruction and Development related to the covering of the 40-60% of the costs incurred for the implementation of international standards by the manufacturers of our country. The program is being implemented successfully.

4. Encourage the establishment of private conformity assessment bodies. Mandatory conformity assessment activities in the country for a long time carried out by the government prevented the establishment of private enterprises in this field. However, passing to the private sector this type of activity in our country as well paved the way for the creation of this type of enterprises. Most of the private certification companies operating in Azerbaijan are foreign and international companies. Local companies have shown little interest in this area. On the other hand, despite the fact that this area is liberalized, the provision of those services by state enterprises prevents the creation of private enterprises. Therefore, the expansion of this field is very important both from obtaining by manufacturers more competitive conformity assessment services and from the development of the business areas related to conformity assessment activities point of view. There are hundreds of private enterprises in this field in Europe. Competition among them leads to service quality improvement and price reduction for the services provided to the manufacturers.

In our country, to encourage the industry the awareness and promotion activities should be taken in the first place. As well as technical support to fulfill the necessary requirements of local businesses and their accreditation should be conducted. Because, the lack of accreditation of local businesses means abcence of international recognition of their compliance documents, which in turn discourages manufacturers from using their services. The accredited local companies should be registered and those companies should be recommended to the manufacturers. [Aslanov Z.Y. 2015. p.149]

One more issue should be noted that some even international certification companies operating in our country deceive manufacturers by selling fake certificates to them or give them for extra money a certificate before necessary requirements met by manufacturers. That’s means delusion of consumers and sale of unsafe products to them. Therefore, in addition to promoting the creation of private enterprises, their operation in accordance with requirements, especially the

mandatory certification of the products' safety parameters should be carefully controlled.

5. Adaptation of new products in the consumer market. Manufacturing of the products according to the new technical regulations and standards will lead to an increase of their production costs and thus, an increase of their market price. This will result in a rise in consumer prices in the market. Therefore, in order to prevent the increase of the prices of products as much as possible it is necessary to support the manufacturers to reduce their costs by usage of the above-mentioned financial aids, grants and soft loans. At the same time, the gradual measures in the direction of the improvement of social welfare and the increase to the level of consumer purchasing power in Europe should be taken.

Another important point is the improving citizens' consumer culture and to be more demanding of products purchased, including the implementation of comprehensive measures for the protection of consumers' rights based on international experience. The harmonization of the product safety regulation system with the international standards leads to the giving more freedom to the manufacturers, which in turn leads to the abuse of freedom by manufacturers. In a market economy consumers are getting better than government to prevent this kind of abuse. The exactingness of consumers makes manufacturers more sensitive than the exactingness of government. Therefore, the important measures aimed at developing a culture of consumer awareness should be promoted.

Conclusion

One of the most important elements of the adaptation of the national standardization system with international standards should be especially the development of the private sector to new system requirements. Thus, that will require billions investment from the private sector for the transition to the new system to be able to apply the new national standards based on international standards. To do this, it needs to think in advance about the necessary investments and preferential loan programs. In addition to this, the new system requires from the private sector the establishment of closer cooperation and development of standards, based especially on the needs of the private sector itself. This in turn makes inevitable by private sector to take a more active role in this process, so in order to take that role by the private sector it should be properly informed and the mechanism for participation should be formed.

References

[1] Aslanov Z.Y. Study and analysis of the characteristics of international standardization system. UNEC. 2009. p. 436-439.

[2] Kleinemeyer J. "Standardisation as a Tool for Strategic Management"in W. Hesser (ed.) From Company Standardisation to European Standardization, Hamburg: Universitet der Bundeswehr, 1995, -15p.

[3] Grindley P.C. Standards Strategy and Policy: Cases and Stories. Oxford: Oxford University Press, 1995, -304 p.

[4] International Centre for Policy Studies. Market survelliance in Ukraine: Reforms on the way to the European Market. Kyiv, 2011, -93 p.

[5] WTO. World Trade Report 2005: Exploring the links between Trade, Standards and the WTO, Geneva: World Trade Organization, 2005, -377 p.

[6] International Trade Center (UNCTAD|WTO). Road map for quality: Guidelines for the Review Of the Standardization, Quality Management, Accreditain and Metrology (SQAM) Infrastructure at National Level. Geneva, 2004, -95 p.

[7] Vries H.J. "Standards for business – How companies can profit from participation in international standards setting", in Standardization as a strategic tool, Geneva: IEC, 2006

[8] Aslanov Z.Y. Development of processes of Quality Management System in the Engineering enterprices. European journal of Economics, Finance and Administrative sciences. France, issue 71, january 2015, p. 149-157 .

MODEL OF A EVALUATION OF AN INNOVATIVE CAPITAL OF THE SUBJECTS ON THE BASIS

Arzu Dogru Huseynova

Ministry of Economic Development of the Republic of Azerbaijan The Institute for Scientific Research on Economic Reforms, Head department the development of innovation.
elm@box.az

Ophelya Idris Mazanova

UNEC, head programmer
Ophelya2008@gmail.com

Abstract

The author analyses classification of the methods for evaluation of an enterprise's innovative potential. According to the author, the most effective model taking into account the uncertainty factor is the model based on the theory of fuzzy sets. The model has obvious advantages in comparison with the expert and statistical methods of evaluation, since it allows us to minimize the evaluation errors.
The scientific-practical value of the results consists in a possibility of their application in a combination with the analysis of the official statistical data in the course of perfection of the state scientific and technical and innovative policy in the direction of a more intensive use of the scientific knowledge and achievements in the interests of modernization of the economy of Azerbaijan. The proposed approach can ensure an information integration of the subjects of the scientific organizations and be used for a complex research of the industrial, innovative and economic-administrative processes within the framework of development of science.

Keywords: scientific organizations, innovations, scientific activity, evaluation criteria, innovative potential, expert evaluation methods, fuzzy sets

Jel Classification Codes: O32

Introduction

Transition to an innovative economy and necessity to ensure competitiveness of the objects demands from the subjects of the innovative processes a radical change in the approaches to selection and substantiation of the directions of the innovative activity, forms and methods of its realization.

An effective use of the innovative potential makes possible a transition of an economic system into a qualitatively new state. Such a potential of the subjects is transformed into a concrete form during an innovative process ensured by the subjects' activity.

One of the factors raising the scientific substantiation of the innovative activity management is evaluation of the innovative potential.

Studying and evaluation of the level and trends of development of the innovative potential in various sectors of the national innovative system allows us to single out a set of the factors and conditions necessary for a steady economic development of the economy as a whole.

Development of the techniques for evaluation of the innovative component in the new and developing sectors of the economy becomes more and more urgent. In practice great attention is devoted to evaluation of innovations and innovative activity.

Among the existing techniques it is necessary to point out the technique of a uniform statistical investigation of the scientific research and development – Frascati Manual - (Organization of Economic Cooperation and Development - OECD), the method for evaluation of the index of the scientific-technical potential, as a component of an integrated indicator of the level of a country's competitiveness (experts of the World Economic Forum - WEF), method for evaluation of the development of the innovative activity of the European Union (EU), used by the experts of the Commission of the European Communities (CEC), methods of the national associations of automated trade, and various factor-indicative methods, which, as a rule, are based, on generalization of the statistical and analytical data, obtained from inspections of enterprises.

Integration of the estimated elements into a uniform integral indicator, as a rule, is done with the use of various mathematical probabilistic methods. In our opinion, it is possible to single out a number of common problems arising in their practical use. Among them is selection of a mathematical apparatus allowing to obtain trustworthy data and take strategic decisions in the conditions of uncertainty and insufficiency of the statistical data for the analysis of an innovative potential.

The usual sequence of actions in the analysis includes the following stages: problem statement; object analysis; selection of a method; elaboration process; analysis of the development results.

From the point of view of the analysis of the means of evaluation the most essential stages are selection of an evaluation method and the process of working out of an evaluation.

New classifications for evaluation of an innovative potential continue to appear. The main reason behind this is a complexity of the subject of evaluation and indivisibility of the innovative potential into independent components. The boundaries between the components are fuzzy, and frequently it is difficult to find «a dividing line». Therefore we believe, it would be correct to classify the methods, which are basic for evaluation of the systems of any complexity degree and acting as a basis for construction of the existing techniques.

Objectives

The purpose of the article is to assess scientific and technical or innovation potential in regions of Azerbaijan.

The evaluation methods can be subdivided into classes by a number of signs concerning the specific features of the aim of an evaluation, of an investigated process and applied instruments. If we take the distinctions in the sources of the initial information as a classification basis, the evaluation methods can be divided into two classes - quantitative and qualitative ones (*Gorbenko A. A. (2012))*. Division of the methods meets the basic requirements of the system analysis, consisting in a combination of formal and informal presentations, which is convenient for elaboration of the techniques and selection of methods for a gradual formalization of reflection and analysis of a situation The quantitative methods (Fig.1) are based on a mathematical apparatus. It is probably not realistic to have a deep knowledge of all the methods of modern mathematics, however, when selecting a method, it is important to understand the specific features of a direction and possibility of its use for evaluation of an innovative potential. Selection of an evaluation method to a great degree determines reliability of the obtained data and, hence, is a very important stage. An evaluation methodology is based on varied by their levels of scale and scientific validity methods, approaches and techniques for evaluation of an innovative potential. Thus, the methodology of research of difficult dynamic systems, to which social and economic systems belong, is rather rich and includes both the elementary methods, which do not use mathematical mechanisms, and the most complicated multifactorial computer modeling. It is obvious, that for carrying out of economic evaluations not all of the above methods are used, but only the ones, which are optimal from the point of view of accuracy and simplicity of realization, and which take into account the character of the economic information.

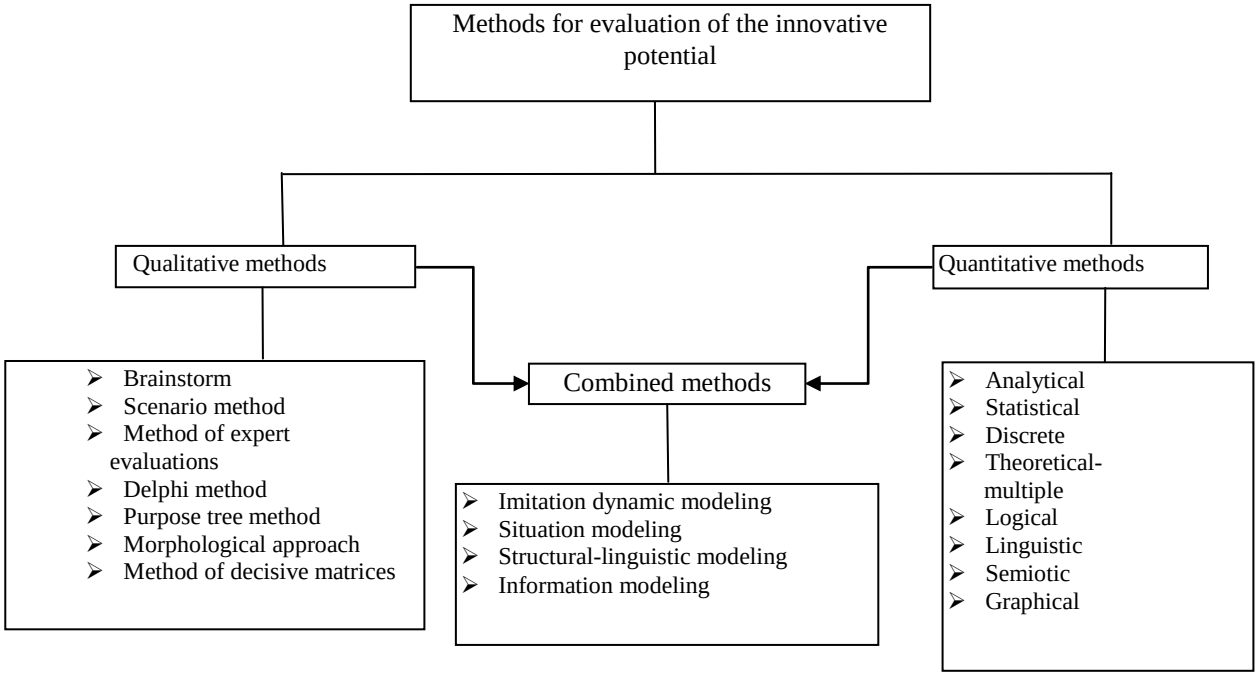


Figure 1. Classification of the methods for evaluation of an innovative potential

The method of expert evaluations connected with gathering, systematization and processing of various kinds of evaluations and the statistical methods got a wide application in management of innovative activity. Such popularity of the methods is due to simplicity of their realization and minimal volume of the preparatory and auxiliary actions. In a number of cases application of the expert methods is the only possible way, if quantitative retrospective information is not available.

