QUANTIFYING INTERNATIONAL OPENNESS IN TURKEY, 1965-1995

TÜRKİYE'NİN DIŞA AÇILMA ORANININ ÖLÇÜMÜ, 1965-1995

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ABSTRACT: The results of empirical studies on the 1980 Turkish economic reform programme frequently suggest that openness has a positive impact on growth in Turkey. However, the results of empirical literature on the relationship between openness and growth have always been under criticism for using openness variables, which are not objective measures of openness, involve measurement errors and do not capture all dimensions of openness. To overcome these criticisms, in this article, we introduce a composite openness proxy obtained using the principle component methodology that captures all dimensions of openness and provide an objective and more reliable measure of openness for Turkey.

Keywords: Openness, Measuring openness, Principle component method

ÖZET: *Türkiye'de 1980'de gerçekleştirilen ekonomik reformlar üzerine yapılan kantitatif çalışmalar genellikle dışa açılmanın büyüme üzerinde pozitif etki yaptığı sonucuna varmışlardır. Fakat, bu konuda elde edilen ampirik bulgular, analizlerde kullanılan dışa açılma endeklerinin objektif bir ölçüsünün olmadığı, ölçme hataları içerdiği ve dışa açılmanın bütün yönlerini kapsamadığı gerekçeleriyle literatürde sıkça eleştirilmişlerdir. Bu makale, Ana Bileşenler Analizi kullanılarak oluşturulacak karma bir dışa açılma endeksinin, literatürde yapılan eleştirileri büyük ölçüde ortadan kaldırabileceğini göstermektedir. Zira bu karma endeks, dışa açılmanın farklı boyutlarını bir araya getirdiğinden, Türkiye ekonomisi için dışa açılmanın objektif ve güvenilir bir ölçüsü olarak ampirik çalışmalarda kullanılabilir.*

Anahtar Kelimeler: *Dışa Açılma, Dışa açılmanın ölçümü, Ana bileşenler analizi*

1. Introduction

Openness can be defined as the extent of impediments to free movements of goods. Similarly, an economy is said to be *more open* the smaller the impediments to international flows of goods. Measuring the level of openness of a country has always been the main concern of much of the empirical literature. Having a reliable measure of openness of a country is not only important because it provides valuable information about the state of an economy but also it is important because openness variable is widely used in the empirical studies on growth. In this literature, it is often argued that outward-oriented countries grow faster than inward-oriented countries or outward-oriented trade policies are superior to restrictive, inward-oriented ones. Along with the East Asian countries, which have also implemented

openness policies, the Turkish openness experience is frequently viewed as an evidence to support those who promote openness.

Over time, an enormous empirical literature has accumulated on the subject and shown that there is a positive relationship between openness and growth. However, the results obtained in empirical literature on the subject have always been under criticism. The focal point of these criticisms is related to empirical problems arising from the use of openness variables, which are not objective measures of openness and involve measurement errors. To overcome these criticisms, much of the empirical literature on growth and openness has concentrated on finding a reliable and objective measure of openness, which captures all dimensions of openness, and resorted to different types of strategies. Considering the literature on the subject, in this article, we will attempt to provide an objective and more reliable measure of openness for the Turkish economy.

To this end, the rest of this article is organised as follows. Section 2 provides a critical review of the literature on openness proxies and presents four types of strategies resorted in the literature over time. Section 3, then, overviews the data on Turkish openness making use of five different openness proxies, namely the shares of exports, imports and international trade in Turkish output, tariff rates and the black market exchange rate. In this section, we will also argue that none of the proxies can represent all dimensions of openness alone. Therefore, Section 4 of this article introduces a composite openness index obtained employing the principle components methodology that may overcome much of the criticisms mentioned earlier and that may help to improve the results of empirical studies on Turkish growth openness relationship. Section 5 gives concluding remarks.

