УДК 339.5

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THE INFLUENCE OF TERMS OF TRADE ON COUNTRY WELFARE

Міжнародна торгівля має великий вплив на розвиток країни. У статті зроблена спроба знайти деякі умови торгівлі, що впливають на добробуту країни. Авторами досліджено 174 країни з усього світу і виділено 4 групи (кластери) країн: перший кластер - бідні країни, другий - середні і багаті країни, третій кластер - найбагатші країни у світі. Один з кластерів (четвертий) був створений спеціально для США. З кожного кластера було вибрано кілька країн, які представляють цей кластер. На основі використання регресійного аналізу і коефіцієнту Пірсона авторами досліджено вплив умов торгівлі на добробут країни (основний вимірник - валовий національний дохід).
Ключові слова: добробут країни, валовий національний дохід, умови торгівлі, багаті країни, середні за достатком країни, бідні країни.

INTRODUCTION

No country in today's globalized world can exist without the cooperation of the outside world. Individual countries in the world are dependent on their cooperation. The involvement of businesses and countries in international trade and the international division of labor produces positive effects. A high degree of international cooperation between countries is improving the quality of life and of its citizens and new products and complementary services flow through the international trade to complete the offer that already exists.

On the other hand, the country exports those goods and services whose production is more than able to consume itself, or which produces specifically for foreign consumers. An increase of countries engaged in the international division of labor and deeper specialization is manifested in the growing international trade.

According to the data obtained from the WTO [1] between 1948 and 2011, world export has increased more than 300 times from 59 billion to 17,816 billion USD. World importation of goods and services has increased from 62 to 15,077 billion USD, which is an increase of 243%. The highest increase in international trade compared to 1948 was recorded at the beginning of 21st century. The increase in trade was due not only to the increased volume of buying and selling goods and services, but also due to the increase in the value of traded goods and services, as well as changes in the commodity structure of trade.

Ten new countries took the part in EU in the 2004 year. Most of them were included in the block of East centrally planned economies. Not only social and political systems changed in these countries. The foreign trade - its structure and destinations were also modified. The question is, if the EU membership in EU had influence in terms of trade in those economies.

The paper deals with the influence of international trade measured by the Terms of Trade on the performance of a country through the gross national income (GNI).

1 DEFINITION OF TERMS

The performance of countries is mostly measured by some indicators
- GDP (Gross Domestic Product)
- GNP (Gross National Product),

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- GNI (Gross National Income).

One of the most frequently used indicators is GDP, or its replacement *GDP per capita.* GDP is expressed in nominal or real terms, to make international comparisons it is expressed in purchasing power parity. GNP is similar to GDP and reflects the national principle of calculating GDP. Out of the less used indicators is the indicator of GNI, or *GNI per capita.*

Similarly, several indicators may be used to assess the importance of foreign trade for a particular country. One of them is the Terms of Trade indicator (ToT), which expresses the degree of involvement of the country to international trade. ToT is given by the ratio between the price index of exported and imported commodities.

The higher the value of ToT, the greater the benefit to the country in the international trade due to a favorable price development of the product exported by the country. Therefore, more products can be imported for the money received. The price index of import and export can be expressed by the import deflator, respectively by the export of goods and services, or using the index of prices in foreign trade.

Even though, the ToT is statistically accessible and usable for research, its biggest drawback is that the exported and imported price level is significantly subjected to changes in price of primary raw materials traded in world markets such as oil.

The value of exported or imported products may not reflect actual changes in quality or innovation, but only changes in world prices. Therefore, it is necessary to be cautious when explaining the impact of ToT on the economy of a country.

Several economists have been dealing with the correlation between ToT and GDP or GNI deal. M. Davies from the Statistical Office in Australia concedes that there is a correlation between ToT and GNI. *"When the Terms of Trade change there may be a significant divergence between the movements of GDP in volume terms and real GDI"* [2]. Moreover, M. Davies states that according to SNA (The System of National Accounts 2008) *"the total real income that residents derive from domestic production also depends on the rate at which export may be traded against imports from the rest of the world."* [2].

Small and open economies can be used as a specific case of the trade measurement. M. Mora has dealt with the resulting effects of ToT on catching up countries, specifically the example of the Czech Republic. According to his findings, *"the welfare effect can be substantial, in particulary in the case of small open economy with a dynamically changing structure of foreign trade"* [3].

