**TUSIAD COST-BASED COMPETITIVENESS INDEX (TUSIAD-CCI)**
**METHODOLOGICAL DOCUMENT**

## I. Calculation Steps

The TUSIAD Cost-Based Competitiveness Index (TUSIAD-CCI) is an index designed to track developments in production costs (intermediate goods, energy, labor and financing) in Türkiye's 10 exporting manufacturing industry sectors compared to competitor countries. The sectors covered by the index are: food, textile-clothing-leather, chemicals, plastics and rubber, non-metallic minerals, basic metals, fabricated metals, electrical equipment, machinery manufacturing and motor vehicles.

Competitor countries were identified by considering Türkiye's main export markets. Specifically, 41 countries with a share of at least 0.5 percent in manufacturing industry exports were defined as the main export markets. For each of the 10 sectors analyzed, countries other than Türkiye that import from each of these 41 countries (export markets) were identified. The importance of these 41 countries for Türkiye in each sector was then assessed, and the weights of other exporting countries in these markets were aggregated. After this aggregation, the 15 countries with the highest total market share for each sector were defined as Türkiye's competitors.

These 15 competitor countries and their weights varied by sector. In total, 31 competitor countries[1] were included in the index calculations for the 10 sectors analyzed. Among the countries included in the index, China, Germany and Italy had the highest weight in the general index, while Malaysia, Romania and Canada had the lowest weight. Furthermore, the European Union was the highest weighted region in the index.

After determining the competitor countries and their sectoral weights, total production cost components and their respective weights for competitor countries and Türkiye based on "intermediate goods, energy, financing and labor cost" items were calculated for the 10 sectors examined by using input-output tables provided by national and international organizations. To calculate the values of cost items in each quarter, data on producer price indices, average gross wage level, energy price, private sector loan interest rates and exchange rates of the relevant countries were compiled. Using these data and the weights derived from the input-output tables, a sectoral total production costs index in local currency was calculated for each country.

To make the indices comparable across countries, the index values that are calculated in local currencies were divided by the current USD exchange rate for each respective country. The base year for all countries, sectors and cost components was 2017.

[1] Countries covered in the index: China, Germany, Italy, France, Spain, Netherlands, India, USA, Belgium, Poland, South Korea, Japan, Ukraine, Bangladesh, Czechia, Austria, Brazil, Pakistan, Portugal, Hungary, United Kingdom, Slovakia, Mexico, Morocco, Indonesia, Argentina, Switzerland, Saudi Arabia, Malaysia, Romania, Canada



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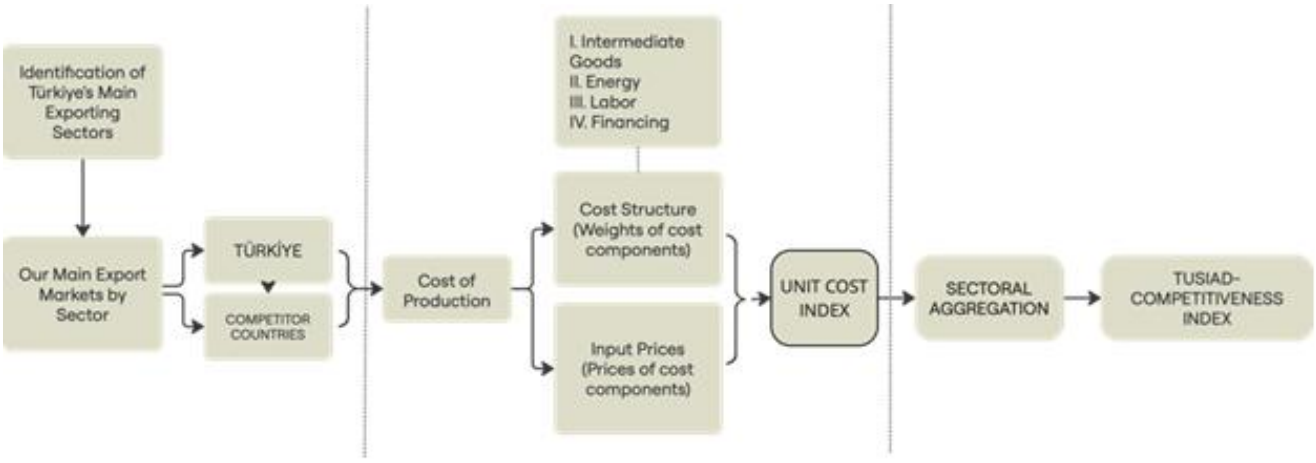
First, sectoral cost indices were constructed using data on the weights of competitor countries and trends in production costs. Second, the cost index for Türkiye and competitor countries was calculated by aggregating sectoral cost indices. Finally, the TUSIAD-CCI index was obtained by dividing the aggregated index for competitor countries by the cost index for Türkiye. An increase in the index indicated a decrease in unit production cost relative to competitor countries (cost-based competitiveness gain), while a decrease in the index indicated an increase in unit production cost relative to competitor countries (cost-based competitiveness loss). The calculation steps are summarized in Figure 1.