2. Empirical Measures of Openness: A Literature Review

There is a considerable empirical literature on the relationship between openness and long-run economic growth[1]. However, the results of empirical studies on the subject have always come under criticism for a number of reasons (Edwards, 1993). The most important one of these criticisms is related to empirical problems arising from the measurement difficulties related to openness variables or finding an objective way of measuring openness. As the definition of openness given above implies, the level of openness is closely related to the level of tariffs, non-tariff barriers, exchange rate policy, and export subsidies. However, such a data that involves all these dimensions of openness is not readily available and therefore researchers employed a proxy for openness in their analysis.

Although the use of proxies for openness helped to overcome the difficulties related to the lack of data, the findings of empirical studies on the subject have always been questioned. To overcome this criticism, the literature on openness and growth has adopted four types of approaches over time.

The *first approach* is to use export growth or the share of exports in GDP as a proxy for openness (Feder, 1982)[2]. The use of exports as a proxy is justified by arguing

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1 The empirical literature on openness and growth is surveyed by Edwards (1993), Greenaway and Sapsford (1994), Falvey (1996), Rodriguez and Rodrik (2000), Greenaway, Morgan and Wright (2002).

2 This methodology was used for the first time by Michalopoulos and Jay (1973) and later by Balassa (1978), and Tyler (1981). However, Feder (1982) explicitly used the links between openness and growth for the first time in a formal modelling framework.

that the impact of openness on growth can be decomposed into two stages. In the first stage, openness will promote exports by reducing anti-export bias. In the second stage, the higher exports result in a higher rate of growth through the positive spillovers it generates, exploiting scale economies, allowing input availability by relaxing the foreign exchange constraint, and encouraging competitiveness. Following Feder (1982)'s work, an enormous empirical literature that used exports as openness proxy has accumulated. This literature has been surveyed by Jung and Marshall (1985), Greenaway and Sapsford (1994), and Edwards (1992).

In the recent empirical literature, the use of export growth as openness proxy is criticised for a number of reasons. First, a detailed account of the links between openness and growth provided by the new growth theories has left the decomposition approach of the early literature ungrounded. Second, Levine and Renelt (1992) showed that exports are not special as a proxy for openness; imports and total trade could be substituted for exports because all three variables assumes the same coefficient estimates and standard errors in cross-section regressions. In summary, the dissatisfaction with the use of exports as openness proxy led the researchers to concentrate on finding reliable measures of openness (Edwards, 1993).

The *second approach* is to focus on constructing more creative and alternative indicators of openness, which capture important aspects of openness and are free from previous criticisms. More than ten such openness proxies are developed and used in the empirical literature (Edwards, 1992). Some of these proxies are Leamer (1988)'s overall restrictiveness proxy, the average black market premium, the volatility of the black market premium, Dollar (1990)'s index obtained by combining an "index of real exchange rate distortion" (Distortion) and an "index of real exchange rate variability" (Volatility), the World Bank (1987)'s outward orientation index and Lee (1993)'s composite measure of trade openness, Sachs and Warner (1995)'s index of openness that combines information on tariff rates, non-tariff barriers, and economic system of a country, the share of state economic enterprises in major exports and a black market premium. Although the Sachs-Warner index is a comprehensive index, it involves a subjective measure of economic systems term and gives an arbitrary weight for each of the variables in the index.

Difficulties in defining satisfactory and convincing summary measures of trade policy that can be used in empirical analysis are partly solved by the introduction of more creative proxies as discussed above. However, the fact that the existing proxies are either subjective or restricted only to limited aspects of trade policy leaves the relationship between openness and growth a question of to what extent these indices are indicators of trade policy. To tackle this problem, Edwards (1992) follows a different strategy.

The *third approach* (Edwards, 1992) is to use all proxies, including subjective indicators, to determine whether econometric findings are sensitive to the choice of a particular proxy. This involves using more than one proxy separately and if results are robust across proxies then conclude the presence of reliable relationship between openness and growth. Edwards (1992) argues that the imperfections in specific proxies would be irrelevant so long as the positive impact of openness is robust

across different openness proxies. In his empirical analysis, he uses ten different openness proxies and finds out that in all except one proxy (non-tariff barriers), the estimation results show that trade policy has a significant effect on growth. Using the same strategy, Harrison (1996), however, finds that only three out of seven proxies exhibit a robust relationship with growth. Edwards (1998) goes a step further and combines all these different indices into one openness proxy using principle component analysis.

