

Executive Summary

Current account deficit is a closely followed indicator as it reflects the difference between the resources needed for the production of goods and services and those owned; and (if there is deficit) the level of external financing required to maintain the current level of activity within the economy. It is known that the growth performance of the Turkish economy has become increasingly dependent on foreign funds over the years. Turkey's primary energy mix, which is dependent predominantly on fossil fuels (by 90 percent), worsens the trade balance outlook as energy deficit is responsible for the 44 percent of it. When considered from this point of view, diversification of energy resources and prioritizing domestic and renewable energy resources stand out as a critical issue. Particularly, in the case of renewable energy resources, Turkey's realization of its high technical potential is also crucial in seizing the opportunities that the energy transformation is offering at the global level.

However, all these evaluations related to the connection between energy and foreign trade deficit lacks the figures regarding the trade balance in the energy machinery-equipment and does not fully reveal the the problem. However, Turkey imports a significant portion of energy machinery-equipment. Although the issue of domestic production of energy machinery-equipment has as increased importance as the share of renewable energy is increasing in the energy mix, high level of imported machinery and equipment is a serious problem encountered in other power plants as well.

This study aims to elaborate the relationship between foreign trade deficit-energy imports, which is framed above, from the energy machinery-equipment trade point of view. Analyzes were conducted on the selected energy resource (renewable – solar and wind in particular – and coal); so that the reflection of a domestic and renewable resource-oriented energy policy on the industrial policy through energy machinery-equipment production is portrayed.

Highlights:

Renewable energy (solar, wind, geothermal, current-wave and biomass) machinery-equipment

- Renewable energy equipments account for 4.5 percent of the global trade. Between 2008 and 2015, the total world trade grew at an annual average rate of 0.3 percent, whereas renewable energy equipments recorded a growth of 1.8 percent. China ranks the first with 21.7 percent share in the export of renewable energy machinery-equipment, followed by Germany with 11.1 percent. China's exports grew by an average of 7.1 percent between 2008 and 2015, outperforming all other countries in the list of the top 5 exporters in the same period. Germany appears to be a shrinking producer with -1.2 percent. The largest importer is the USA with a share of 13.3 percent and a growth performance of 5 percent.
- Turkey is a net importer of renewable energy machinery-equipments. The foreign trade deficit in the sector is around USD 2.8 billion, which represents 1 percent of the total foreign trade deficit. Despite the 1.2 percent average growth rate of exports, the 5 percent growth in imports indicates that Turkey's foreign trade deficit in renewable energy equipment may increase in the period ahead. Whilst China (23.8 percent) and Germany

(20 percent) continue to be the primary import markets for Turkey, regional countries (Iraq with 9.7 percent and Turkmenistan with 9.4 percent shares) stand out as primary export markets. 25.4 percent of Turkey's exports of renewable energy equipment are directed to rapidly growing markets (whose imports grow faster than the global trade of the sector).

- Between 2003 and 2014, a sum of USD 521 billion worth of renewable and alternative energy investments were made in the world. The largest investor and the region attracting the highest investment is the EU 28. The share of Turkey within these investments is USD 7.6 billion and the sector is the 5th sector in which Turkey attracts the highest investment.

Solar energy machinery-equipments

- Solar energy equipments account for 2.5 percent of world trade with a volume of USD 391 billion. Between 2008 and 2015, the trade volume grew at the same level as that of the renewable energy equipments (1.8 percent). The largest exporter is China with 27 percent, followed by Germany with 9.4 percent. South Korea which occupies the third place with a share of 8.8 percent is a supplier of China with 57 percent. Whilst Germany is suffering a downsize of -2 percent, China is showing a rapid growth performance of 6.4 percent. The top 3 importers are China (13.7 percent), the USA (12.9 percent) and Germany (6 percent). Here it should be noted that Germany's imports had again a shrinking profile (-3.2 percent) in 2008-2015.
- Turkey has a foreign trade deficit of USD 2.1 billion in foreign trade of solar energy machinery-equipment. Solar energy equipment imports represent 2 percent of the total imports. On the average Turkey's exports grew by 1 percent year on year over the 8-year period, while its imports grew by 5.5 percent. The current foreign trade outlook suggests that further new investments in this area may deepen the foreign trade deficit unless domestic production is improved, Iraq (13.2 percent) and Turkmenistan (9.5 percent) occupy the first places among the export markets, whereas China (32 percent) and Germany (16.3 percent) are again the primary import markets as is the case with renewable energy equipment. The rapidly growing markets have a share of 27.8 percent in solar energy machinery-equipment exports.