Mainly U. Kohli dealt with the impact of ToT on GNI and GDP to relatively wide extent. According to K.J. Fox and U. Kohli [4] the following factors have an effect on GDP and its changes - Technological change, Movements in the terms of trade, Increases in the endowments of labour and capital, Changes in domestic output prices.

Fox and Kohli investigated the effect of various factors on GDP using econometric researched methods. U. Kohli made a measurement of the ToT impact on GDP and GNI for each country. Measurements were performed at different times.

Based on the analysis, he came to the conclusion that the impact on GDP growth is made from two-thirds of the domestic price, about one-half of capital accumulation, one third of the growth in employment and one-sixth of technological growth. The ToT had a little effect on GDP growth, only one-tenth of a percentage point [4].

The results of Fox and Kohli analysis show that *"it is clearly visible, that the ToT have not contributed much to GDP growth on average. On the contrary, in the late 1980's, this component has rather been a drag on income growth. "* [4].

The ToT impact on GNI is not entirely clear. ToT is affected by many aspects, for example: by changes in raw material prices in world markets, the size and number of mutual exchange transactions between companies involved in transnational corporations, as well as by changes in the mix of production and import.

For a more accurate assessment of ToT it is necessary to examine the composition of foreign trade and the share of each item of goods. Their change is also reflected in the change of ToT and the terms of trade can be affected both positively and negatively.

The size and value of the ToT has a significance for the country and changes in the ToT should be subjected to systematic analysis. According to M. Davies from the Australian Statistical Office changes in ToT have two key effects *„dicect effects, such as trading gains; and indirect effects, such as increased employment"* [2]. The ToT indicator reflects not only the importance of international trade for a country, but also the degree of division of labor and economic maturity of the country.

2 METHODOLOGY

The classical theory of international trade is based on the idea that countries which participate in the international division of labor and international trade obtain the benefits regardless of whether they own the absolute advantage or comparative advantage. The participation of countries in international trade should be a potential source of their wealth.

Based on the fact that in the literary sources we came across several views on the relationship between ToT and GNI, we have decided to examine the relationship between these two variables using simple statistic methods. In this article we monitor the presence or absence of mutual interaction of two variables - GNI_N *(Nominal Gross National Income)* and boundness of the country to international trade through the variable ToT (Terms of Trade).

According to OECD, GNI is *„GDP less net taxes on production and imports, less compensation of employees and property income payable to the rest of the world plus the corresponding items receivable from the rest of the world"* [5].

Simpler definition expresses

$$GNI_R = GDP_R + T \qquad (1)$$

where:

GDP_R = real gross domestic product, T = profits, respectively losses of international trade

Profits or losses in international trade reflect the income or loss of land, resulting from its participation in the international division of labor. According to M. Mora *"some authors label T as the ToT effect"* [3]. Algebraic variable T can be expressed as follows:

$$T = \frac{X - M}{P} - \left(\frac{X}{P_{EX}} - \frac{M}{P_{IM}} \right)$$

(2)

where:

X = the total value of exports, M = total value of imports, P_{EX} = export price index, P_{IM} = import price index, P = price index expressed as the mean value of P_{EX} and P_{IM}

There is a correlation between GNI and GDP. It is important to point out that the net export as a part of GDP is not identical with the ToT value. However, GNI can also not be identified with GDP measured by the income approach. The main difference is that the *"GNI measured income, not value added"* [2].

We have used the GNI indicator for its association for the profit or loss resulting from the terms of trade. The other variable is the Terms of Trade (ToT). ToT or "pure barter" is defined as the ratio of the price indices of foreign trade. Indices are calculated by using the method of unit value. ToT are calculated at the level of each country and in percentage reflects the difference between export value units to import value units [6]. Analysis of the impact of ToT on GNI was based on data from the UNCTAD database obtained over the period 1980-2010 throughout 174 countries. Given the fact that a large number of countries was included in the analysis, the countries were divided by the cluster analysis into separate clusters according to the size of GNI_N. Based on the average GNI_N value, countries were classified according to what values of GNI they can generate. The countries included in the first group reached the maximum average height of GNI_N of 500 million dollars. The countries included in the third group reached an average height of GNI_N over 20,000 million dollars a year. In the second group countries reached an average GNI_N value between 500 to 20,000 million dollars.