Methods of expert evaluations are the methods of organization of work with specialists-experts and processing of their opinions expressed in a quantitative and/or qualitative form, for the purpose of preparation of information for decision-making (*Gorbenko A. A. (2012)).*

The task of the expertise is an evaluation of the scientific and technological level of an object and its feasibility and efficiency. On the basis of the expertise decisions are taken concerning the expediency and volume of financing. The methods of expert evaluations are used for forecasting of the scientific and technical events, which are the sources of innovations, and for identification of the actions, necessary to ensure the scientific-technical and economic development of an object, and for forecasting of the terms and costs for solving of the arising problems.

The expert methods allow us to predict the qualitative breakthroughs in various areas of science, technologies and economy, changing the present

development trends. A drawback typical for all the expert methods consists in prevalence of a subjective approach to evaluation of the future.

Often a most accurate evaluation of the future is influenced by the psychological factors, for example, such as the opinions of the majority of experts or opinions of the most authoritative scientists. The expert methods are effective for evaluation of an innovative potential, when the quantitative methods do not justify themselves, because it is practically impossible to find a function, adequately approximating the dependence between a big number of variables in the conditions of uncertainty of the initial data and limiting terms.

Statistical method for evaluation of an innovative potential

Such methods allow us without revealing of all the determined ties between the studied sequence of events or system elements reflected in a model, but on the basis of a selective observation to identify regularities and to extend them to the behavior of the system as a whole, to detect the character, force of mutual influence of the elements within a system structure and also of the environment components. The statistics elaborates a special methodology for studying and processing of materials: mass observations, method of groups, average values, indexes, balance method, method of graphical images, and other methods of analysis (*Gorbenko A. A. (2012)*).

Statistics of numerical data is a basic method widely used in economic researches. The methods based on the numerical statistics have a number of drawbacks. Such inaccuracy in respect to the analysis of an innovative potential consists in impossibility to have statistical information during an indicator analysis, or in an insufficient volume of samples for certain indicators.

Obviously, for creation of an adequate and accurate model for evaluation of an innovative potential of subjects the methods based on the numerical statistics and the methods of expert evaluations cannot be used in their pure form because of their serious drawbacks (Table 1).

Therefore usually the method of expert evaluations and the statistical method co-exist in an analysis of the economic indicators, which have digital presentations. In this case drawbacks of one method are compensated for by the advantages of another. However such a combined approach to evaluation of economic indicators also has its drawbacks. This is connected with the fact that an accuracy of evaluation of a probability of realization of an event depends on a number of factors, beginning from the quality of the statistical information and finishing with the expert evaluations: uncertainty is present in evaluation of this or that economic indicator.

Table 1.Comparison of the basic methods for analysis of social and economic indexes

Methods for evaluation of indicators	Positive characteristics	Negative characteristics
Method of expert evaluations	Evaluation of the quality indicators is possible	– Subjectivity of the expert evaluations; – Not always based on mathematical calculations; – Labor intensiveness
Statistical method	Based on mathematical calculations and numerical data	– Inaccuracy due to absence of a big entire sample of the initial data; – Impossibility to evaluate the qualitatively expressed indicators
Fuzzy set method (non-numerical statistics)	Allows: - To use the data of a non-numerical nature and the data, characterized as quasi-statistics; - To obtain more reliable data in the conditions of a low statistical sample; - To form a full range of possible scenarios for evaluation of an innovative potential; - To obtain evaluations in the form of a point value and in the form of a multitude of interval values with its distribution of possibilities characterized by the membership function of the corresponding fuzzy number, which opens opportunities for forecasting and evaluation of risks; - To operate with a not absolutely accurate set of a membership function, but with interval values (unlike probabilistic methods, the result on the basis of fuzzy-interval descriptions is characterized by a low sensitivity to the change of the membership functions of the initial fuzzy numbers, which in real conditions makes application of the given method more substantiated); - To reveal successfully expert knowledge with possibility of its formalization.	Labor intensiveness when the method is for first time applied for a concrete object of research

The fact that uncertainty is not taken into account in an estimation model leads to a considerable error in the results. In modern conditions such an error is inadmissible. Therefore for evaluation of an innovative potential only the theory of fuzzy sets is used.

Fuzzy-set method for evaluation of an innovative potential

Set-theoretic presentations are based on the following notions: set, set elements and relations over set. Of special importance is the analysis based on the theory of fuzzy sets (*Gorbenko A. A. (2012)*).

Construction of models within the framework of the fuzzy approach gives us a chance to compare models and to give exact meaning to the notions:

"high", "low", "most preferable", "highly expected", "most likely".

There appears what is described in science as a linguistic variable with its term-multitude of values, while the connection of the quantitative value of a certain factor with its qualitative linguistic description is set by the functions of membership of the factor to a fuzzy set. Certainly, the theory of fuzzy sets is not an absolutely

independent method and it is used in a combination with the other methods of evaluation for the purpose of introduction and taking into account of the uncertainty factor. For the analysis of the social and economic indexes the theory of fuzzy sets is usually used together with the statistical methods and methods of expert evaluations.

In our opinion, one of the possible ways to increase reliability and validity of the evaluation of the level of an innovative potential is application of the methods based on the theory of fuzzy sets. Fuzzy-interval methods have indisputable advantages in comparison with the probabilistic methods in the conditions of uncertainty (Table 1).

So, for evaluation of a multifactorial model of an innovative potential most suitable is the method, which can allow us to eliminate the insufficiency of the data used for evaluations and probability of the experts' errors. Therefore, the fuzzy-set approach is the most acceptable in this situation, allowing experts to think in the categories correlated with concrete numerical intervals. The existing systems of classifications of the methods for evaluation of an innovative potential of the economic systems can be expanded by the mathematical methods of the fuzzy sets theory.

Development of a system of balanced indicators for evaluation of the level of an innovative potential and determination of their interrelation within the framework of such a model were done with the use of a determined factorial analysis, and are logically predetermined by the essence of an innovative activity of the subjects (countries, economic zones, regions and enterprises).

System of evaluation of the level of an innovative development of subjects based on the use of heuristics and fuzzy measures of similarity

A specific feature of the proposed approach is a combination of a situational approach to decision-making, heuristic methods and algorithms based on the use of the fuzzy sets theory. Decision-making is one of the basic components of any management process. Despite its seeming simplicity a decision-making process is not simple at all.

Nevertheless, there are common features for any decision-making process, no matter, where it is carried out. It is a uniform core, which forms the technology for elaboration and adoption of decisions, employed in any organization. This is the common foundation, on which the decision-making theory is based. One of the specific features of such theory is availability of the methods, allowing us to process the quantitative and qualitative information.

In a number of cases in the process of decision-making we have to resort to the use of an expert evaluation and fuzzy logic, intended for operation with the quantitative and qualitative information. The main aim of the expert technologies is to enhance professionalism and efficiency of the adopted administrative decisions (*Malyshev L.A., Shestakov I.V. (2012)*). Today many works are devoted to the problems connected with the adoption of administrative decisions. Here we will discuss the main stages of elaboration and adoption of decisions used for management of any organization.

There are different ways for presentation of a decision-making process, in the basis of which are varied approaches to management: systematic, quantitative, situational, and other approaches.

As a number of authors point out (*Goncharenko A.P. (2007)*), the situational approach reflects more fully the problems arising as a result of an administrative activity, it is a universal approach and, in fact, it includes the basic methods connected with adoption of management decisions contained in other approaches.

Decisions are prepared on the basis of all the available information concerning the situation, its careful analysis and evaluation.

For realization of the situational approach to adoption of management decisions the following tasks have to be solved:

1. Obtaining and analysis of information concerning possible states of an object of management;
2. Identification of the properties of an object of management determining its state and influencing adoption of the management decisions;
3. Transformation of a family of properties of an object of management into a system of parameters (indicators and criteria) of the state of an object of management;
4. Description of the "hierarchy" of the parameters of an object of management;
5. Formation of a system of measures, in which the indicators' values and evaluation criteria concerning the state of an object of management are estimated;
6. Scaling of the systems of measures by introduction of a system of relations;
7. Elaboration of the methods and procedures for formation of the files of the reference states of an object of management;
8. Ascertainment of metrics and determination of similarity measures in the space of signs of a state of an object of management, by which the affinity of the state of an object of management to the reference state will be determined;
9. Working out of the methods and procedures for formation of files of management decisions;
10. Formalization of comparison of the management decisions with the reference states of an object of management, i.e. presentation of it in the form of an operator of a certain type;
11. Formation of a formalized description of the technology for adoption of a management decision on the basis of evaluation of a state of an object of management;
12. Repetition of the whole of the chain of procedures, if necessary.

Solving of the above tasks demands carrying out of the following procedures (*Zubov L.G (2012)*):

1. Proceeding from the analysis of the aim of management, many signs or parameters are singled out, by which the level of an innovative development of a subject is determined.

2. For each of the above signs an indicator is assigned corresponding to it, for

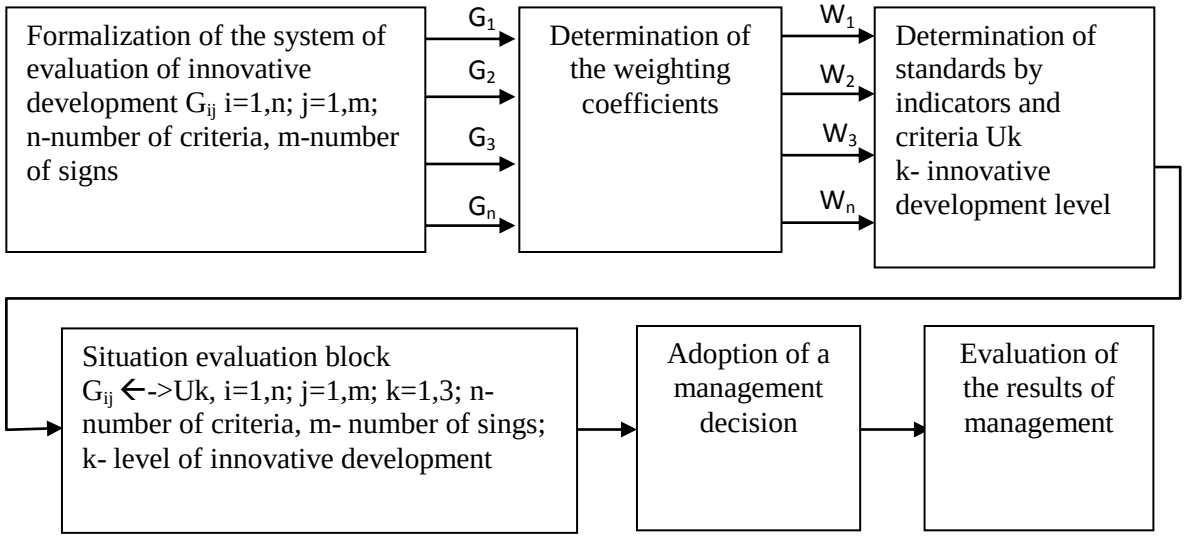


Figure 2. Scheme of adoption of decisions
G_{ij}- indicators; G_i- criteria; Uk- security level decision adopted

example, with the values: α1 = "high", α2 = "medium", α3 = "low".

3. Innovative development indicators α1, α2, α3 together with the families of their values form a multidimensional space. During evaluation of such a category as "innovative development of subjects", the space of signs has a hierarchal character. Formation of a hierarchy begins with breaking of the system of the innovative development indicators into groups of uniform indexes. Such a group is called a *criterion* – all the indicators are divided into two classes – indicators and criteria. Indicators of all the hierarchal levels are placed into corresponding basic scales {X,Y,...Z}, which form a base of multidimensional space indexes, each point of which (*x*0, y0,...,z0) characterizes a certain level of an innovative development of a subject.