Similarly, sectoral productivity indices were constructed using the weights of competitor countries and data on labor productivity and the final productivity index was calculated by aggregating the sectoral productivity indices. The aggregated productivity index of competitor countries was divided by the Turkish productivity index to obtain the relative productivity index for the manufacturing industry. Dividing the TUSIAD-CCI index by this aggregated relative productivity index yielded the productivity-adjusted index (TUSIAD-CCIP). A higher increase (decrease) in the TUSIAD-CCIP index compared to the TUSIAD-CCI index indicated that labor productivity in exporting sectors increased (decreased) at a higher rate than in competitor countries, which in turn mitigated (increased) cost increases compared to competitor countries.

The calculation of the intermediate goods cost index considered the inputs used by the relevant sector in production processes from agriculture-hunting-forestry, fisheries and aquaculture, mining and quarrying (non-energy products) and manufacturing industry sectors and their prices. In the calculation of the energy cost index, inputs used by sectors from mining and quarrying-energy yielding products (coal, lignite), coke and refined petroleum products, and electricity, gas, steam and air conditioning sectors and their prices were used. The financing cost index was calculated using the commercial loan interest rates and the amount of financing needed. In the calculation of the labor cost index, the gross labor payments per employee indicator were used.

Figure 1: TUSIAD-CCI Calculation Steps



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## II. The Uniqueness of TUSIAD-CCI

Currently, firms' price/cost-based competitiveness in foreign markets is commonly monitored through the real effective exchange rate indices announced by central banks, which are calculated by comparing a basket of exchange rates with domestic and international price developments. These indices provide general and aggregated information on the evolution of production costs. In this context, the TUSIAD-CCI has the following differences from real exchange rate indices:

a) ***Competitor Countries Focused Analysis:*** Real exchange rate indices are constructed based on the volume of foreign trade (exports and imports) of the country in question, whereas the TUSIAD-CCI focuses on the competitor countries in the main export markets rather than the volume of foreign trade. As a result, real exchange rate indices compare developments in exchange rates and consumer or producer prices between the country and its foreign trade partners. In contrast, the TUSIAD-CCI identifies direct competitors in foreign markets and conducts relative price and cost analyses against these competitors.

b) ***Coverage of Exporting Sectors*****:** Real exchange rate indices consider exchange rate developments and consumer or producer prices in the countries with which the country trades. When producer prices are used, they encompass prices across the entire industry, including both export-oriented sectors and those that primarily produce for the domestic market. In contrast, the TUSIAD-CCI focuses exclusively on export-oriented sectors that have a significant share in manufacturing industry exports.

c) ***Comparison with Similar Production Patterns*****:** In real exchange rate indices, countries with varying levels of development, which may have different sectoral production patterns and export orientations, are compared based on aggregated price developments. In contrast in the TUSIAD-CCI, countries are compared based on price/cost developments in the same sectoral context, even if their levels of development differ. This approach ensures a more targeted comparison of competitiveness in specific sectors.

d) ***Utilization of Sectoral Information*****:** Real exchange rate indices rely on aggregated data from the industrial sector in the relevant country and its trading partners. The TUSIAD-CCI, on the other hand, with its export and sector-oriented structure, uses detailed information on manufacturing industry sub-sectors in the relevant country and its competitor countries.

e) ***Analysis by Cost Components*****:** In the calculation of real exchange rate indices, the exchange rate and consumer or producer inflation in the relevant country and its trading partners are used but additional details on the sources of changes in these inflation indicators are not included in the calculations. The TUSIAD-CCI, on the other hand, is designed to reveal the possible sources of cost inflation and takes into account the relative development in USD in terms of the inputs used by firms in the manufacturing industry in Türkiye and competitor countries. The cost components used in the

comparison are intermediate goods prices, energy prices, labor cost per employee, and financing costs.

f) ***Quick Reflection of Cost Developments*:** Since real exchange rate indices are calculated using consumer or producer prices, they cover the portion of the change in production costs that is reflected in product prices (producer or consumer prices). However, in some cases, firms may delay reflecting cost changes to their prices even when production costs have increased or decreased. This may be due to factors such as previously announced list prices, existing purchase-sale agreements or a strategy of gradually passing on cost changes to prices. On the other hand, since the TUSIAD-CCI is calculated based on cost components, a significant portion of cost changes is simultaneously incorporated in the index, whether it is reflected (fully or partially) in product prices by firms. In this framework, real exchange rate indices capture the portion of cost changes that are reflected in product prices, while the TUSIAD-CCI directly reflects firms' input costs.