Cluster Analysis (CA) according to J.Stankovicova and M. Vojtkova [7] is a set of mathematical and statistical techniques used to identify groups called *clusters*. That means that the cluster analysis decomposes the set of objects to several homogeneous clusters (subsets), based on the fact that the objects belonging to one cluster are close and similar - internally homogeneous. Objects belonging to different clusters are a distant and different - heterogeneous. Similarity between objects was determined by using the *measure of distance*. The higher the values of the measure of distance are, the more distant and different the objects are.

If it is true that we have *n* objects and each is characterized by *k* features, then the distance between objects *i* and *j* can be determined by the *Euclidean distance*, which assumes no correlation of variables and can be algebraically written as:

$$d_{ij} = \sqrt{\sum_{k=1}^{n} \left(X_{ik} - X_{jk} \right)^2}$$

(3)

The criteria of determining the distance between objects using the *Euclidean distance* is based on no correlation of variables, therefore, by working with the variables in a standardized form we have removed the interdependence of objects.

Cluster analysis was conducted by using the *Ward method. Ward's method* was used to create clusters of similar countries due to their average level of GNI_N reached during the whole analyzed period, and then the countries representing a specific cluster were selected for analysis. Selected countries have the characteristics of a particular cluster, which they represent.

The second variable analyzed was the level of participation of the country in the international division of labor, which expresses the value of the Terms of Trade indicator (ToT). At the same time it can be stated that the ratio mentioned above is one of the indicators of living standards of the country.

The basic idea of ToT is a causal relationship between the ratio of prices and quantities of two products, which are mutually exchanged. Therefore, the terms of trade are expressed as the ratio of export price index and import price index:

$$ToT = \frac{P_{EX}}{P_{IM}}$$

(4)

The main objective of this article is to determine whether the countries involved in international trade, measured by the terms of trade, contribute to increase of GNI_N especially in countries generating high, average and low values of GNI.

The first partial aim of this contribution is to classify development trends of indicators ToT and GNI on a selected sample of countries.

UNCTAD for countries classifies the ToT in relation to the baseline year 2000, therefore, in order to synchronize the data, developmnet trends of GNI were classified by the base index where the base was year 2000. The second partial aim of the contribution is to determine whether a linear relationship exists between the variables.

The analysis of the impact of the ToT on GNI_N is based on regression and correlation analysis, which complement each other. Correlation analysis evaluates the strength of dependence between two independent variables and complements regression analysis, mainly because the dependence between variables may reduce the quality of the results of the regression analysis.

Based on the results of the *Pearson correlation coefficient* we classify the direction and tightness of the linear dependence between two qualitative variables *Y* a X_k, while eliminating the impact of variables $X_l, ..., X_{k-l}$ [8, p.94-95]. The correlation coefficient *(R)* takes values from the interval ‹-1; 1›. Negative, respectively positive value of *Pearson coefficient* defines the direction of the linear dependence [8, p.78]. Therefore, the following applies:

If | r | = 0, then variables X and Y are not linearly dependent,

If | r |> 0, then between variables X and Y there is a direct linear relationship,

If | r | <0, then between variables X and Y there is an indirect linear relationship.

The statistical significance of correlated variables is expressed through the absolute value of *R*, which can be in the following intervals:

0.1 <| r | trivial dependence

0.1 <| r | <0.3 small dependence

0.3 <| r | <0.5 medium dependence

| r |> 0.5 strong dependence.

The correlation analysis was added by *a simple regression analysis*. Prerequisite of analysis is the existence of a linear relationship between the dependent variable *Y* and the independent variable *X*. This dependence can be written through the regression line:

$$Y = \beta_0 + \beta_1.X \tag{5}$$

where β_0 is a constant that expresses the influence of random factors on an explained variable and β_1 is the regression coefficient that indicates the growth *($\beta_1 > 0$)* or decrease *($\beta_0 < 0$)* of the dependent variable *Y* value to a unit increase in the explanatory variable X_1 while unchanged values of other explanatory variables [8, p.18]. A point estimate of the regression line is the regression function:

$$y = b_0 + b_1.x \tag{6}$$

Explanatory variables were the *terms of trade (ToT)*. Variable that has been explained was *the nominal gross national income (GNI$_N$)* at current prices and current exchange rates in millions of dollars. In assessing the impact of the *ToT on GNI$_N$* we set the hypothesis that we tested through *cluster, correlation and regression analysis.*

H$_1$: We assume that there is a statistically significant relationship between GNI$_N$ and ToT in all groups of countries.