4. The number of the levels of an innovative development of a subject necessary for an efficient control is determined.

5. The space of the innovative development indicators is divided into reference classes, which in a general case are fuzzy. With each of these classes certain levels of such development are bound, for example, U1 = "high", U2 = "medium" and U3 = "low".

6. A qualitative structure of the model of innovative development levels is formed, for example, in the form of a decision table. In each line, in the first n columns of the table there is one of the possible sets of parameters of innovative development, and the last column contains the level of an innovative development corresponding to the set.

7. Values of the parameters of a situation of management are evaluated, the set of which (*x*0, y0...,z0) determines its position in the space of the innovative development parameters.

There is, in a certain predetermined sense, the nearest to the point (*x*0, y0...,z0) reference class, by the level of which an innovative development level is defined. Implementation of the stage demands setting in the space of innovative development parameters of the metrics or affinity measures, through which the "nearest" reference class is defined.

8. In accordance with the results and "configuration" of the parameters' values.

Multifactor model of a complex evaluation of the subjects' innovative potential based on the theory of fuzzy sets

The above-stated order of adoption of a management decision can be presented in a form of a block-scheme for a factorial analysis of subjects. We will divide factors by n criterion.

Elaboration of the system of balanced indicators for evaluation of the level of an innovative potential and determination of their interrelation within the framework of such a model was done with the use of the determined factorial analysis, and was logically predetermined by the essence of the innovative activity of the scientific-technological complex of the economic zones.

N criterion of factors (groups) (G) is singled out and a scale is developed for evaluation of every model's element, a correlation is done of the indicators' values with the corresponding values of the level of an innovative potential (G - G_ij), where i is a number of criteria i=1,n; j is a number of indicators j=1,m; (Table 2).

Table 2.Factors for evaluation of the Innovative potential component of the scientific-technological complex of the economic zones

Numbers	Groups	Indexes	Indicators
G_1	Educational level	3	$G_{a1i}, i = \overline{1,3}$
G_2	Standard of well-being	2	$G_{a2i}, i = \overline{1,2}$
G_3	Level of infrastructure elements in a region	1	$G_{a4i}, i = \overline{1,1}$
G_4	Level of economic development of a region	2	$G_{a5i}, i = \overline{1,2}$

The opinions found as a result of processing of the expert data were averaged out with the use of an arithmetic mean. Where G_i – is weight of the factor for *i*- expert, k – is the number of experts.

$$\overline{G_i} = \frac{\sum_{i=1}^{k} G_i}{k}$$

The ranged list consisting of four groups has three levels of mutual preferences (Table 3).

Table 3. Ranged number of groups of factors by the method of a direct arrangement

Group number	Names of the groups of factors	Factor rank in the list
G_1	Educational level	3
G_2	Standard of well-being	2
G_3	Level of infrastructure elements in a region	1
G_4	Level of innovation development of a region	3

Weighting factors of the list ranged by Fishbern rule with the use of a recursive scale were determined. The condition of priority of the first two groups over each other and over the third group, and an alternative of indifference of the second and the third groups is characterized by the following relation:

$$G_3 > G_2 > G_1 \approx G_4$$

Determination of criteria by Fishbern Scale:

$$W_i = \frac{2 \cdot (n - i + 1)}{(n+1) \cdot n},$$

Where Wi – value coefficient of i- indicator; i – number of a criterion; n – number of criteria, i = 1, 2, …, n. In our case n=4 (Table 3). If the indicators have equal value:

$$W_i = \frac{1}{n}$$

Ranging of the investigated groups of factors is done by weighting coefficients (Table 4).

Table 4. Weighting coefficients of the ranged groups of factors

Group of factors	Weighting coefficients
G_1	0.25(25%)
G_2	0.30 (30%)
G_3	0.20 (20%)
G_4	0.25(25%)
Total:	1.00 (100%)

The proposed technique for a complex evaluation of an innovative potential, constructed with the use of the theory of fuzzy sets, was not previously applied to

evaluation of an innovative potential for **a factorial analysis of the social and economic environment** of the scientific-technological complex of the economic zones.

Implementation of the given method envisages several stages:

-Parametrical values from the corresponding groups of factors are calculated;

- Fuzzification is done – transformation of the design indicators into the values of linguistic variables with the use of the membership functions. For this purpose definitions of the linguistic variables and fuzzy subsets for each element are entered. Belonging of each accurate value to one of the terms of a linguistic variable is determined by means of a membership function.

Also possible is the use of the arbitrary and standard membership functions;

- At the stage of development of the fuzzy rules, the productional rules, connecting two linguistic variables, are defined. A set of such rules describes the management strategy applied for evaluation of an innovative potential;

- At the defuzzification stage generalization is done of the data concerning the level of an innovative potential into an integrated indicator with account of the weighting coefficients of the influencing factors.

For evaluation of the level of an innovative potential two linguistic variables are set. The first variable with the corresponding terms-subsets is introduced for evaluation of each concrete model element. Evaluation of each indicator is done according to the standard 3-level scale, where linguistic descriptions: low, medium and high correspond to the set intervals of the values of indicators (Table 5).

Table 5. Evaluation of the value levels of indicators Gi

Linguistic variables	Term (term - subset)
Low (IC)	Fuzzy subset of indicator (Gi) for the “low” level
Medium (IC)	Fuzzy subset of indicator (Gi) for the “medium” level
High (IC)	Fuzzy subset of indicator (Gi) for the “high” level

The above indicators have diverse character, but, since the value of any quantity indicator is within the interval from 0 up to 1, all the quantitative evaluations are bound with a linguistic variable. At that, the zero value of a fuzzy criterion is estimated as the worst of the possible values, and unity as the best. The second variable with a corresponding term-set is appropriated on the basis of the data evaluation of each indicator (G) corresponding to the levels of an innovative potential (LIP) by the given indicators (Table 5). It should be pointed out that in the scientific-technological complex of the economic zones positive growth rates of the financial-economic indexes are observed. Calculations were done of the indicators’ values included in the model of a complex evaluation of the innovative potential of such a scientific-technological complex. For description of the factorial

characteristics a standard was developed for evaluation of the factorial component of an innovative potential (Table 6).

Table 6.Evaluation of the level of an innovative potential (LIP) by indicators (Gi)

Linguistic variable	Term (term - subset)
Low (IC)	Fuzzy subset of the level of innovative potential "low"
Medium (IC)	Fuzzy subset of the level of innovative potential medium"
High (IC)	Fuzzy subset of the level of innovative potential "high"

Values of the indicators in various groups were calculated with the use of a step-by-step algorithm at the fuzzification stage:

1. Numerical values or their range, characterizing a certain term in the best way, are found for each term of a linguistic variable by each element. These values correspond with the unity value of the membership function.

2. The worst values of the parameters with a zero membership to the given term are defined. These values can be chosen as the values with a unity membership to the following term.

3. After determination of the extreme values, we determine intermediate values corresponding to L - or P - functions from among the standard membership functions.

4. For the values corresponding to the extreme values of a parameter, S- or Z-membership functions are selected.

Table 7. Standard for evaluation of the indicators of the index of an innovative potential

Linguistic variable	Standard
Low (IC)	<10%
Medium (IC)	10%-75%
High (IC)	>75%

Application of the method of the factorial analysis of development of RSTC during evaluation of the innovative potential (Table 8) also provides opportunity to identify invariantly the innovative products.

In the course of monitoring of an innovative activity information about the subject of an innovative potential is taken into account.

For the purpose of finding out of the opportunities and effective ways for increasing of the innovative potential of the subjects an analysis and evaluation were carried out of the innovative potential by the technique of the scientific-technological complex of the economic zones.

The basic directions of innovative development were determined. Statistics of the factors of the scientific-technological complex of the economic zones were revealed.

Table 8.Index of Factors

	Index			
Economic zones	Innovation	Education	Well-being	Infrastructure
Quba-Khachmaz	0.1353314	0.01552	0.150648	0.23982595
Shaki-Zaqatala	0.1552562	0.032513	0.165321	0.26793471
Lankaran	0.1619498	0.04267	0.176193	0.26698667
Yukhari-Karabakh	0.1659169	0.030055	0.134221	0.33347475
Aran	0.1839129	0.025665	0.166893	0.35918047
Ganja-Qazakh	0.2595628	0.191951	0.253392	0.33334487
Nakhichevan	0.2817092	0.237058	0.198661	0.40940835
Absheron	0.4974446	0.283127	0.209206	1
City of Baku	0.9176619	1	1	0.7529858

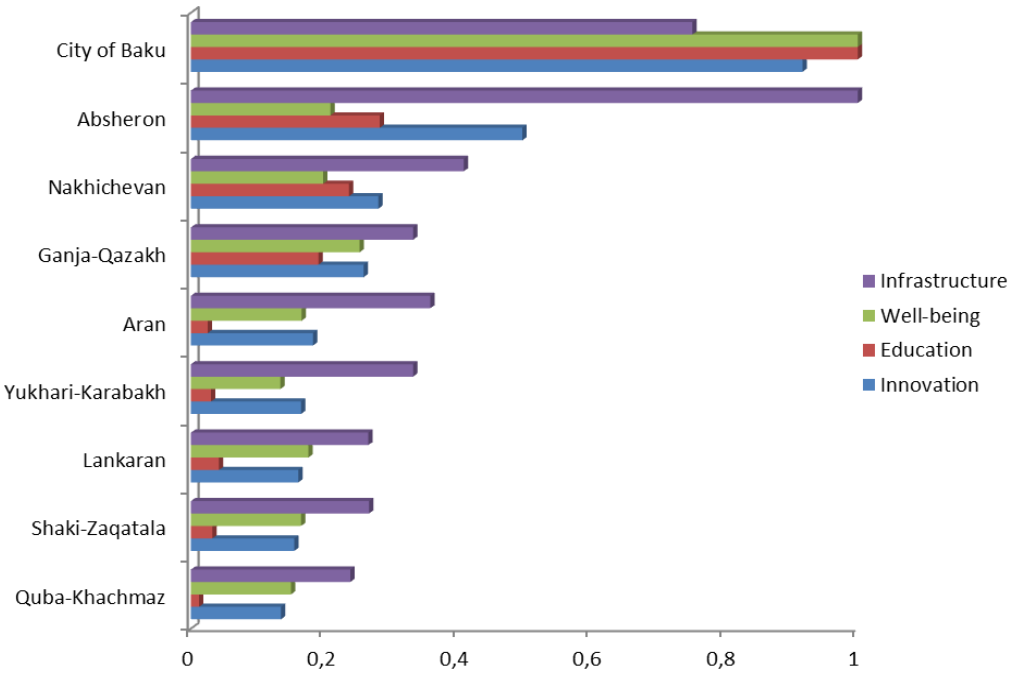


Figure 3. Index of Factors

The work also included monitoring of the level of an innovative potential of the scientific- technological complex of the economic zones (Table 9). This method can also be applied for evaluation of the innovative potential of various subjects.

Table 9.Indicators of the innovative potential of the scientific-technological complex of the economic zones

Number	Name of group of factors	Quba-Khachmaz	Shaki-Zaqatala	Lankaran	Daglig-Shirvan	Aran	Ganja-Qazakh	Nakhichevan	Absheron	City of Baku
G_1	Educational level	Low	Low	Low	Low	Low	Medium	Medium	Medium	High
G_2	Standard of well-being	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	High
G_3	Level of infrastructure elements in a region	Medium	Medium	Medium	Medium	Medium	Medium	Medium	High	High
G_4	Innovative level	Medium	Medium	Medium	Medium	Medium	Medium	Medium	High	High
Total:		Medium	Medium	Medium	Medium	Medium	Medium	Medium	High	High

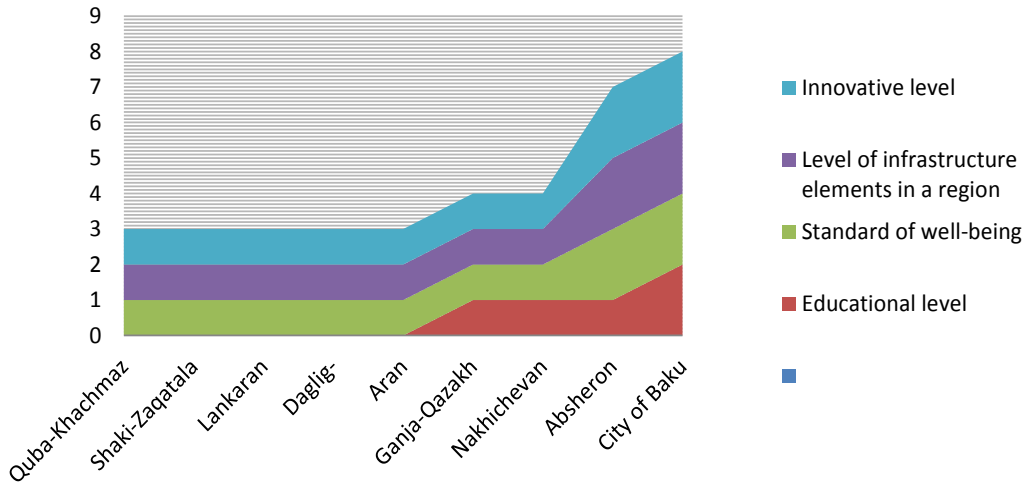


Figure 4. Indicators of the innovative potential of the scientific-technological complex of the economic zones

Thus, the results of the implemented research allow us to carry out monitoring of the innovative potential of the subjects, which, in the long run, makes it possible to control their efficiency and to take substantiated strategic decisions.