The *fourth strategy* (Edwards, 1998) is to combine all proxies into one openness proxy, which captures all dimensions of openness using principle components analysis[3]. Edwards argues that single proxies developed in the literature and discussed above might not capture the full impact of openness on growth. However, one can combine the information represented by a different set of alternative proxies by creating a single openness proxy making use of the principle components analysis. In his analysis on the impact of openness on total factor productivity growth, he employs nine alternative indicators of openness including the one obtained from principle component analysis and shows that the estimation results are consistent across different proxies.

As explained above, a lot of effort has been spent to find an objective, reliable and comprehensive measures of openness. However, the empirical literature on the subject is not without critics. Rodriguez and Rodrik (2000) provide very comprehensive criticisms of the use of proxies for openness in the empirical literature. Their criticism concentrates on the fact that the openness proxies employed in the literature are poor indicators of openness and there were many flaws in the construction of these proxies. They argue that openness proxies are not related to openness but rather highly correlated with other sources of economic performance[4].

In summary, the difficulties in measuring openness cast doubts about the reliability of the empirical evidence on openness-growth relationship. In the following section, we first discuss different dimensions of openness making use of Turkish data over the period (1965-1995)[5]. Then, considering the criticisms related to single measures of openness proxies, we present a composite index of openness which captures all dimensions of openness.

3. Measuring the Dimensions of Openness in Turkey

In this section, we discuss measuring the level of openness that the Turkish economy achieved after undertaking an extensive reform programme in 1980. The policy reform programme involved a number of policy variables directed towards the opening up of the economy to foreign competition. However, direct measures of openness or a variable that captures all aspects of trade policy change are not readily available. As seen from the review of the empirical literature above, the problem of capturing all aspects of openness is resolved by introducing a number of proxies. To this end, Section 3.1 presents five different proxies that can be used to understand the level of openness in Turkish economy over the period 1965-1995. These proxies

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3 See Edwards (1998) and Cameron et.all. (1998) for the justification of this point.

4 See also Gundlack (1997) for deficiencies of openness proxies.

5 Considering the fact that import substitution policies were strictly followed between 1965 and 1980, the sample period is restricted to the period of 1965 to 1995 in order to have equal number of observations for both pre-reform and post-reform periods.

are the share of exports, imports, exports plus imports in GDP, tariff rates, and the exchange rate distortion index. Considering the fact that these proxies might be capturing different aspects of openness, Section 4 introduces the principle component analysis that combines different dimensions of the openness proxies together and provides a single measure of openness.

3.1. Measuring the Level of Openness in Turkish Economy

As mentioned in the previous section, Turkey undertook a reform programme in 1980 but the level of protection was not smooth in the pre-80 period. Although Turkish economy was protected by tariffs and quotas from foreign competition in the pre-80 period, the availability of foreign exchange played an important role in determining the level of openness (or closeness) of the economy. In other words, it is difficult to measure the level of openness because there are a number of other factors that affect the level of openness besides protection rates. Because of the difficulty in finding single objective measure of openness that involves different aspects and policies of reform programme, researchers on the subject are inclined to use more than one measure of openness. In this context, many openness proxies are suggested in the literature, as discussed in Section 2. In this section, we first provide the reasons for using different proxies to understand the level of openness. Then, we introduce five different proxies of openness, which will be employed in the next section, and discuss the problems related to measuring openness, in practice. These proxies are the share of exports, z^{EX}, imports, z^{IM}, exports plus imports in GDP, z^{OP}, tariff rates, z^{T}, and the exchange rate distortion index, z^{BMR}. (The data on exports, imports and tariffs are obtained from the State Institute of Statistics (SIS)'s Statistical Indicators 1923-1995 publication. The exchange rate distortion index is constructed as an annual average black market exchange rate minus the official exchange rate over the black market exchange rate. Black market exchange rate data is taken from the World Currency Book (previously known as Pick's Currency Yearbook), various issues. Official exchange rate data are taken from the Statistical Indicators 1923-1995, SIS). Then, we discuss the level of openness in Turkey, using five different openness proxies, over the period 1965-1995.