3 RESULTS AND DISCUSSION

For the purposes of putting together the analysis of the impact of *ToT on GNI* we divided 174 analyzed countries into three groups of countries based on the absolute value of *GNI$_N$*

For each group of countries were formed into clusters based on similarities or differences in the development of *GNI$_N$* during the period from 1980 - 2010. The process of aggregation of individual groups of countries is captured in dendograms that are listed in the appendix. A specific case is the USA, which created a single independent cluster. Therefore, analysis of the USA is performed separately.

The countries included in the first group consisted of countries with low GNI and achieved the maximum GNI$_N$ 500 million USD. They created six clusters. Due to the availability of data about individual countries, the following countries were analyzed: Cape Verde, Comoros, Gambia, Guinea-Bissau. The analyzed group includes mainly geographically small countries, so we assume that their participation in international trade is large. For that reason, we assume a high dependency

between GNI and ToT in this group of countries.

We expressed the development trends of GNI$_N$ through the base index, where the base year was 2000. Although we analyzed a set of countries with low GNI, it can be concluded that the development of the indicator has a growing trend. Expressed in absolute terms GNI$_N$ grew in those countries as follows - Cape Verde (an increase of 1 494.5 million USD), Comoros (an increase of 516.2 million USD), Gambia (an increase of 779.9 million USD) and Guinea -Bissau (an increase of 499.6 million USD). The increase of GNI$_N$ in the period 2010 to 1980 in these countries it ranged from 4.1% in Cape Verde to 38.1% in Guinea-Bissau.

Involvement of the country to international trade is important not only for small open countries, but also for poor countries. According to B. Balaz [9] poor countries are dependent on economically strong countries. It is due to the shortage of internal resources for the countries development based only on its own efforts and abilities.

To T expresses the share of price indices of exported and imported goods and services. Therefore, it is possible for countries to achieve a ToT value higher than 100. Just then the country benefits from international trade, export incomes are growing, and the country can afford to import more. In all selected countries in the first group, the ToT value decreases even though, the value of GNI$_N$ was growing in all the analyzed countries during the monitored period.

Out of mapping it is clear that the values of ToT and GNI$_N$ are not moving in the same direction. For those clusters represented by countries from the first group we performed a regression analysis. By using regression analysis, we tested the hypothesis assuming non-acceptance of the year 2000, because the ToT indicator is reported at the baseline year 2000, which would disturb the results of the regression analysis. This criteria was used for all groups of countries.

Regression analysis showed a weak dependence of the impact of ToT on GNI of poor countries' (Multiple R = 0.031991394) and variability in the values of the dependent variable (GNI$_N$) was explained by the model only on 0.1%. The model is not statistically significant (Significance F = 0.72868984). The value of the correlation coefficient R = 0.031991 proves trivial dependant between variables and direct linear relationship.

The cluster analysis of **the second group of countries, the countries with the average GNI** created 5 clusters. For individual clusters the selected countries were: Central African Republic, Costa Rica, El Salvador, Haiti, Namibia, Sudan, Uruguay, and Zimbabwe.

As in the first group of countries with low production of GNI, development trends of GNI$_N$ base index for the second group of countries indicate an increasing trend. The value of GNI$_N$ in these countries was increasing from 1,610 million USD in the Central African Republic to an increase of 4,700 million USD in Zimbabwe. Compared with countries with low GNI, an increase of GNI$_N$ in this group of countries is considerably higher. Between the years of 1980 and 2010 the value of GNI$_N$ increased by 1.6% in Sudan, 1.61% in Salvador, 3.6% in Costa Rica, 4.1% in Namibia, 5.4% the increase

in the value of GNI$_N$ which was recorded in Haiti, 6 , 4% increase was in Uruguay, nearly 14% the Central African Republic and the largest increase 29.6% was in Zimbabwe, despite the fact that during the monitored period values of GNI$_N$ indicator fluctuated in Zimbabwe.