Statistical analysis

Microsift Excel2013 and SPSS software (version 17.00) was used for statistical analysis.

Results

On the basis of the examination of the state of the innovative potential and identification of its

development problems it is possible to draw the following conclusions:

- Innovative potential of the subjects should be understood as a system of interconnected resources, which determines real opportunities for realization of an innovative activity. Adoption of the strategic decisions based on an effective use of the innovative potential ensures additional competitive advantages for the subjects.

- Dynamic properties of the innovative potential require, in the conditions of uncertainty, adoption of the decisions oriented on its development, which is especially important, in the scientific sphere, and demand a search for new methods of analysis and evaluation with the use of a modern mathematical apparatus.

1. Diagnostics of the state of the scientific sphere and monitoring of its development have demonstrated that the major factors constraining the innovative development are a low level of innovative activity, unsatisfactory state of the technological base and unpreparedness of the personnel for an innovative activity.

2. Analysis of the techniques applied for evaluation of an innovative potential has shown, that a considerable part of them leans on probabilistic methods, which demand sufficient statistical sample of data. Some of the techniques are based on the use of mainly expert evaluations. In practice evaluation of an innovative potential of enterprises with application of such techniques often appears to be too complicated. In this connection we should search for the methods allowing us to evaluate the innovative potential of subjects in the conditions of uncertainty.

Use of the fuzzy-set descriptions, in our view, provides an opportunity to take into account the drawbacks of the techniques previously used for evaluation of the innovative potential of the subjects and to avoid difficult mathematical calculations.

3. The methods proposed in the work for a complex evaluation of the innovative potential of the subjects on the basis of the theory of fuzzy sets meet the requirements for obtaining of reliable results in the conditions of uncertainty.

The proposed technique allows us to establish a correlation between the numerical values of the indicators and the level of an innovative potential, connecting them with the evaluations of the linguistic variables. By means of the given technique it is possible to implement a quantitative interpretation of the qualitative factors expressed in the terms of a natural language.

4. The methods developed for a complex evaluation of an innovative potential allow us to apply them to different subjects, and also to carry out monitoring of its level, which makes it possible to implement control over the enterprises' activity and to improve their management system in order to ensure their effective innovative development.

Acknowledgement

The research work was carried out with funds allocated according to "Expenses for economic reforms" paragraph of State Budget of the Republic of Azerbaijan for year 2015 confirmed by the number 290s order of Cabinet of Ministers of the Republic of Azerbaijan which was signed in 1st October 2015.

Topic of the article is based on the agreement signed between Ministry of Economy and Industry of the Republic of Azerbaijan and Institute for Scientific Research on Economic Reforms to "Prepare recommendations and suggestions for increasing effectiveness of assessment of innovational activity and functionality of innovations in Azerbaijan".

References

[1] Gorbenko A. A. (2012) Systematic approach to analyzing the structure and nature of innovation capacity [Text] / A. Gorbenko / / Journal "Integral" . , 2012. Number 1 (0.5 ps)

[2] Goncharenko A.P. (2007) The role of the national system of scientific and technical information in the development of innovative economy in Ukraine / A.P.Goncharenko / / Problems of science. - 2007 . - № 2 . - S. 14-18.

[3] Zubov L.G., Andreeva O.N., Antropov O.A., Arzhanykh E.V. (2012) Public research organizations : the state , the dynamics and problems of development / / Information- analytical bulletin . - 2012 . - № 4 .

[4] Malyshev L.A., Shestakov I.V. (2012) Analysis of approaches to the evaluation of the innovation activity of Russian companies / / Herald PNIF . Socio-economic sciences , 2012, № 14 (38) , p. 101-110 .

[5] Nadzhafov Z.N/, Gasimov F.H., Huseynova A.D. (2011) National Innovation Policy of the Republic of Azerbaijan / / magazine "Science and Innovation ", September 2011, p . 36-41 .

Oslo Manual : Guidelines for collecting and analyzing data on innovation . The third edition (2006), Moscow , 2006, 192 p .

[6] Sanzhapov B.H. , Kopylov A.V. , Kopylov D .A. (2012) Classification methods to assess the innovation potential of the company / / The Gazette VolgGASU . Ser. : Build . Informatics . , 2012. MY . 7 (21). Mode of access : www.vestnik.vgasu.ru.

[7] Trifilova A.A. (2005) Evaluating the effectiveness of innovative development company . Moscow: FIS 2005 .

INFLUENCE OF OIL PRICES ON INNOVATION IN RENEWABLE ENERGY SECTOR

Emil Eyler Gasimzade

Lecture, MBA Department

Abstract

In this study, oil prices' impact on innovation in renewable energy sectoris analyzed. Using correlation-regression analysis, yearly average oil prices are taken as independent variables and patent counts as dependent variables. Patent counts act as proxy and indicator of innovation. For finding the consequent reaction and relationship, independent variables are lagged by one and two years. The study covers 1982-2010 period. Patent data is got from PATSTAT database for patents of European Patent Office (EPO).For the years of 1982 – 2010, firms that have applied to at least one solar (photovoltaic) patent are chosen for dataset. According to the analysis, oil prices have positive impact on innovation in renewable energy. In one year and two years periods companies' reaction regarding renewable energy innovation to oil prices are positively correlated, but in one year period this effect is greater.

Keywords: renewable energy sector, oil prices, solar energy, innovation, determinants of innovation

JEL Classification Codes: O31, O32, O33

Introduction

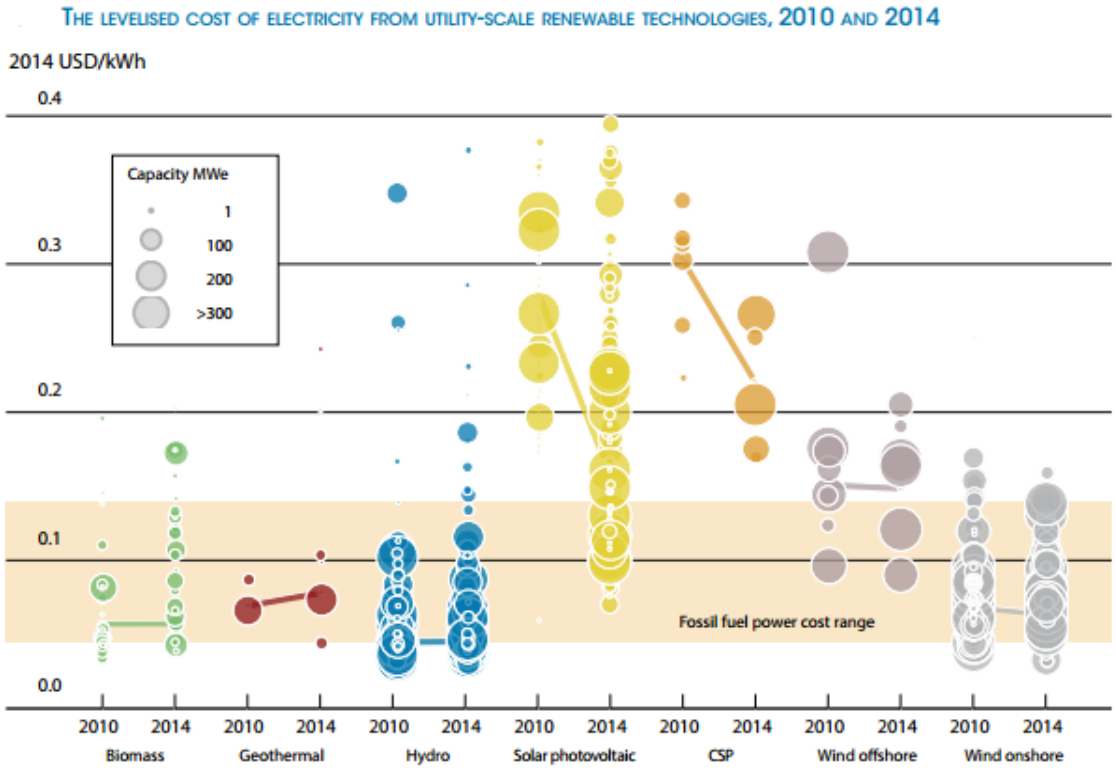
Renewable energy is an alternate source of energy which is naturally renewed, therefore doesn't deplete in contrast with conventional energy sources. As technology improves and count of people in the world rises, daily energy need of the world increases significantly. In such conditions governments and companies fulfill many activities to keep up with high demand for energy, and search for alternative and cheaper energy sources. But, costs of producing alternative energy are mainly higher than that of conventional energy.

Many years ago cost of alternative energy production was much higher, but important advances have been made in these renewable sectors. If we analyze what resulted in this, the answer will probably be the innovation.

Innovation is a broad category and defined as "the successful introduction into an applied situation of means or ends that are new to that situation" (Mohr, 1969, pp.112) [1].

Innovation is the remedy that can improve our life qualities, besides, innovation decreases costs in many industries, and renewable energy belongs to this group too. Innovation creates, endows wealth, comfort, reliability, quality.

If we look at cost of producing electricity from different resources, as shown in the graph below, the levelised cost of electricity from utility-scale renewable technologies has been decreased from 2010 to 2014. But, if we for example take solar photovoltaic and compare it to fossil fuel energy costs for producing electricity, we can see that, the solar energy costs more. So, new and more innovation is required for better competitiveness.



Credit: RENEWABLE POWER GENERATION COSTS IN 2014; The International Renewable Energy Agency (IRENA) [2].

In another study, LAZARD finds that although conventional energy prices fall, costs in some renewable energy sectors (e.g. solar) has continued to shrink [3]. Decreasing costs can be a sign of more and new innovation despite of falling energy prices.

In general terms, relationship seem to exist between conventional energy prices and innovation in alternate energy sectors, and it seems to be positive correlation, but, as we noted, some studies find sometimes the costs in renewables

continue to diminish in spite of decreasing oil prices. Simply, it seems logical that, as oil prices increase, companies need to shift to cheaper energy resources. If , say, 45 USD per barrel to generate electricity is much cheaper than some renewable energy sources, but when prices increase to 60 USD, then renewable energy sector's competitiveness chances increase and more and serious innovation is a good solution for cost shrinking.

In this research, I would like to shed light on possible relationship between oil prices and innovation in renewable energy sector.

Trends in renewable energy

According to OECD Factbook, In OECD (Organisation for Economic Co-operation and Development) countries, growth and development are more significant in renewable energy sector, which shows the importance and focus on this sector. Thus, between 1971-2014 total primary energy supply grew on average 1.0% yearly, but on the other hand this growth figure for renewable energy supply is 2.7%.

Among renewable energy sources hydro-power experienced the least growth rate (1.1%), while geothermal exposed 4.9%, biofuels and waste 2.9% growth rate yearly.

Governments stimulated development some renewable energy fields like solar and wind energy and they have achieved rapid growth.

During the discussed period total share of renewable energy in energy supply increased from 4.8% to 9.2%. But, while some countries get significant share of their energy from renewables (Iceland – 89.3%, Norway 43.5%), in some others (Japan, Korea) renewable energy sector contributed to total energy sector as low as 5% share [4].