Mainly for three reasons, it seems best to use different proxies to understand the level of openness: (1) the lack of any objective criterion that can be used in selecting the right proxy among alternative proxies; (2) the lack of reliable data on the level of protection (such as tariffs, quotas); (3) there are no unambiguous reasons to suppose that openness proxies are complementary or supplementary. To overcome these problems and remove the ambiguities that exist in providing a reliable measure of openness, we rely on the theoretical literature on the relationship between openness and economic performance in choosing the relevant proxies that correspond to different dimensions of openness and employ the principle components method to combine these proxies to establish a single measure of openness for Turkey[6]. Therefore, the composite openness proxy provided in this paper is an objective proxy in a sense that it captures each and every dimension of openness established in the theoretical literature on openness and economic performance. First step in quantifying openness requires understanding the nature of openness. In the theoretical literature on the relationship between openness and economic performance, it has been shown that openness affects economic performance

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6 Thank for an anonymous referee reminding us to clarify this point.

through five main channels[7]. These channels are the factor allocation effect, import discipline effect, scale effect, input availability effect and spillover effects. Since we do not have a readily available, observable data which can be used to represent these dimensions of openness, as a second step, we search for proxy variables that relate the theoretical arguments about the dimensions of openness to the readily available and observable variables. To find such proxies, we need to look at closely to the mechanisms that translate the impact of openness into a change in economic performance.

For example, the first theoretical channel that links openness to economic performance goes through the allocation of resources. According to this argument, opening up to international trade brings about reallocation of resources according to comparative advantages (Grossman and Helpman, 1992, Young, 1991). Since the direct effect of allocation of resources is observed on the level of exports and imports, the share of exports and imports in total production can be used to represent this dimension of openness. Following the same line of reasoning, we argue that the import share and tariff rates can be used as an openness proxy characterising the dimension of openness related to increased international competition; the share of export in production can be used as a proxy of openness to capture the dimension of openness related to scale economies; the black market exchange rate index can be a better indicator of the level of openness in case of the availability of inputs; the share of the total of exports and imports in total production provide the proxy that represents technology spillover dimension of openness. We, now, discuss the level of openness in Turkey measured by using five different proxies, which are presented in Figures 1 to 3.

In Figure 1, we show the level of openness in Turkey over the period 1965-1995 measured by the share of exports, imports and international trade in GDP. These proxies are commonly used in the literature as measure of openness. The examination of this figure shows that the share of trade in GDP was modest and almost constant over the period 1965-1980, when the import-substitution policies implemented. It also shows an increasing trend between 1980 and 1995 implying gradually opening up to international competition following the reform programme of 1980. Figure 2 presents the exchange rate distortion index, which shows the percentage differences between official and the black market exchange rates. From figure 2, we see that the black market premium was very high between 1965 and 1980 except the years of devaluation. The use of a realistic exchange rate following 1980, the exchange rate distortions seem to disappear indicating a reduction in anti-export bias.