Zimbabwe is an example of that, as the only country reported in 2010 with the value of GNI$_N$ lower than the value of GNI$_N$ in 2000.

The ToT value in countries with an average GNI in the evaluated period was developing differently. Countries like Central African Republic and Haiti had at the beginning of the evaluated period, the value of the variable ToT over 200. That means, that the export price index was more than twice as high in comparioson to the import price index. However, at the end of the evaluated period the situation has deteriorated dramatically in both analyzed countries and the values of ToT decreased to 80 (Central African Republic) and 60 (Haiti). Adjusted values of ToT at around 100 varied in countries Sudan and Uruguay during the monitored period. In other analyzed countries the value of ToT increased slightly from about 70-80 to 100 or slightly above 100. For a more precise analysis to identify the causes of changes in the values of ToT a detailed analysis of the commodity structure of exports and imports is needed.

By testing hypothesis in the case of countries with an average production of GNI was proved a weak dependence of GNI$_N$ from ToT (Multiple R = 0.011520619). A value of coefficient of determination is negligible. The model is statistically not significant (Significance F = 0.859075809).

It means that even in a group of countries with an average GNI, as well as, in the case of countries with a low production of GNI, the dependence between GNI and ToT was proved to be not statistically significant. Pearson's correlation coefficient indicates an indirect linear relationship and trivial dependence between variables (R = -0.01152).

Countries that reached an average value of GNI$_N$ over 20,000 million dollars were placed in *the third group of the group of countries with a high GNI*. Cluster analysis within the mentioned group of countries created four clusters. As a group of rich countries, we defined these representative countries - Argentina, China, Hong Kong, SAR, Egypt, India, Korea, Republic of Mexico, Philippines, Singapore, Thailand, Tunisia and Turkey.

The development trends of the base GNI$_N$ index indicate a long-term growing trend of indicators in all analyzed countries. At the same time, it can be concluded that the year after 2000 the indicator shows growth only. The increase in absolute value of GNI$_N$ in countries with a high GNI is expressed in absolute value from 40,455 million USD. Tunisia up to the value of 1,646,761 million USD in India. The increase in percentage of the GNI$_N$ value in the year 2010 compared to 1980 in Argentina was 5.9%, in China, Hong Kong, SAR 9.3%, Egypt 3.7%. In India GNI$_N$ grew by 3.6% in Korea 0.9%, in Mexico 4.2%. The Philippines recorded an increase of 3% in Singapore 0.9%, in Thailand an increase of 2.3% in Tunisia 3.7% and in Turkey an incerease of 3.6%.

Despite the growing trend of GNI$_N$ we can conclude that in most countries the index of ToT drops down. Between the values of 80 to 100 or slightly above

100 are countries like Argentina, India, the Philippines, Turkey. In the other surveyed countries included in the group of countries generating high GNI is shown a considerable decrease in the value of ToT. It often shows the decrease from 200 - 300 to below 100. This trend is characterized by a gradual decline in value over the 80's and 90's of 20th century. Only Argentina, Egypt and Mexico reached the value of terms of trade higher than 100 after the year 2000.

In countries with a high GNI the value of multiple correlation coefficient shows a weak dependence between variables - Multiple R = 0.0871726. Tested hypothesis showed statistically not a significant model (F Significance> 0.05). The variability in value of the dependent variable (ToT) was explained by the model only to 0.7%. The value of the Pearson correlation coefficient (R = -0.08717) confirmed the trivial dependence and indirect linear relationship, therefore, the variables correlate in the opposite direction.

Based on the fact that the USA showed a high variability in value compared to other countries with a high GNI and created a separate cluster, was the regression and correlation analysis done independently. *The United States of America* belong to the largest economy in the world. The GNI$_N$ created in 1980 reached the value of 1,029,523 million USD. At the end of the analyzed period the GNI$_N$ value increased by more than 13 million USD to the amount of 14,700,956 million USD. The value of ToT in the monitored period fluctuated slightly below 100, between the years 1986 to 2004, but in 2004 was slightly above 100.