According to UNEP's 10th "Global Trends in Renewable Energy Investment 2016", prepared by the Frankfurt School-UNEP Collaborating Centre for Climate & Sustainable Energy Finance and Bloomberg New Energy Finance, in 2015 investments in renewable sector became 286 billion dollars, which is about three percent higher than in 2011. Custom energy sources gas-fired electricity and coal got less than half investment than solar, wind and other renewables.

In 2015 first time in the history, developing countries' investments in renewable energy sector left behind the developed countries and much of this was because of China [5].

These trends show the interest in renewable energy, and it is growing bigger each new year. Countries and companies look for ways to get more of their energy from renewable energy resources, and their investments are towards more and cost-efficient usage of renewable energy sources.

Factors that might stimulate innovation in renewable energy

There can be a lot of micro and macro level factors that stimulate or demotivate innovation. Energy prices being part of macro-level factors, it would be worthy to look at some such elements.

Henriques and Sadorsky correctly informs that, only little statistical research tries to find relationship between oil prices and financial gains and stability of renewable energy companies. Using vector auto regression model, they analyze correlation between stock prices of renewable energy companies and energy, technology stock prices and oil prices. According to their analysis, changes (shocks) to technology stock prices is more relevant to renewable energy companies' stock prices rather than changes in oil prices [6]. The hint is that, renewable energy sector represents the technological situation and is less influenced by other sectors including custom energy. Science is a solid base for innovation and improvements in science and technological environment, impact all sectors, as the newly invented finding many times can be applied to more than one sector. Technological changes themselves are influenced by investments, quantity and quality of scientists working on project, and technology stock prices can determine the financial situation, hardships and initiatives. Consequently, fall of stock prices can create financial hardships in technology related investments and all related sectors might be influenced, and in opposite, increases of stock prices can create money flow available for R&D and stimulate innovation. Here, I want to note that one of the most important elements in renewable energy innovation is the technological situation throughout the country or region, and new general scientific improvements impact the sector.

According to Cheon and Urpelainen, advances in technologies decrease costs of structural changes. Simultaneously such advances positively affect political actions towards such changes. The study focuses on the relationship between oil prices and policymakers' and entrepreneurs' actions towards innovation in energy sectors. They use data such as public research and development expenditures and patents to gauge the relationship and findings support positive relationship [7]. Policymakers' actions are good reason that can determine renewable energy innovation. Many countries today try to focus on renewable energy more and governments have tools to motivate innovation and investments in these sectors. Dependance on oil creates unstability and uncertainty regarding future and more risks. In contrast, renewable energy is something that countries and companies rely on long-term and such 'dependance' would not create similar risks. Governments through subsidies, creating knowledge hubs, helping universities, financing projects can direct innovation towards required fields.

When looking at policymakers' actions towards renewable energy from economic aspect, it is also important not to forget environmental benefits of alternative energy sector. Environmentalists and some representatives of governments focus on side-effects of custom energy and try to shift carbon-free energy sources. Here some might question why people just simply don't shift, but need innovation for this purpose. As noted above, costs are many times higher and innovation can decrease cost differences. Johnstone, Haščič and Popp study influences of environmental policies on renewable energy innovation. According to their analysis based on patent applications as determinant, various policy instruments have impact on innovation in renewable energy sector. Further, while broad-based environmental policies have special effect on innovation in areas which compete with custom energy sources, specific and targeted policies have effect on innovation in more costly renewable energy technologies [8]. Another important factor that can influence renewable energy innovation (alone or together with other drives) seems to be environmental policies.

According to Induced innovation theory, many economic factors, including input prices, market demand and etc. influence companies' focus on research activities. Lichtenberg analyzes effects of energy prices on research and development by United States companies and finds that, industries where price increases are witnessed more also show high tendency and growth in R&D expenditures [9]. R&D expenditures solely cannot determine innovation, as innovation is also dependent on many other factors, such as how innovation-open the sector or technology. For example, if we spend the same amount of money for R&D on wood products and electronics, logically, electronics sector will encounter more innovation. However, it is clear that R&D spendings and innovation should be positively related. The study by Lichtenberg does analyze the energy prices' effect on innovation in the same sectors, but in this study, we want to see the influence on related/alternative sectors and whether such energy price increases also stimulate to shift to other sectors and consequent stimulation to invest in innovation (or R&D). Another interesting research is done by Crabb and Johnson. They gauge effects of oil prices in innovation in energy-efficient automotive technologies. Using patenting model, they confirm their hypothesis. They conclude that fuel prices' acquisition cost is important element in determining future level of innovation [10].

We noted the emphasis of science above, but how science or knowledge is available to inventor, to R&D people is an important element. Popp, one of the most great researchers in innovation field, uses patent data to measure energy prices' effect on innovations which are energy-efficient, therefore, demand less costs. His study shows that, prices have serious role in stimulating innovation, simulatenously,

how available the knowledge to inventors and how qualified this knowledge is another considerable factor. However, an important finding here is that, eliminating quality of knowledge influences the results of study can be affected adversely [11]. This discussed element also looks through science, but this time not the current situation of knowledge and technology, but how easily company and independent researchers can get the knowledge. Some copyrighting restrictions, institutional difficulties might create obstacles people to get latest improvements in science. Therefore, besides technology, science and how it is accessible can determine innovation in renewable energy sector.

Some researches don't see the rate of innovation in a given sector to be related with energy prices. For example, Newell, Jaffe, & Stavins claims that, despite rate of innovation in total seems not to be dependent on energy prices, direction of innovation is related with changes in energy prices. Thus, when energy prices increase, it motivates innovation towards a direction in which capital costs are decreased and energy efficiency is achieved. Their study shows that, since 1973 year in more than twenty years rising prices in energy sector have resulted in improvements in energy-efficiency of new models. They also claim that, after labeling requirements for products came to scene, responsiveness and reaction of such innovation to energy prices increased significantly. However, many improvements for energy efficiency seem to be independent [12]. This argument expresses its doubt about specific increase of rate of innovation, and it is very wise one. Thus, rather than investing heavily in your own sector, you can switch your innovation efforts to other cost effective and energy efficient sectors/inputs and this would support our argument too. A lot of time you can find substitutes, and as substitutes become more attractive or your current deal becomes rough, you are driven towards alternative sectors.

Hypothesis

After reviewing relevant studies, we can say that, various researches find influence of technology stock prices, political actions, quality of existing knowledge, environmental policies, price increases and etc. have impact on innovation in general and in renewable energy case. Sometimes complex set of factors influence altogether, and it becomes hard to determine factors which specifically influenced innovation in a given period. However, considering that increasing oil prices will result in rise in companies' and countries' energy input costs, therefore will create a need for alternative energy sources; and innovation is a good method for decreasing costs in alternative energy resources; furthermore, taking into account related research:

I hypothesize that, increasing oil prices positively influence innovation in renewable energy sector.

Empirical study

Method

I will use correlation-regression analysis to find relationship between oil prices and innovation in renewable energy sector.

Because renewable energy sector involves many fields (wind, solar, biofuel, geothermal and etc.) and therefore many and complex possible indicators exist, in my opinion, the best strategy would be choosing one of the fields and analyzing effects of oil prices on that sector. Thus, one field can actually represent the trends in renewable energy sector, considering that, they are all alternatives to custom energy sources and price increases of oil can make companies to shift to any or all of them as alternative sources and search for new measures to make them more cost competitive. Furthermore, the chosen field should be open to innovations, which mean that, innovation should be more clear to detect and patentable. I consider Solar Photo-voltaic to have these characteristics, therefore, patent applications' count (later "patent count") in this field can be a good indicator of innovation.

In this analysis, as independent variables average yearly oil prices from 1982 to 2010 and as dependent variables solar photo-voltaic (solar PV) patent counts of companies which have applied at least one solar PV patent in the given period are used.

The UnitedStates Patent and Trademark Office (USPTO) defines a patent as : "a property right granted by the government to an inventor to exclude others from making, using, offering for sale or selling the invention for a limited period of time in exchange for public disclosure of the invention when the patent is granted". Patents can be granted for inventions, significant improvements or incremental innovations. In our case for measuring innovation, patents (patent counts) seem reasonable choice.

The logic here is that, price increases in companies in different sectors will result in search of other energy sources, they will shift to e.g. solar energy and will do more R&D, which will be accompanied with patents. But, here lag needs to be used. Thus, as an event or a process and its result cannot be present at the same time (at least in our example), and as the first causes (results in) the latter, innovation will be present in renewable energy sector some after rises in oil prices. Thus, after changes in oil prices, companies might start R&D process, start actions towards innovation and the results will be achieved after some period of time. A good method would be looking at oil prices in year N, and patent counts in years N+1, N+2.

Additionally, analyzed companies are not only renewable energy companies, but companies which have applied for at least one solar PV patent in the analyzed

period. The reasons are: 1) we don't analyze the companies in renewable energy sector, but the sector itself. Companies doing other kind of business can have serious impact in this sector. 2) companies that use renewable energy as an alternative to custom energy are probably not renewable energy companies themselves, but various (all sectors) companies which need energy input in their operations. Therefore, as noted, companies involved in patents in solar PV are studied.

Historical oil prices are retrieved from the website of Illinois Oil and Gas Association (http://www.ioga.com/history-of-crude-oil-prices). Then, yearly average oil prices are calculated for the period between 1982-2010.

The Patent data is got from PATSTAT database for patents of European Patent Office (EPO).

Analysis

Below the yearly average oil prices and solar patent counts are shown.

In the studied period the minimum yearly average oil price was 11,91 USD , which represents 1998 year. The maximum average price was 91,48 and it occurred in 2008.

Minimum yearly total patent count in solar photo voltaic sector was 57 (year: 1982), while the maximum being 1080 (year: 2009)

If we look at the numbers, we can see that, there is no chronologically stable increase. Because of some factors, the numbers sometimes increase, while sometimes shrink year-by-year. It will let us know, how patent counts react to oil prices.

Year	Av. Oil price
1982	31,55
1983	29
1984	27,5
1985	26,5
1986	14,64
1987	17,5
1988	14,87
1989	18,33
1990	23,19
1991	20,19
1992	19,25
1993	16,74
1994	15,66
1995	16,75
1996	20,46
1997	18,97

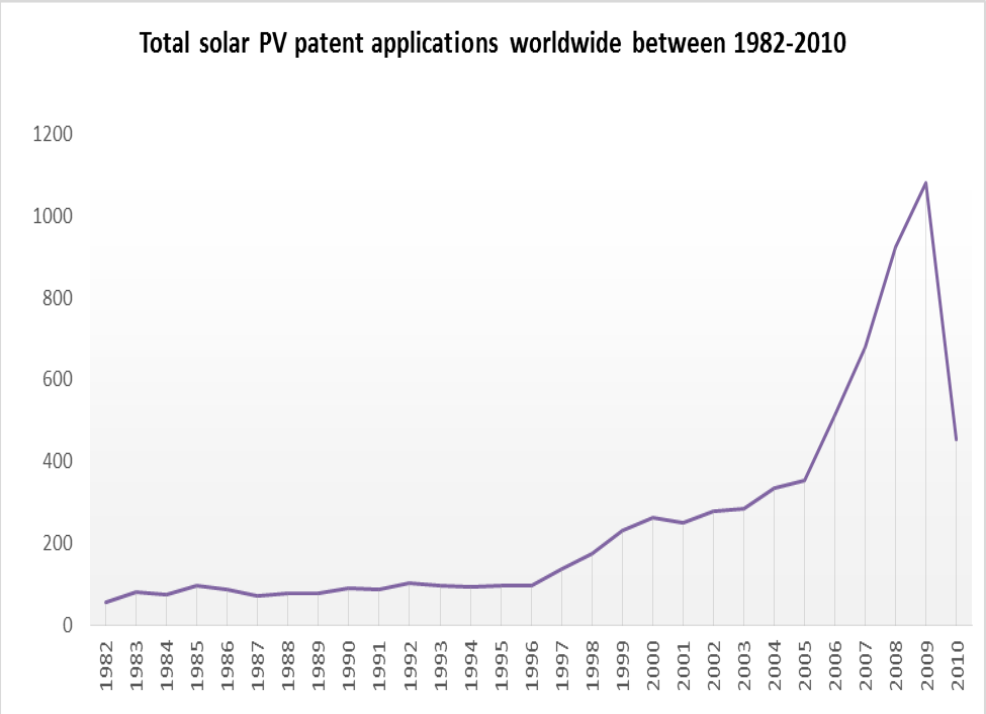
Year	Solar PV Patent Count
1982	57
1983	81
1984	74
1985	98
1986	87
1987	71
1988	78
1989	77
1990	89
1991	88
1992	102
1993	98
1994	92
1995	95
1996	97
1997	137

1998	11,91
1999	16,55
2000	27,4
2001	23
2002	22,81
2003	27,69
2004	37,41
2005	50,04
2006	58,3
2007	64,2
2008	91,48
2009	53,5
2010	71,21

1998	174
1999	230
2000	263
2001	249
2002	279
2003	284
2004	334
2005	355
2006	515
2007	681
2008	923
2009	1080
2010	455

And looking at historical graphs will give visual understanding, but, one thing should be noted that, indicators or the same year should not be compared, as we will use lag. The graphs are for informative purposes.