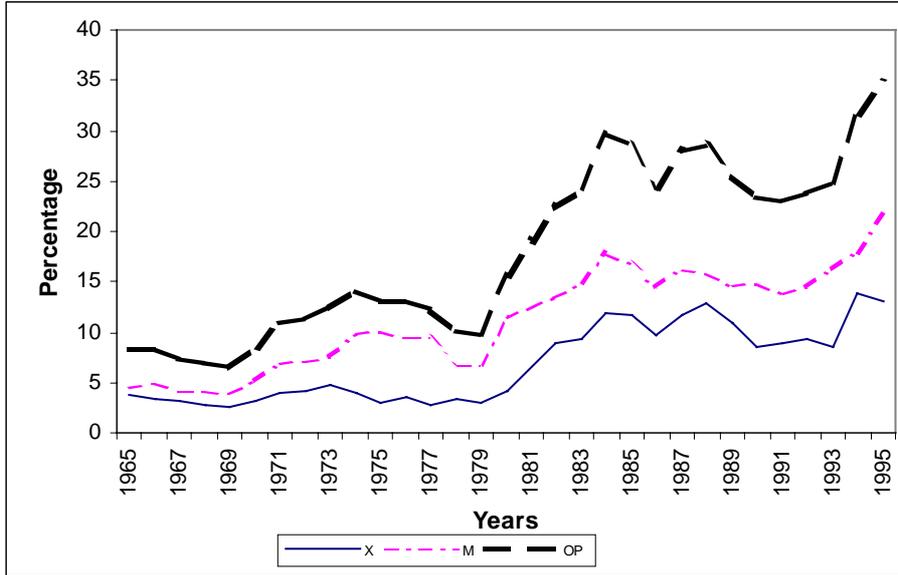7 Please see Örnek and Kaplan (2004) for more information on this subject.

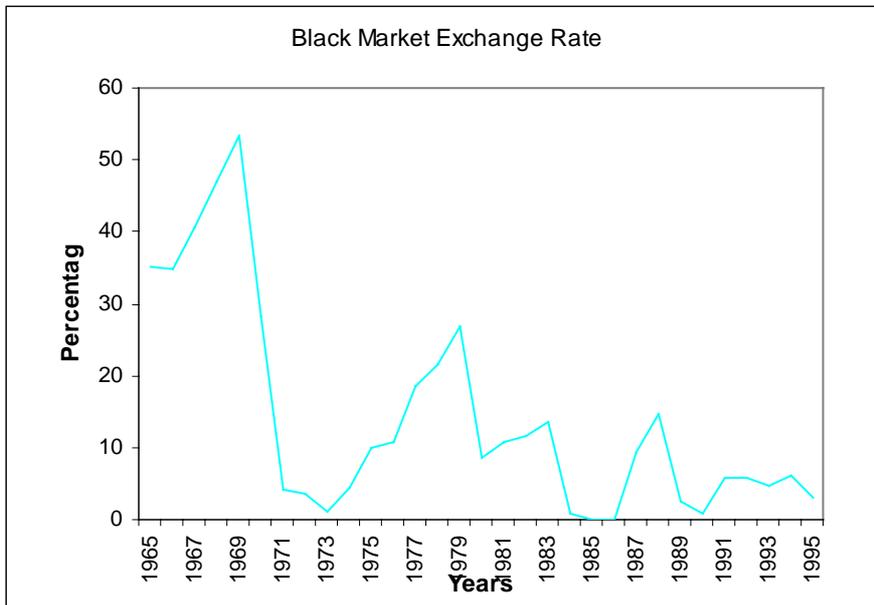**Figure 1**. **Openness Proxies: Exports/GDP, Imports/GDP, Exports plus Imports/GDP, 1965-1995.**

Figure 2. Openness Proxy, Black Market Exchange Rate, 1965-1995.
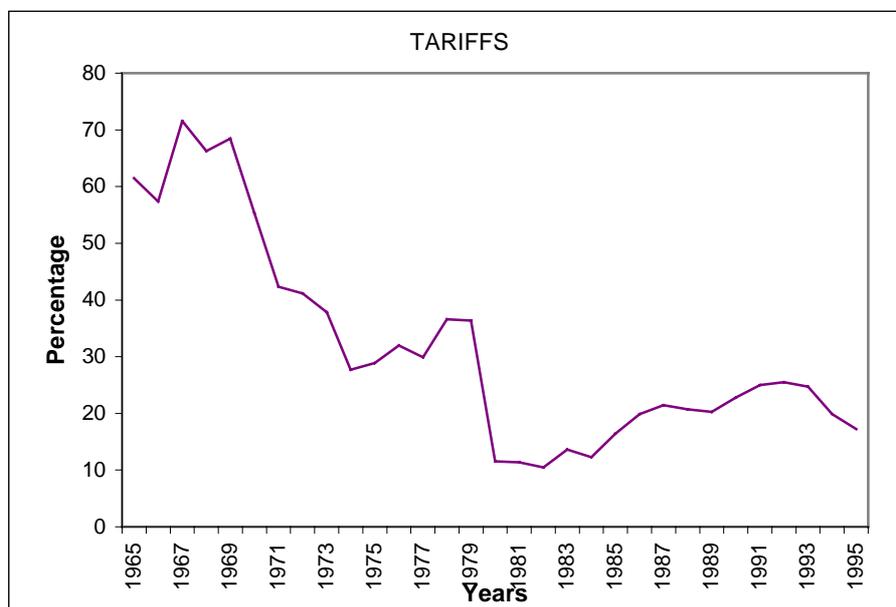
Figure 3. Openness Proxy, Tariff Rates, 1965-1995.