Wind energy machinery-equipment

- Wind energy equipments remained behind solar energy equipments in terms of growth performance both in global trade volume (USD 249 billion) and average annual trade volume (1.6 percent). The top 3 exporters are China (19.5 percent), Germany (12 percent) and the USA (9.2 percent). While Germany's exports in this area are shrinking (-1 percent), China appears to have a strong growth performance (8.5 percent). In respect of imports, the ranking is different than that of renewable energy machinery-equipment. The USA (14.4 percent) and Germany (8.4 percent) occupy the first 2 places, followed by China (5.8 percent). Germany's annual average import growth of 1.1 percent is noteworthy.
- Wind energy machinery-equipments are important for Turkey, as the sector accounts for a foreign trade surplus. Although the surplus was higher in previous years, this figure was at USD 1.1 billion in 2015 due to exports which declined notably between 2013 and 2015.

When exports are viewed in detail, the first 5 products have a 70 percent share, showing a very concentrated structure. The low technological level of products listed under the heading of other construction parts made of iron/steel (30 percent) and towers and pylons made of iron / steel (8 percent), which have a share of 38 percent in exports suggests that the production structure in wind energy equipments should be evaluated more carefully in terms of the future of Turkish economy. Iraq (12 percent) and Turkmenistan (11 percent) are among the export markets, whereas Germany (22 percent) and China (16 percent) are the primary import markets.

Coal-fired thermal power plant machinery-equipment

- Coal-fired thermal power plant machinery-equipments account for 7.7 percent of the global trade with a trade volume of USD 470 billion. They exhibit a better outlook than the renewable energy machinery-equipment In terms of foreign trade performance (2.1 percent and 1.8 percent, respectively). The top 3 exporters in the sector are China (17.3 percent), Germany (14 percent) and the USA (12.7 percent), and China's rapid growth performance (9.5) is noteworthy against the shrinking exports of Germany (-0.7 percent). In imports, the USA (15.1 percent) is followed by Germany (7.7 percent) and China (5.9 percent).
- Turkey's foreign trade deficit in terms of coal-fired thermal power plant machinery-equipment is around USD 2.1 billion. The sector has a share of 2.3 percent in total exports and 3.2 percent in imports. Turkey imports thermal power plant machinery and equipment mainly from the EU countries (59 percent) and the Far East (31 percent). When exports are concerned, the EU countries (39 percent) are in the first place, followed by Middle East and North Africa markets with 31 percent, due to their geographical proximity and ease of access. The markets growing faster than the global trade of the sector enjoy a share of 23.8 percent in Turkey's exports.

Technological content comparisons of energy machinery-equipments

- The technological contents of energy machinery-equipments differ with respect to energy sources. While high skill and technology contents of machinery-equipment used in thermal power plants is only 5 percent, this ratio is as high as 23 percent in total renewable energy machinery-equipments (consisting of solar, wind, geothermal, current-wave and biomass). However, both figures fall behind the share of high-skill and technology-intensive products (28 percent) in global trade.
- Considering sub-items of renewable energy, solar energy appears to have a high technology content above the global trade and renewable energy average with a share of 31 percent. The wind energy is still 11 percent, which is below the global trade average.
- Turkey is experiencing a technological deficit in all energy machinery-equipment sub-groups assessed in the report:
 - In solar energy, which has the highest technological potential among the energy machinery-equipment examined, 6 percent of Turkey's exports are comprised of the high skill and technology products, where the 24 percent of the imports are high technology products. In wind energy, these rates correspond to 2 percent and 18 percent, respectively.

- Turkey's high skill and technology intensive product exports and imports in thermal power plants which have the lowest high technology content among the energy machinery-equipment are 1 percent 6 percent, respectively.
- Given that high-skill and technology intensive products have a share of 8 percent in Turkey's total exports, solar and wind energy machinery-equipments appear to have a higher potential to improve this outlook.

Calculations performed using energy equipment foreign trade data indicate that renewable energy investments, which Turkey has currently accelerated, may have an effect beyond diversification of energy resources. Large-scale renewable energy investments addressed under YEKA (Renewable Energy Resource Areas) Regulation aim to close both foreign trade and technology deficits in renewable energy equipments through R&D investments and domestic production requirements. The effect of these investments has the potential to go beyond the energy sector. As a matter of fact, studies carried out on patent citations suggest that publications on clean production technologies are cited more than other technologies and that the areas of use of renewable energy technologies have also gone beyond energy production. Particularly it is shown that solar energy and storage technologies contribute to the development of a broader range of technologies.

When technologies that are critical for transition to a low-carbon economy, which also includes renewable energy technologies, are examined over time on the basis of their revealed comparative advantage (RCA), it appears that competitiveness in these technologies is less contingent on past competitiveness than an average product. In other words, countries that invest in such technologies can have a competitive position regardless of their previous positions in the global market. However, it must also be noted that the existence of supporting sectors and qualified labor force is a prerequisite, so that investments to be made can lead to a technological transformation and countries can become competitive in these fields. The results indicate that Turkey should, on the one hand, target renewable energy applications and R&D investments, and on the other hand, increase its readiness for technology transfers to be realized by these means. These objectives will only be possible with the design of an inclusive and a feasible action plans.