Graph 1. Prepared by the author based on information retrieved from the website of Illinois Oil and Gas Association



Graph 2. Prepared by the author based on information retrieved from database for patents of European Patent Office (EPO)

From the graphs above we can easily detect oil price increase in 2008 and the following rise in solar PV patent counts in 2009. Later, when oil prices fell down in 2009, solar PV patent counts decreased the following year - in 2010.

In this study, correlation-regression analysis will be done to find the relationship.

Dependent variables are yearly total solar PV patent application counts.

Independent variables are yearly average oil prices.

Firstly, all independent variables are lagged for 1 year to see the relationship of a given

year's oil price on innovation in renewable energy sector after one year.

Oil prices/ year = n	**Solar patent counts/ year = n+1**	**a**	**b**	**a x b**	**a^2**	**b^2**
31,55	81	2,428929	-175,643	-426,62395	5,899694	30850,4133
29	74	-0,12107	-182,643	22,1128316	0,014658	33358,4133
27,5	98	-1,62107	-158,643	257,171403	2,627873	25167,5561
26,5	87	-2,62107	-169,643	444,646046	6,870015	28778,699
14,64	71	-14,4811	-185,643	2688,30747	209,7014	34463,2704
17,5	78	-11,6211	-178,643	2076,0214	135,0493	31913,2704
14,87	77	-14,2511	-179,643	2560,10319	203,093	32271,5561
18,33	89	-10,7911	-167,643	1809,04605	116,4472	28104,1276
23,19	88	-5,93107	-168,643	1000,23283	35,17761	28440,4133
20,19	102	-8,93107	-154,643	1381,1264	79,76404	23914,4133
19,25	98	-9,87107	-158,643	1565,97497	97,43805	25167,5561

16,74	92	-12,3811	-164,643	2038,45497	153,2909	27107,2704
15,66	95	-13,4611	-161,643	2175,88605	181,2004	26128,4133
16,75	97	-12,3711	-159,643	1974,95319	153,0434	25485,8418
20,46	137	-8,66107	-119,643	1036,23533	75,01416	14314,4133
18,97	174	-10,1511	-82,6429	838,913546	103,0443	6829,84184
11,91	230	-17,2111	-26,6429	458,552117	296,221	709,841837
16,55	263	-12,5711	6,357143	-79,916097	158,0318	40,4132653
27,4	249	-1,72107	-7,64286	13,1539031	2,962087	58,4132653
23	279	-6,12107	22,35714	-136,84967	37,46752	499,841837
22,81	284	-6,31107	27,35714	-172,65288	39,82962	748,413265
27,69	334	-1,43107	77,35714	-110,7036	2,047965	5984,12755
37,41	355	8,288929	98,35714	815,275332	68,70634	9674,12755
50,04	515	20,91893	258,3571	5404,55462	437,6016	66748,4133
58,3	681	29,17893	424,3571	12382,2868	851,4099	180078,985
64,2	923	35,07893	666,3571	23375,0946	1230,531	444031,842
91,48	1080	62,35893	823,3571	51343,6693	3888,636	677916,985
53,5	455	24,37893	198,3571	4835,73462	594,3322	39345,5561
Mean= 29,12107143	**Mean= 256,6428571**			**119570,761**	**9165,453**	**1848132,43**

Correlation coefficient =119570,761 / sqrt (9165,453 x 1848132,43) = 0,918716

Also, it is worthy to look at correlation between oil prices and total solar PV patent application counts to see whether companies take immediate reaction to oil prices' changes or they are keen to take more long term measures.

In the second correlation analysis all independent variables are lagged for 2 years.

Oil prices/ year = n	**Solar patent counts/ year = n+2**	**a**	**b**	**a x b**	**a^2**	**b^2**
31,55	74	3,331852	-189,148	-630,21361	11,10124	35777,0219
29	98	0,781852	-165,148	-129,12139	0,611292	27273,9108
27,5	87	-0,71815	-176,148	126,500466	0,515737	31028,1701
26,5	71	-1,71815	-192,148	330,138985	2,952033	36920,9108
14,64	78	-13,5781	-185,148	2513,96898	184,3661	34279,8368
17,5	77	-10,7181	-186,148	1995,16343	114,8787	34651,1331
14,87	89	-13,3481	-174,148	2324,55528	178,1731	30327,5775
18,33	88	-9,88815	-175,148	1731,89084	97,77547	30676,8738
23,19	102	-5,02815	-161,148	810,276763	25,28227	25968,7257
20,19	98	-8,02815	-165,148	1325,8338	64,45116	27273,9108
19,25	92	-8,96815	-171,148	1534,88195	80,42768	29291,6886
16,74	95	-11,4781	-168,148	1930,02936	131,7479	28273,7997
15,66	97	-12,5581	-166,148	2086,51306	157,7071	27605,2071
16,75	137	-11,4681	-126,148	1446,68565	131,5184	15913,3553
20,46	174	-7,75815	-89,1481	691,62454	60,18886	7947,39232
18,97	230	-9,24815	-33,1481	306,558985	85,52824	1098,79973
11,91	263	-16,3081	-0,14815	2,41602195	265,9557	0,02194787
16,55	249	-11,6681	-14,1481	165,082689	136,1457	200,170096
27,4	279	-0,81815	15,85185	-12,969163	0,669366	251,281207
23	284	-5,21815	20,85185	-108,80805	27,22907	434,799726
22,81	334	-5,40815	70,85185	-383,17731	29,24807	5019,98491
27,69	355	-0,52815	91,85185	-48,511385	0,27894	8436,76269
37,41	515	9,191852	251,8519	2314,98491	84,49014	63429,3553
50,04	681	21,82185	417,8519	9118,30121	476,1932	174600,17
58,3	923	30,08185	659,8519	19849,5657	904,9178	435404,466
64,2	1080	35,98185	816,8519	29391,8423	1294,694	667246,948
91,48	455	63,26185	191,8519	12136,9034	4002,062	36807,1331
Mean= 28,21814815	**Mean=263,1481481**			**90820,9174**	**8549,109**	**1816139,41**

Correlation coefficient = 90820,9174 / sqrt (8549,109 x 1816139,41) = 0,728871

Findings and discussion

The results show that, oil prices have positive influence on renewable energy sector innovation. The first finding is that, companies' direct reaction to oil prices seem to be higher in short term. Thus, when we analyze impact after one year, the correlation is 0,918. Therefore, companies positively react to oil prices. If oil prices increase in year n, then innovation (patents) increase in the following year and vice-versa. But if we make two years' lag, correlation coefficient decreases down to 0,728. It hints that, direct influence is mainly for short term and with time the relationship level shrinks between oil prices and discussed innovation.

The reason for short-term focus can be that companies always look for cheaper energy sources in short period and in real time. In real time business, they search for the cheapest energy input and if oil prices decrease, they again prefer to shift to custom energy sources in the following time period (year).

Another reason can be governments' role. When oil prices increase, governments and policy makers start to stimulate renewable sector through subsidies, university-company cooperation, etc. But this becomes more influential in policy makers actions and plans in high energy price periods, and when prices go down ease and distraction starts again.

As noted this study represents the whole renewable energy sector, and it should again be noted that, there are many other factors that influence renewable energy companies' innovation. We analyzed oil prices' effect in general companies who can use both custom and renewable energy sources and the results showed that, companies innovativeness in alternate energy sector is related with oil prices, the reason of which might be inclination to shift back to oil based energy when prices go down. So it is possible they mainly behave tactically rather than strategically.

Regarding, how it affects companies' renewable energy policies in investments to innovation in 2 years' period, the relationship exists and is positive too. In long term, companies don't that seriously react to oil prices, and here the reason can be they want to insure themselves, and therefore dependence on oil prices decreases, so they try to keep innovation balance or to invest in more radical type of innovation. Although, low energy prices de-stimulate innovation somehow, it is not significant and companies understand the importance of alternate energy sector. Further research can be done using patent citations as indicator of innovation, which can shed light to more radical type innovation.

So, according to the results, when oil prices increase,companies are motivated to invest in renewable energy sector innovation, but tend to shift back to oil based energy when prices go down and their innovation level decreases in short term.

However simultaneously, in the long term it is possible that, deeper (radical) innovation is achieved through years to decrease dependence from the oil price and its fluctuations, therefore relationship between prices and innovation levels decreases.

Conclusion

This paper analyzed relationship between oil prices and innovation in alternative energy sources – renewable energy.

The study showed that, oil prices influence innovation in renewable energy sector, and companies' reaction and response to changes of oil prices can be considered substantial.

Both in one year and two years periods companies react to oil prices on their renewable energy policies, but in short term the effect is higher than 2 years' term.

As conclusion, although some other factors should be researched further – like patent history of companies (whether they keep their innovation levels) or government policies, renewable energy sector in terms of innovation seems to be influenced by oil prices.

References

1. Mohr, L. B. (1969). Determinants of innovation in organizations. The American Political Science Review, 63(1), pp. 112.
2. http://www.irena.org/documentdownloads/publications/irena_re_power_costs_2014_report.pdf
3. https://www.lazard.com/media/2392/lazard-s-levelized-cost-of-energy-analysis-90-key-findings.pdf
4. OECD (2016), "Renewable energy", in OECD Factbook 2015-2016: Economic, Environmental and Social Statistics, OECD Publishing, Paris.
5. http://fs-unep-centre.org/publications/global-trends-renewable-energy-investment-2016
6. Henriques, I., & Sadorsky, P. (2008). Oil prices and the stock prices of alternative energy companies. *Energy Economics*, *30*(3), 998-1010.
7. Cheon, A., & Urpelainen, J. (2012). Oil prices and energy technology innovation: An empirical analysis. *Global Environmental Change*, *22*(2), 407-417.
8. Johnstone, N., Haščič, I., & Popp, D. (2010). Renewable energy policies and technological innovation: evidence based on patent counts. *Environmental and resource economics*, *45*(1), 133-155.
9. Lichtenberg, F. R. (1986). Energy prices and induced innovation. *Research Policy*,*15*(2), 67-75.
10. Crabb, J. M., & Johnson, D. K. (2010). Fueling innovation: the impact of oil prices and CAFE standards on energy-efficient automotive technology. *The Energy Journal*, 199-216.

11. Popp, D. (2001). *Induced innovation and energy prices* (No. w8284). National Bureau of Economic Research.
12. Newell, R. G., Jaffe, A. B., & Stavins, R. N. (1998). *The induced innovation hypothesis and energy-saving technological change* (No. w6437). National Bureau of Economic Research.

THE RISE OF NEW INSTITUTIONAL ECONOMICS AND ASSESSMENT ITS CONTRIBUTIONS TO THE POST WASHINGTON CONSENSUS

Bahruz Natig Babayev
MSc, Azerbaijan State University of Economics
Email: n.hajiyev@unec.edu.az Tel: (055) 950 82 39

Abstract

The main objective of this article is to describe the rise of New Institutional Economics (NIE) and assess its contributions to the Post Washington Consensus (PWC). This paper argues that the rise of the NIE has provided theoretical ideas for the PWC, but it is still debatable how the contributions of the NIE are effective to tackle development challenges. However, these contributions can still be considered important in the development thinking and their accurate application and implementation in various traditional societies can have long term development impact.

Key words: Post Washington Consensus, New Institutional Economics, institutions, World Bank, International Monetary Fund, Consensus.