The fourth measure of openness is presented in Figure 3, which gives the tariff rates over the sample period. It is often argued that the tariff rates provide the most reliable measure of openness. However, tariff data is not readily available in the sense of the complexity of the protection system and difficulty in calculating it, and usually calculated by dividing the total tariffs revenue by total imports. As can be seen from the figure, tariff rates seem to decline gradually over the import-substitution period reflecting the restrictions over and above in obtaining imports. In this sense, tariff rates cannot be used as a single proxy to measure the level of openness in the economy. In the next section, we provide a composite openness index obtained using the principle component analysis.

4. Composite Index of Openness for Turkey

As discussed in the previous section, we cannot rely on single measures of openness in the investigation of the reform programme for the reason that while different proxies of openness capture different aspects of reform programme, they may also show the common trends in the level of openness. For example, the share of imports in GDP is directly related to the rates of tariffs. In this sense, tariffs and import proxies seem supplementary. However, they represent very different aspects of openness once it is recognised that the import proxy is directly related to the availability of foreign exchange, quotas, the structure of the domestic industry and other regulations. Therefore, we need to have another tool that utilises the relationship among alternative proxies and provides a more reliable measure of openness. The task is then to find out a latent variable that combines different dimensions of openness together and provides a single measure of trade policy. Principle component analysis can be used to combine this information in the openness proxies.

The main idea of principle component analysis is to reduce the dimensions of a data set that consists of a number of interrelated variables, making use of the covariance

between them, while retaining as much as possible of the variation present in the data set (Jolliffe, 1986). This is achieved by the linear transformation of the data that are orthogonal to each other. The method of principle component analysis can be applied by using the original values of the data or their deviations from their means or standardised variables. Since the method is sensitive to the unit of measurement of the data, it is better to use standardised variables when the variables are measured in different units. Then it can be shown that the variances of the principle components are the eigenvalues (λ_{ij}) of the variance-covariance matrix (Σ) of the data. In addition, the elements of the corresponding eigenvector are the coefficients that will be used for the linear combination of the openness proxies.

Considering the fact that openness proxies are non-stationary, principle components were estimated on the data matrix of the difference of the logs of the five standardised variables over the period 1966-1995. Table 1 presents the estimated eigenvalues and their corresponding eigenvectors. The examination of Table 2 shows that the first principle component explains 70% of the sum of the individuals variances of the five openness proxies[8] and that the signs of the coefficients on each variable in the corresponding eigenvector are as expected: while the combined measure of openness is increasing in z^{EX}, z^{IM} and z^{OP} proxies, it is decreasing in z^T and z^{BMR} measures of openness. The interpretations of the other eigenvectors are more difficult. However, these eigenvectors explain only a small variation in openness proxies and we will therefore only consider the first principle component in our analysis. As seen from the table, the relative weights (in absolute values) attached to each of the openness proxies ranges from 0.36 for z^{EX} to 0.52 for z^{OP} proxies.

Table 1. Eigenvalues and Eigenvectors for the Five Openness Measures of the Turkish economy, 1966-1995.