g) ***Nominal Exchange Rate Changes*:** Real exchange rate indices and the TUSIAD-CCI directly incorporate the nominal exchange rate as a separate variable in their calculations. However, as mentioned above, the TUSIAD-CCI tends to exhibit lower volatility than the real exchange rate indices in periods of high exchange rate movements, as it can more quickly reflect changes in other cost items that may follow nominal exchange rate shifts compared to the real exchange rate index.

h) ***Inclusion of Productivity Developments*:** By definition, real exchange rate indices do not account for the productivity dimension, which affects competitiveness in foreign markets. However, the TUSIAD-CCIP, produced as a complement to the TUSIAD-CCI, provides more comprehensive insights into firms' competitiveness and more holistic information on the competitiveness of firms by incorporating relative labor productivity developments in the exporting sectors.

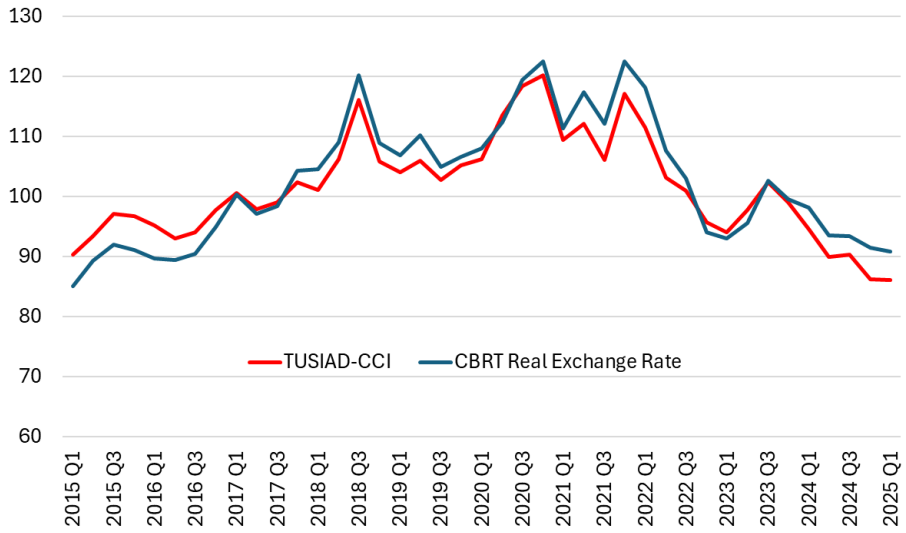
**III. TUSIAD-CCI and CBRT Domestic-PPI Based Real Effective Exchange Rate**

Chart 1 below presents the CBRT Domestic-PPI Based Real Effective Exchange Rate (CBRT real exchange rate) and the TUSIAD-CCI indices (2017=100), which are widely used for the competitiveness of Türkiye's manufacturing industry. Both indices generally depict a similar trend. Although the turning points and overall patterns of the indices are in line, divergences occur in certain periods due to changes in production cost components.

As anticipated, the CBRT real exchange rate index exhibited sharper increases compared to the TUSIAD-CCI during periods of significant exchange rate depreciation. The main reason for this difference is the faster exchange rate-production cost pass-through in the TUSIAD-CCI. In the following periods, the CBRT real exchange rate index decreases more sharply as exchange rate developments are gradually reflected in domestic producer prices. As a result, both indices converge. Therefore, in periods of significant increases/decreases in exchange rates, the TUSIAD-CCI emerges as a less volatile competitiveness indicator.

Furthermore, in cases where there is a significant change in the cost components that are independent of exchange rate movements, the TUSIAD-CCI may respond more quickly than the real exchange rate index. This is because it may take longer for firms to reflect this cost increase in domestic producer prices. For example, if there is a substantial increase in wage and financing costs, firms may choose to reflect these cost increases to their final prices gradually. In this situation, changes in the cost-based competitiveness of these firms can be observed earlier in the TUSIAD-CCI compared to the CBRT real exchange rate. As cost increases are eventually reflected in product prices, the real exchange rate index converges to the TUSIAD-CCI.

Chart 1: TUSIAD-CCI and CBRT Domestic-PPI Based Real Effective Exchange Rate[2]




[2] To be compatible with the TUSIAD-CCI index, the inverse of the CBRT Domestic PPI-based Real Effective Exchange Rate was used.



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