JEL classification: B52, 017

The rise of the New Institutional Economics (NIE) has founded a new theoretical school of economic thinking which supported most policy prescriptions within the Post Washington Consensus (PWC). The theoretical thinking of the neo-classical economics was about a minimum role of state in economic and social development, and policy prescriptions of this paradigm for the developing countries were listed in the so-called Washington Consensus (Ahrens, 1999: 18). However, the economic programs executed under the Washington Consensus did not result in positive changes in economic performance of most developing countries (Fine, 2006: 7). Since development challenges have remained unsolved in the developing world after the execution of programs on economic liberalization based on neo-classical economic thought, the role of state and institutions in economic performance are promoted extensively within the PWC to improve economic conditions of the developing countries. A new group of ideas contributed with the rise of the NIE were proposed on development under the PWC.

In this paper I will critically assess the contributions of the NIE to the PWC. This paper argues that the rise of the NIE has provided theoretical ideas for the PWC, but it is debatable how the contributions of the NIE are effective to tackle development challenges. I will use the following structure to support the argument.

First, this paper will briefly summarize the issues behind the PWC. Second, this article will describe the rise of the NIE and its fundamental contributions. Third, it will assess the contributions of the NIE to the PWC. The paper will also assess how the contributions of the NIE to the PWC are capable to tackle the challenges of the Washington Consensus and development. Finally, it will conclude the issues described and assessed in this essay.

Before describing the rise of the NIE, let us review the issues which encouraged the development community to benefit from the contributions of the NIE. These issues are related to the decline of the Washington Consensus and the emergence of the PWC. The development agenda related to the neo-classical economic thought of 1980s supported non-intervention of states to markets and saw the state intervention as an inhibiting factor for the activity of markets and development (Mosley et al. 1991: 4). Therefore, the development prescriptions of 1980s in the developing countries were related to execution of policies that envisaged minimum participation of states in development processes (Waeyenberge, 2006: 26). Williamson (1993: 1331-1333) prepared a list of reforms on economic liberalization for developing countries in 1989 that created the foundations of the so-called Washington Consensus. This list of economic reforms supported "structural adjustment programs" in developing countries which was referred to as the Washington Consensus (Waeyenberge, 2006: 26).

Nevertheless, the policies of 1980s which eliminated state's role in market and economic development resulted in unsuccessful outcomes in most developing world. Frances Stewart (1991: 1847-1848) described in his paper how "structural adjustment programs" within the Washington Consensus exacerbated the economic indicators in most developing countries by explaining the negative consequences of reforms with the poor 'macro-performance' levels of developing countries. The World Development Report in 1989 showed that the "development strategies" used within the implemented programs were not successful and it proposed "the role of state" in terms of building infrastructure and conditions to improve the ongoing programs.

The unintended results of the policies on economic liberalization created a need to use additional strategies to foster development in the developing countries. Some other factors also accelerated the application of new strategies on development. First, the success in East Asia showed the importance of government intervention for effective economic performance (Öniş and Şensus, 2003: 16). Second, institutions historically played an important role in western countries for regulating human interaction (Bardhan, 1989: 1389). Third, the rise of the NIE provided theoretical foundations about institutional arrangements to achieve effective markets and economies which influenced new development policies. The

theoretical contributions of the NIE are essential, as Carroll (2010: 18) argues that the PWC is based on a group of new ideas theoretically supported with the NIE.

The new development paradigm was referred to as the PWC by Chief Economist of the World Bank Stiglitz during his lecture in Finland on 7 January 1998 (Stiglitz, 1998: 7). He highlighted the shortages of the Washington Consensus and stressed "the role of state" to establish an effective market economy (Stiglitz, 1998: 7). The basic tenets of the PWC also include "ownership, partnership and participation" (Stiglitz, 1998: 20-23). Stiglitz gave his other lecture in Geneva on 19 October, 1998 and stressed the importance of "going beyond the Washington Consensus" (Stiglitz, 1998: 1-2).

As mentioned earlier, one of the factors which provided theoretical contributions to the PWC was the NIE, and I will account for the rise of the NIE to assess its contributions to the PWC. The NIE became a crucial field in development issues starting from the early 1990s. The rise of the NIE has been associated with the works of Douglass C. North (Brown, 2005: 99). However, the origins of the NIE dates back to the popular work of Ronald Coase which are "The Nature of the Firm" (1937) (Kherallah and Kirsten, 2001: 1).

North (1995: 17) identifies "the NIE as an attempt to incorporate a theory of institutions into economics". The definition of North clarifies that institutions as well as institutional management are essential elements in economic performance and development. Williamson discusses the fundamental tenets of the NIE in his paper discussing Matthews's the presidential address to the Royal Economic Society in 1986, quoting a 1986 book by Matthews: "Institutions do matter and second the determinants of institutions are susceptible to analysis by the tools of economic theory" (2000: 595 quoting by Matthews, 1986).

Harriss discusses the benefits of the rise of the NIE and summarizes three reasons why the rise of the NIE is crucial for development of economic thinking. One reason is that although the origins of the NIE have derived from the roots of the neo-classical economics, it seeks to offer solutions to the challenges of the neoclassical economics. The second argument is that the NIE created a new theoretical framework which challenged the idea that markets play crucial role in development, and state must not intervene to markets. The final importance of the NIE according to Harris is that the NIE stresses that the institutional change can spur economic development (1995: 1). All these arguments make the NIE an innovative wave on development agenda. It is important to highlight that another significance of the NIE can be its domination within the PWC which seeks to find an answer to the puzzles of neo-liberal economic programs.

As institutions play a central role in the economic performance from the perspective of the NIE, it is important to identify what refers to as institutions. According to North, "institutions are the rules of the game in a society or, more formally, are the humanly devised constrains that shape human interaction" (1990: 3). North mentions two forms of constrains. Formal constrains include political rules, economic rules, contracts, property rights, and laws. Informal constrains include traditions, customs etc. (1990: 35-52). North argues (1997: 4) that the existence of formal rules minimizes ambiguity in human relations and encourages the market interaction among different actors that positively influence an overall economic performance. According to North (1990: 6), "the major role of institutions in a society is to reduce uncertainty by establishing a stable structure to human interaction". At the same time, institutional management also requires the role of an effective organization (state, central structure) in order to manage an effective run of institutions (North, 1995: 23). Therefore, good political structures are essential in economic and social development from the perspective of the NIE. The role of government in terms of effective run of institutions with an aim to achieve better economic performance is a new wave which the NIE brought to the neo-classical economic thinking, since the latter has been based on an idea of perfect market based on a non-intervention of states in economic development (Mosley et al. 1991: 4). These contributions of the NIE about the role of state and institutions are also dominating within the agenda of the PWC.

Furthermore, North (1995: 8) argues that institutions reduce transaction costs during economic interactions of agents in order to explain the importance of institutions in economic growth. According to the findings of North, transaction costs are high in developing countries because of poor institutional arrangements and these costs hamper the agricultural growth (Kherallah and Kirsten, 2001: 16-17 quoting by North, 2000). First, let's determine what the transaction cost is. In his paper of Oliver E. Williamson, Williamson defines the transaction, quoting a 1932 book by John R. Commons: "the ultimate unit of activity must contain in itself the three principles of conflict, mutuality and order. This unit is transaction" (2000: 599 quoting by John R. Commons, 1986). Therefore, Williamson argues (2000: 599) that governance can create an institutional system so that it can regulate mutual gains and minimize conflicts within human interaction. There is a need for institutional arrangements (property rights, legal rules) as well as effective organization to ensure institutional provisions to decrease the transaction costs in agriculture of developing countries. Therefore, the NIE is an innovative field which proposes institutional analysis to find out what kinds of institutions are needed to decrease high transaction

costs hampering agricultural growth in developing countries (Kherallah and Kirsten, 2001: 17).

A causal relationship between institutions and economic growth must be taken into consideration from the perspective of the NIE. It basically proposes that developing countries must have good governments and well functioning institutions to manage fair and sustainable rules in economic and political life. The fair rules in economic interaction will not only create trust and favorable environment for private investors to invest, but also increase incentives of market agents to interact without fear. While criticizing the failure of Washington Consensus, Rodrik (1990: 933) argues that "illiberal policies" are the major reasons of failure of "structural adjustment programs". For filling this gap, the NIE has contributed to the PWC by proposing the idea of "developmental states". Tornquist defines developmental states as "states whose politics have concentrated sufficient power, autonomy and capacity to shape, pursue and encourage of explicit development objectives, whether by establishing and promoting the conditions and direction of economic growth or by organizing it directly, or varying the combination of both" (1999: 89). Taking this into consideration, the NIE also contributes to the agenda of the PWC by proposing the importance of transparent, legitimate, democratic, accountable, and responsible governments as well as their policies which can play a crucial role in the development issues (Tornquist, 1999: 94).

The contributions of the NIE to the PWC are a group of ideas which supported prescriptions within the PWC. These prescriptions were described by Stiglitz in his lectures and promoted by the World Bank through many policies and programs in the developing world. Let's review what the contributions of the NIE to the PWC are and how they are effective in modern development agenda. As mentioned earlier, the most policy prescriptions of the PWC have been described in the popular lectures of Stiglitz (19 October 1998 and 7 January 1998) and these prescriptions influenced economic policies in our contemporary period. Carroll shows that two schools of the NIE especially made contributions to the policy prescriptions of the PWC. First is transaction cost and second is imperfect information (2005:3).

Within his lecture on 7 January 1998, Stiglitz summarized the several key prescriptions for economic policy of developing countries which cover the agenda of the PWC. First point which he mentioned is that economic liberalization can not achieve growth itself, that's why developing countries need "regulatory framework" and "truly competitive markets" to overcome "market asymmetric information" and "market imperfections". Second argument which he made is that "the role of government" and "effective institutions" is unavoidable in order to foster the economic growth (1998: 7). The principles of the PWC which focus on an effective

state, good institutions, and regulatory framework do not have much difference from the Washington Consensus as Carroll calls it "socio-institutional liberalism" (Carroll, 2005: 1).

Carroll discusses the PWC in his book and identifies some arguments for the consensus. First, he mentions that the PWC is fully based on the theoretical ideas of the NIE. Second argument is that the agenda of the PWC continues supporting the neo-classical reforms, but it proposes new institutional arrangements and good governments to manage institutions which have been contributed by the theory of the NIE (2010: 28-69).

Furthermore, while analyzing the policy prescriptions of the PWC we can assume that they have been influenced by the NIE. For example, the basic proposals of the NIE require an institutional framework and effective government for economic development (Ankarloo, 2006: 2). We can see this influence in the agenda of the PWC as well. Especially, formal institutions which include rule of law, legal environment for competition, property rights and effective state to effectively manage the mentioned institutions are the ideas dominating within the agenda of the PWC.

At the same time, the changes of informal institutions for economic and social development derived from the principles of the NIE also underpinned the theoretical base of the PWC. For example, Stiglitz (1998: 16) stipulates that the development must be based on "transformation of the society" which must be achieved by transforming the institutions. Second point which Stiglitz argues is that equality between women and men must be achieved by moving from traditional way of life into modern one in order to involve women in development processes (1998: 16). Transformation of society also covers changing the customs and traditions which can hamper development. This idea of behind the PWC was also contributed from the NIE. As Williamson mentioned, the NIE supports the idea of informal institutions that include customs, traditions and proposes institutional changes for social development (2000: 597). Stiglitz stresses the transformation of informal institutions contributed by the NIE (1998: 16).

The contributions of the NIE to the PWC have produced a lot of policy prescriptions in the modern economic policies. Good governance, role of state and institutions play an important role in the documents and reports of the World Bank, International Monetary Fund and international organizations. Aid policies of the World Bank seek to deal with the economic problems of developing countries by applying the principles of the NIE including institutional reforms and good governance. Especially, the Development Report of the World Bank in 1997 highly influenced by the PWC and the principles of the NIE stresses an important "role of

state in the changing world" (1997). According to the report, partnership between governments and citizens, cooperation among all groups of society, "good governance" and capacity of states to foster economic development and maintain formal institutions are extremely important for development (1997). The report influenced by the PWC seeks to promote the idea of "developmental state" contributed by the NIE and promoted within the PWC (Tornquist, 1999: 89). The contributions of the NIE to the PWC are also promoted in the foreign policy prescriptions of the most supranational organizations, like the European Union. For example, EU Neighborhood Strategy Papers promote the idea of "good governance" to achieve sustainable development in its neighborhood countries (2004: 3).

Although the contributions of the NIE to the PWC have been dominating in the modern economic policy documents and prescriptions for the developing world, it is important to assess that how the contributions of the NIE to the PWC solved the problems coming from the Washington Consensus by analyzing a number of literature and cases.