	Eigenvalues				
	3.480	0.744	0.581	0.192	0.003
% of the Total Variance Explained	0.696	0.149	0.116	0.038	0.001
	Eigenvectors				
z^{EX}	0.361	-0.846	-0.118	-0.165	-0.336
z^{IM}	0.492	0.292	0.255	0.542	-0.561
z^{OP}	0.520	-0.164	0.171	0.319	0.756
z^{BMR}	-0.375	-0.284	0.881	0.525	-0.246
z^T	-0.465	-0.304	-0.341	0.758	0.115

Note: The z^{EX}, z^{IM}, z^{OP}, z^{BMR} and z^T refer to openness proxies based on exports, imports, total trade, the black market exchange rate and tariffs data, respectively.

Using the elements of the first principle component given in Table 1, we can find the one-dimensional measure of openness as follows:

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8 Because we work with standardised variables which have a unit variance, the sum of the eigenvalues is equal to five. To find out what percentage of the total variance explained by the first principle component we just divide the value of its eigenvalue by five (3.56/5=0.7).

$$z_t^{PR} = \prod_{i=1}^{5} \left(z_t^i \right)^{\lambda_i} \tag{4.1}$$

where Z_t^{PR} represents the one dimensional measure of openness at time t, z_t^i is the standardised ith openness proxy at time t, and λ_i is the eigenvector component that corresponds to a complementary measure of ith proxy.

Using equation (4.1), the combined measure of openness for the Turkish economy has been calculated and presented in Figure 4.
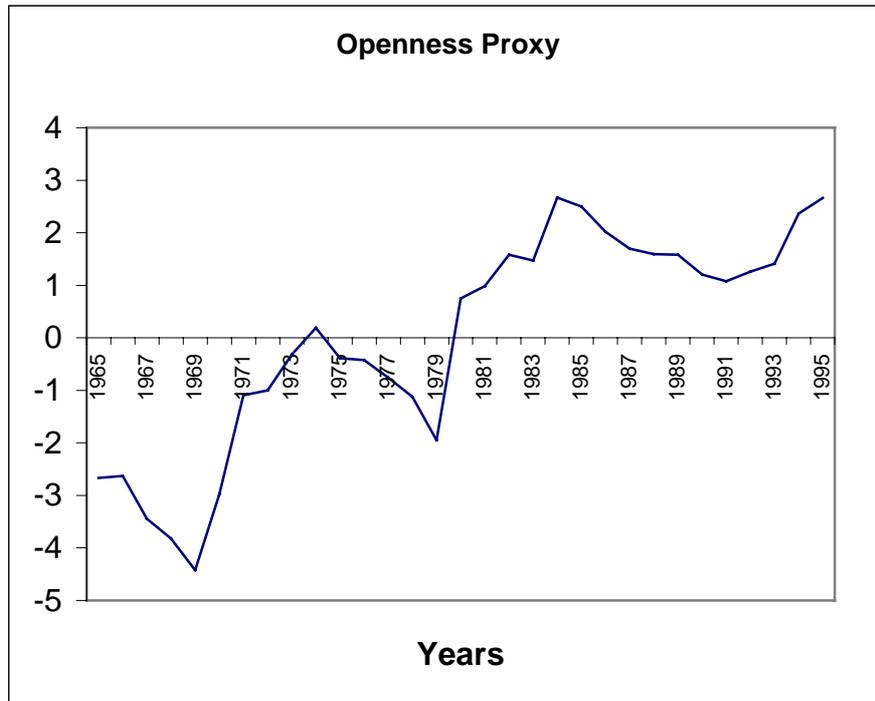

Figure 4. Composite Openness Proxy obtained from the Principle Component Analysis, 1965-1995.

The examination of Figure 4 provides important insights into the level of openness and its variation for the Turkish economy over the period 1965-1995. It shows that the Turkish economy experienced rapid increases in its openness over the reform period of 1980-1995, following the removal of restrictions implemented in the import substitution period of 1965-1980. It is also noted that there are considerable variations in the level of openness in the sub-periods within each of these periods. While the level of openness decreased between 1965-1969 and 1974-1979, it seems that the restrictive nature of the import substitution period is eased over the period

1969-1974. In the reform period, the level of openness increased substantially between 1980-1984 and 1991-1995, although it decreases slightly between 1984 and 1991.

We can get more insights into the shape of the composite openness proxy of principle component and its relation to the five measures by decomposing the growth of openness into the contribution of the different measures underlying it. As shown by Cameron et.al. (1998), this can be achieved by taking the total derivative of equation (4.1) with respect to time t as follows:

$$\frac{\Delta z^{PR}}{\Delta t} = \sum_{i=1}^{5} \frac{\lambda_{1i}}{z^i} \frac{\Delta z^i}{\Delta t} z^{PR} \tag{4.2}$$

The terms on the right hand side of equation (4.2) give the contribution of the each of the five different openness proxies to the change in the composite openness proxy of the principle component. Table 2 presents the results obtained from the decomposition equation (4.2) over the entire sample period and over the sub-periods, 1969-1973, 1973-1979, 1979-1984, 1984-1991 and 1991-1995. In the period as a whole, the contributions of individual openness proxies to the observed trend in the principle component proxy of openness range from a low of 8% for the z^{EX} proxy to a high of 50% for the z^{BMR} proxy. The examination of the sub-periods provides more insights into the shape of the principle component measure of openness. In the import substitution period, it seems that the level of openness was driven by the black market exchange rate, which explains the 40% of the upward trend between 1969 and 1973, and explains the 92% of the downward trend between 1973 and 1979. This is not surprising once we recognise the importance of the availability of exchange rate in determination of the economic performance in these periods.

Table 2. Decomposition of Openness Measures: The Contribution of the five openness proxies to Change in Composite Proxy Openness, 1965-1995.

	Whole Period	Import Substitution Period		The Reform Period		
	Average	1969-1973	1973-1979	1979-1984	1984-1991	1991-1995
z^{EX}	0.08	0.12	-0.20	0.21	0.34	0.13
z^{IM}	0.11	0.19	0.10	0.00	-0.07	0.24
z^{OP}	0.13	0.19	0.03	0.10	0.15	0.23
z^{BMR}	0.50	0.40	0.92	0.28	0.59	0.35
z^{T}	0.18	0.10	0.14	0.42	-0.01	0.06
Total	1.00	1.00	1.00	1.00	1.00	1.00

However, this pattern was radically changed in the first phase of the reform period, 1979-1984: while the contribution of the z^{BMR} proxy to the rise in openness was only 20%, tariffs and the z^{EX} proxy explain the 42% and 21% of the variation in the principle component measure of openness respectively. During the 1984-1991

period, the decline in openness was contributed by the appreciated exchange rate (59%) and a decline in exports (34%). As seen from Figure 4, openness increased sharply over the period 1991-1995 and it seems that 95% of the entire change is explained by the improved trade performance and a decline in the black market premium. Taken together, it seems that each of the alternative proxies of openness, given above, capture different aspects of openness and the principle component proxy of openness might be a candidate for a single measure of openness we are looking for.

5. Concluding Comments

In this paper, we provided a composite measure of openness, which combines different aspects of openness together for Turkey over the period 1965-1995. As discussed in the literature review section, although the concept of openness is easy to define, the level of openness is very difficult to measure in practice. The literature review provided in Section 2 has revealed these difficulties. We also noted that finding a reliable measure of openness is vital for empirical studies on openness-growth relationship.

To this end, we first presented five different measures of openness. Graphical analysis of these proxies of openness has shown that the level of openness in Turkish economy increased rapidly following the reform programme of 1980. However, more close examination of the graphs of these proxies has revealed that trend in openness represented by each proxy differs significantly for sub-periods implying that these proxies represents different aspects of openness. Therefore, in Section 4, we introduced the principle components analysis and make use of it to combine these five different proxies of openness into a single openness proxy. The composite index obtained using this method seems to explain most of the variation in single proxies and can be a very good candidate for a reliable measure of openness for Turkish economy. This also means that the empirical studies carried out using the composite proxy and the comments based on it about the level of openness of Turkey will provide more reliable results than any single measure of openness of Turkey that can provide.

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