The conclusion of hypothesis testing in the USA is the same as for the other clusters. ToT has no effect on creating GNI$_N$ in the country (Significance F> 0,05). The regression model is statistically insignificant. The strength of dependence between variables is negligible (Multiple R = 0.006054632). Although, Pearson's correlation coefficient indicates a direct linear relationship but this is a trivial dependence (R = 0.006055)

CONCLUSION

The GNI indicator is compiled primarily for measuring household income in the country. A higher income usually means a higher standard of living and quality of life it the country. Based on the size of the measured GNI$_N$ income, countries were divided into three groups - countries with low, average and high GNI. During the monitored period of years 1980 - 2010 all three groups of countries noticed the growth of GNI$_N$. Despite the increase of GNI$_N$, this increase wasn't equal in all groups.

Over the 30 years of monitoring GNI$_N$ grew in countries of the first and second groups significantly less than in countries with a high GNI. While in the third group the wealth grew from 40 to 1646 billion USD, in countries with an average GNI there was an increase of GNI$_N$ expressed in absolute value in the amount of 1610 to 4700 million USD and in countries with low GNI the increase was about 1,495 million, USD. The differences between the first and second group of countries increased indeed but the difference is less marked than between countries of the third and first and second group together.

Although it is true that most growth of GNI$_N$ in countries with low and average GNI is accompanied by an intensive cooperation with countries with a high production of GNI. Especially, in the second half of the 80's of the 20th century GNI$_N$ of countries with high GNI begins to deviate significantly from the GNI$_N$ in other countries.

For the second half of the 20th century a tremendous growth of mergers and acquisitions is characterized, which was accompanied by the growth of transnational corporations. Promoting of science and technology is used in production. This causes the movement of foreign investment and a shift in the processing chain from production to sale to the final sale of semi-finished products and work in progress. Changes in the global economy are reflected not only in the outcome of the trade balance of each country, but also the size of the ToT. While in countries with low production of GNI over the monitored period the value of ToT declined, in countries with low and average GNI develop very heterogeneously. For those countries, which didn't catch this trend or didn't have enough financial capital or an educated workforce, a decline in terms of trade measured by the ToT indicator is showed.

In examining the impact of ToT on GNI we used different methods, such as Fox and Kohli. Our research base consisted of a 174 countries and has been performed in a different period of time and the results analysis show that there is a little or no dependence between ToT and GNI. In countries with a high average of GNI, the studied variables did not correlate in the same direction. It looks as if the ToT reduced the value of GNI. Therefore, the involvement in international trade caused the decrease of GNI value.

In countries with low GNI there was a positive correlation between GNI and ToT demonstrated but none of the analyzed clusters of countries was a statistically significant relationship confirmed.

We made the special analysis for the post-communist countries. As we have a fewer data from other countries, we can conclude that it is very important for every country to participate in international trade for a long time. In short period ToT has no influence on GNI.

Our hypothesis was not confirmed and so we can state that there is no dependence, respectively there is only a weak dependence between ToT and GNI in the countries we analyzed during the selected years. The testing of hypothesis in all groups of countries, however, did not confirm a statistically significant relationship between the variables.

The value of ToT reflects not only the level of involvement of the country in international trade, but also has an important role, taking into account the efficiency of export and import. According to K.J. Fox and U. Kohli strengthing of ToT has the same role in the economic development of the country as a technological advantage up to the moment when they start to use the benefit of others. For a country in which the growth of ToT was expressed, it has the same meaning as the newly created output basis on a technological progress and not on the usage of domestic input. The opposite trend can be seen in the decline in the value of ToT [4].

In Kohli's later work a following finding can be found „a change in the ToT or in the real exchange rate will have a direct impact on real GDI, but not on the real GDP"[10]. As well as from his research, and from the findings of Reinsdorf it is clear that there is a very important role in the method for calculating GNI and GDP when measuring the effect deriving from the ToT. *„The difference between real GDI and real GDP can be decomposed into two key terms: the change in the terms of trade weight by the average share of trade in GDP, and the change in the relative price of tradables weight by the average share of the trade balance in GDP"* [11].

Even though, the ToT is a part of the evaluation indicator for economic performance of the country - GNI, a statistically significant dependence between these variables wasn't demonstrated.

It means that if we wanted to focus on the country's performance growth measured by GDP or the GNI ratio, the effect of international trade is negligible in the assessment of the country as a whole. According to the findings of Reinsdorf „*ToT improvement added an average of 0,15 percentage points to the annual growth rate of real GDI, or cumulative 1,8 percent over 12 years*" [11]. Such a low percentage of increase in GNI or in the case of Reinsdorf GDI appears to be statistically insignificant.
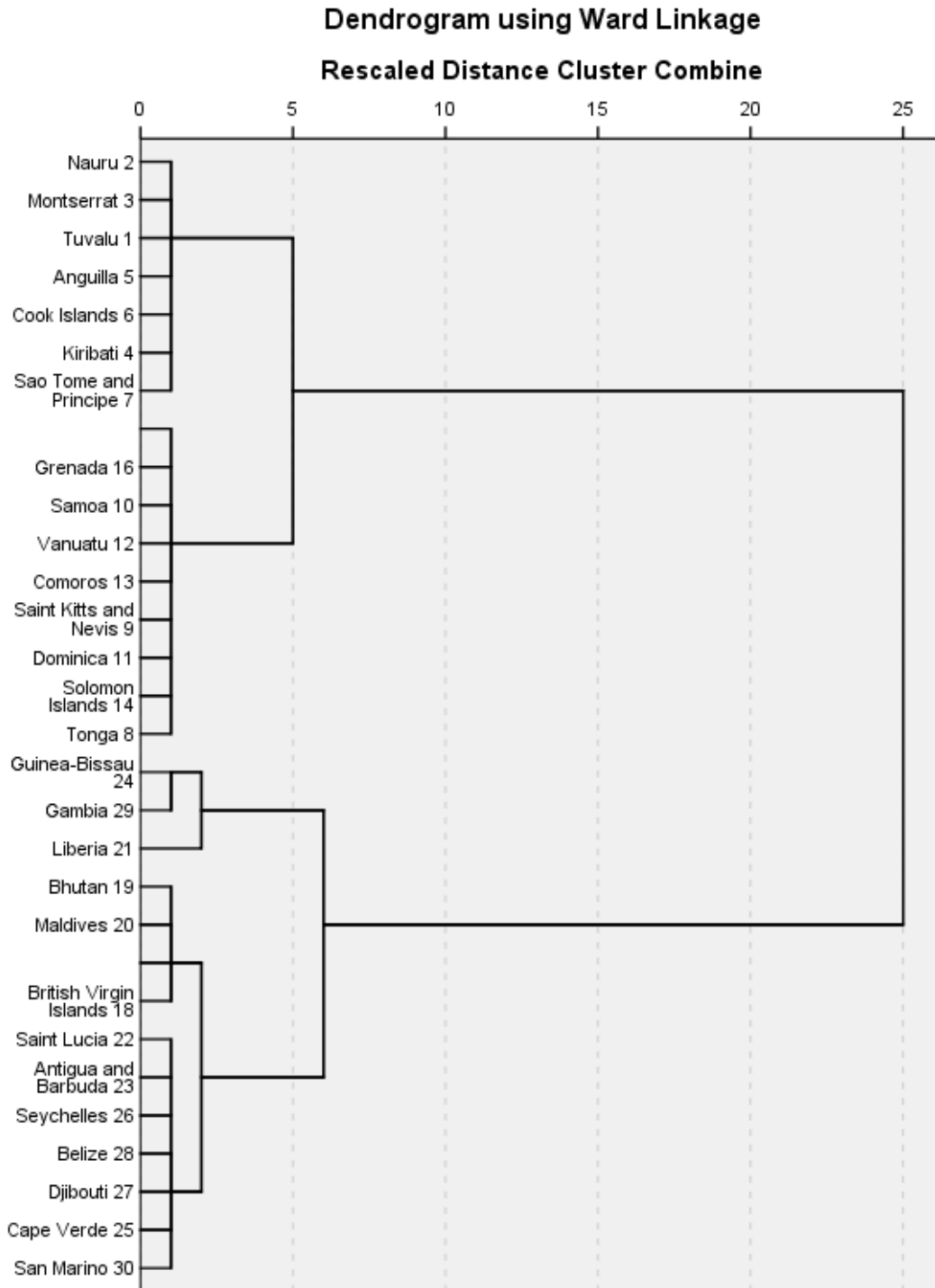
The question remains, what is an essential driver for efficiency growth of the country, or when the effects arising from international trade will manifest on GNI? The question we have not dealt with in the article, but is revealed in our analysis is that if the technological advance is fundamental to the success of the country, at what point this effect will occur when it comes to ToT and the growth of GDP or GNI?
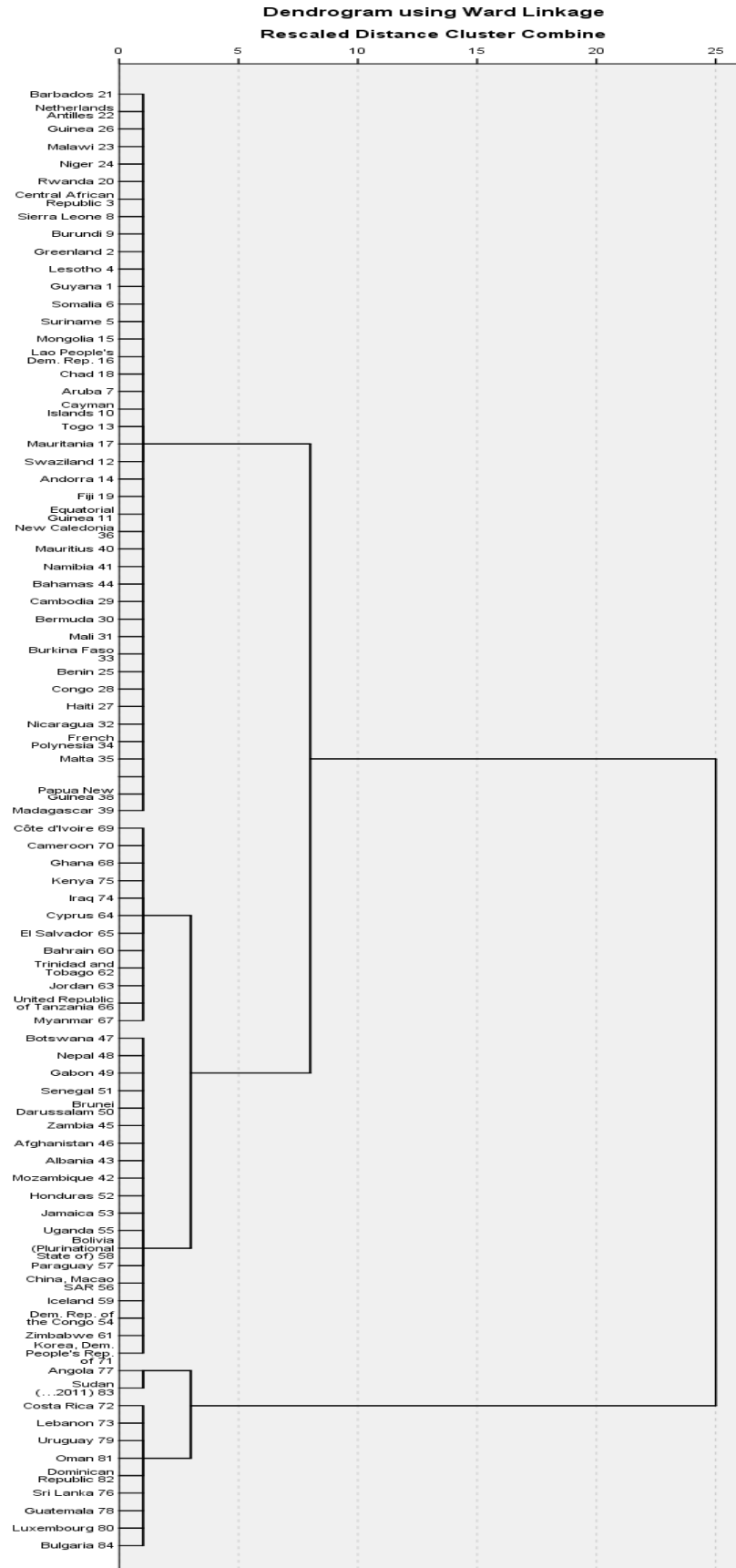
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1. Cluster of countries

Dendrogram using Ward Linkage

Rescaled Distance Cluster Combine

2. Cluster of countries

Dendrogram using Ward Linkage

Rescaled Distance Cluster Combine

3. Cluster of countries

Dendrogram using Ward Linkage

Rescaled Distance Cluster Combine