Ankarloo has a conclusion in his paper to assess the contributions of the NIE. According to Ankarloo, "NIE is not the solution to the problems of orthodox economics. NIE is rather testament to fact that the problems remain unsolved. NIE does not explain 'the institutions of capitalism' – NIE is itself best explained as 'an institution of capitalism'" (2006: 18). The statement of the Ankarloo concludes that the contributions of the NIE to the PWC are not the solutions, but new theoretical views within the PWC that are still seeking solutions for gaps of the Washington Consensus.

On the other hand, Carroll (2005: 3) shows the PWC and its "socio-institutional liberalism" derived from the principles of the NIE that seek to promote good governance, social capital, transparent state and accountability have political nature rather than economic goals.

I will review some cases from various countries and sectors how formal institutions played an important role in the development processes which is major contribution of the NIE to the PWC.

Brett argues (1995: 213) that institutional changes, open and democratic institutions have created instability and autocracy in Africa in 1986. According to his analysis, the theories that focus on the institutional reform are effective theories, but they work in the western countries, but not in Africa, because western countries only need to maintain them, and institutions have historical and cultural linkages in the western societies. Imposition of institutional changes on traditional countries and cultures may be demonstrated with conflicts as Brett argues (1999: 213).

On the other hand, the contribution of the NIE to the PWC which is institutions (property rights, rule of law) is effective. However, markets and the institutions will empower some groups and exclude the others (Carroll, 2005:26). The case in Uganda in 1986 is a good example to support the arguments of Carroll. Institutional changes in Uganda after 1986 have enabled the state to support certain groups relative to others which had resulted in a failure (Brett, 1995:209-211).

Another example which assesses the contributions of the NIE to the PWC can be seen from Indonesia. The KDP project of the World Bank started 1998 in Indonesia aimed at poverty reduction by promoting the formal and informal institutions, good governance and democracy had very limited work in poverty alleviation, while it focused on democratic governance, NGOs, and institutional reforms (Edstrom, 2002: 2). This case shows that the contributions of the NIE within the PWC are in action. However, the project had fewer consequences in terms of the poverty reduction, and described as a political project by Carroll in his book (2005: 3).

In spite of fact that, the instruments of the NIE promoted within the PWC are still discussed as solutions to fill the gaps of the Washington Consensus, and have ineffective consequences in some cases, it is important to note that correct and accurate application of the instruments of the NIE within the agenda of the PWC can form long term stability, good infrastructure, and a sustainable legal environment for development. Institutional reforms and good governance may not have immediate results, but will definitely result in long term development if they are implemented accurately. The argument of Seers is especially important to assess the contributions of the NIE as he argues "development means creating conditions for the realization if human personality" (1972: 3). The application of the instruments of the NIE including property rights, legal and sustainable environment and good governance can create conditions for development as well. Seer also (1972:7) argues that "a country where economic growth is slow may be busy reshaping its political institutions so that, when growth comes, it will be development". The theory of the NIE offers the institutional and political development as well as good governance that will create conditions for development and can be assessed very practical in modern economic agenda. However, it is under question whether the policy prescriptions of the NIE will be accurately implemented by developing countries and how these policies will be imposed and adapted to the traditions of different countries having various traditions and development levels.

This essay assessed the contributions of the NIE to the PWC. I described the issues behind the rise of the PWC and failure of the Washington Consensus and neo-classical economic thinking. The PWC influenced with the rise of NIE and promoted the role of state, good governance, democracy and institutions for growth were

discussed. Then, I summarized the rise of the NIE and its contributions to the PWC that are institutions, institutional analysis, developmental state, as well as good governance. Finally, I assessed the contributions of the NIE to the PWC. We can conclude that the contributions of the NIE to the PWC have been reflected in most policy prescriptions of the PWC and PWC is a process in which the principles of the NIE have been included into policy papers. Although the contributions of the NIE to the PWC are still the agenda of discussion how they solved the unresolved issues of the Washington Consensus, but they can still be considered important in the development thinking and their accurate application and implementation in various traditional societies can have long term development impact. The NIE can be considered as a practical and applicable theory in the modern economic development.

References

[1] Ahrens, J. (1999) 'Toward a Post-Washington Consensus: The Importance of Governance Structures in Less Developed Countries and Economies in Transition', in: Niels Hermes and Wiemer Salverda (eds.), State, Society and Development: Lessons for Africa? CDS Research Report No. 7, Groningen: University of Groningen: 18-64.

[2] Ankarloo, D. (2006) 'New institutional Economics and Economic History. A Case of Economics Imperialism', Paper for *Historical Materialism Conference New Directions in Marxist Theory*, December 8-10, 2006, London.

[3] Bardhan, P. (1989) 'The New Institutional Economics and Development Theory: A Brief Critical Assessment', Journal of World Development, 17, (9): 1389-1395.

[4] Brett, E.A. (1995) 'Institutional Theory and Social Change in Uganda', in The New Institutional Economics and Third World Development, John Harriss, Janet Hunter and Colin M. Lewis (eds) London: Routledge: 200-214.

[5] Brown, J. (2005) 'From Structuralism to the New Institutional Economics: A Half Century of Latin American Economic Historiography Author', Journal of Latin American Research Review 40, (3): 97-99.

[6] Carroll, T. (2005) 'Efficiency of What and for Whom? The Theoretical Underpinnings of the Post-Washington Consensus' Socio-Institutional Neoliberalism', Working Paper No. 122, Perth: Asia Research Centre, Murdoch.

[7] Carroll, T. (2010) 'Delusions of Development: the World Bank and the post Washington Consensus in Southeast Asia', London: Palgrave-MacMillan.

[8] Communication from the Commission (2004) "European Neighborhood Policy Strategy Paper", available online at http://ec.europa.eu/world/enp/pdf/strategy/strategy_paper_en.pdf.

[9] Edstrom, J. (2002) 'Indonesia's Kecamatan Development Project Is It Replicable? Design Considerations in Community Driven Development' Paper No. 39, available at http://siteresources.worldbank.org/INTCDD/Resources/Indonesia.pdf .

[10] Fine, Ben, & KS, Jomo. (2006) 'The New Development Economics after the Washington Consensus', New York: Zed Books.

[11] Harriss et al. (1995) 'Introduction Development and Significance of NIE' in The New Institutional Economics and Third World Development, John Harriss, Janet Hunter and Colin M. Lewis (eds) London: Routledge: 1-13.
[12] Kherallah, M. and Kirsten, J. (2001) 'The New Institutional Economics: Applications for Agricullttural Policy Research in Developing Countries', Markets and Structural Studies Division. MSSD Discussion Paper No. 41. International Policy Research Institute, Washington, DC.
[13] Mosley P., J. Harrigan and J.Toye (1991) 'Aid and Power. The World Bank Policy Based Lending. ' London. Routledge.
[14] North, D.C. (1990) 'Institutions, Institutional Change and Economic Performance' Cambridge University Press, Cambridge.
[15] North, D. C. (1995) 'The New Institutional Economics and Third World Development', in The New Institutional Economics and Third World Development, John Harriss, Janet Hunter and Colin M. Lewis (eds) London: Routledge: 17-26.
[16] North, D. C. (1997) 'The Contribution of the New Institutional Economics to an Understanding of the Transition Problem,' WIDER Annual Lectures, available online at http://www.wider.unu.edu/publications/annual-lectures/en_GB/AL1/.
[17] Onis, Ziya and Fikret S., (2003) 'Rethinking the Emerging Post-Washington Consensus: A Critical Appraisal', ERC Working Paper in Economic 03/09, available online at http://ideas.repec.org/p/met/wpaper/0309.html.
[18] Rodrik, D. (1990) 'How Should Structural Adjustment be Designed?' Journal of World Development, 18. (7): 933-947.
[19] Seers, D. (1972) 'What are we trying to measure?'. In Nancy Baster (ed.) Measuring Development: The Role and Adequacy of Development Indicators. London: Frank Cass.
[20] Stewart, F. (1991) 'The Many Faces of Adjustment', Journal of World Development, 19. (12): 1847-1864.
[21] Stiglitz, J. E. (1998) 'Towards a New Paradigm for Development: Strategies, Policies, and Processes', Given as the 1998 Prebisch Lecture at UNCTAD, Geneva.
[22] Stiglitz, J. E., (1998) 'Annual Lecture 2: More Instruments and Broader Goals: Moving toward the Post-Washington Consensus', available online at http://www.wider.unu.edu/events/annual-lecture/Past-annual-lectures/en_GB/1998/.
[23] Tornquist, O. (1999) 'Primacy of Institutions", in Politics and Development: A Critical Introduction, Tornquist' O. London: Sage.
[24] Waeyenberge, E. (2006) 'From Washington to post-Washington Consensus: Illusions of Development.' In: Fine, Ben and Jomo, K.S., (eds.), New York: Zed Books.
[25] Williamson, O.E. (1993) 'Democracy and the "Washington Consensus' Journal of World Development, 21. (8): 1329-1336.
[26] Williamson, O.E. (2000) 'The New Institutional Economics: Taking Stock, Looking Ahead'. Journal of Economic Literature, 38. (3) 595-613.
[27] World Bank Development Report (1989) 'Financial Systems and Development', available at

http://wdronline.worldbank.org/worldbank/a/c.html/world_development_report_1989/abstract/WB.0-1952-0788-2.abstract.sec1, accessed 25 November 2012.

[28] World Bank Development Report (1997) 'The State in a Changing World', available at http://wdronline.worldbank.org/worldbank/a/c.html/world_development_report_1997/abstract/WB.0-1952-1114-6.abstract, accessed 20 November 2012.

THE JOURNAL OF ECONOMIC SCIENCES: THEORY AND PRACTICE
(Scientific, Refereed, Biannual)

NOTES FOR CONTRIBUTORS

1.Articles not published or submitted for publication elsewhere are accepted in English.

2.Manuscripts should be typed on one side of a A4 sized paper and should not exceed 25, 1,5-spaced pages with the Times New Roman 12-font character size. Only e-mail posts are welcomed for article submissions. Manuscripts should be sent official e-mail address of the journal (n.hajiyev@aseu.edu.az; nazimxx@yahoo.com).

3.The first page should include (i) the title of the article; (ii) the name(s) of the author(s); (iii) institutional affiliation(s) of the author(s); (iv) an abstract of not more than 250 words in English (text of abstracts must be consist of sections of "purpose", "design /methodology/ approach", "findings", "research limitations/implications", "practical implications" and "originality/value"); (v) keywords must not be more than 5 words; (vi) JEL codes. The name, address, e-mail address, phone and fax numbers and academically sphere of interest of the author(s) should be indicated on a separate page.

4.Tables, figures and graphs should be numbered consecutively and contain full references. The titles of the tables, figures and graphs should be placed at the heading of them; the references of tables, figures and graphs should be placed at the bottom of them. Decimals should be separated by a comma. Equations should be numbered consecutively. Equation numbers should appear in parentheses at the right margin. The full derivation of the formulae (if abridged in the text) should be provided on a separate sheet for referee use.

5. Footnotes should be placed at the bottom of the page.

6.All references should be cited in the text (not in footnotes), and conform to the following examples:

It has been argued (Hajiyev, 2000 – 504-45)....
Griffin (1970a: 15-20) states....
(Gupta et.al., 1982: 286-7).
(Hajiyev and Bayramov, 2011: 461-26).

7. References should appear at the end of the text as follows:

Books: Kenen, P.B. (1989), The International Economy, Englewood Cliffs, N.J.: Prentice-Hall, Inc.

Periodicals: Bayramov A. (2011)," The phenomenon of economic reality", The Journal of Economic Sciences: theory and practice, 12 (2), 152-15.

Articles in edited books: Krugman, P. (1995), "The Move Toward Free Trade Zones", in P. King (ed.), International Economics and International Economic Policy : A Reader, New York: McGraw-Hill, Inc., 163-82.

Other sources: Central Bank of the Republic of Baku (2012), Statistical Bulletin 4/2012 <http://www.cbar.az/assets/2246/BULLETEN_04-2012__eng.pdf>

Chang, R. (1998), "The Asian Crisis", NBER Discussion Paper, 4470, National Bureau of Economic Research, Cambridge, Mass.

8. Cited web pages should exist at the References with their full address and certain cited date as follows: