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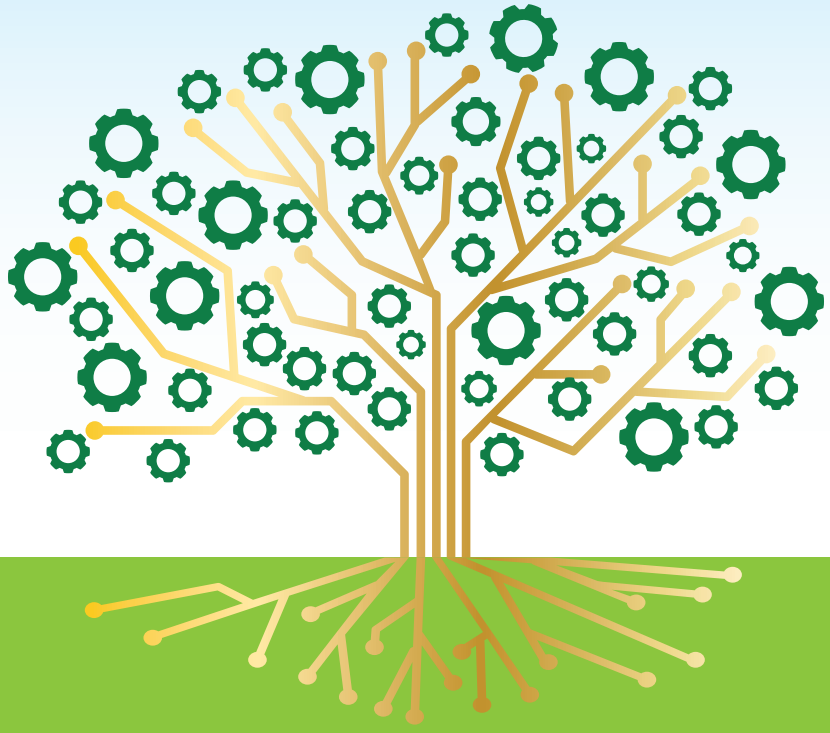

Toplam Faktör Verimliliği Projesi

Total Factor Productivity Project

Support to Development of a Policy Framework on

Total Factor Productivity Project

GREEN PAPER

CFCU
CENTRAL FINANCE & CONTRACTS UNIT

REPUBLIC OF TURKEY
MINISTRY OF DEVELOPMENT

UNDP
Empowered lives
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Support to Development of a Policy
Framework on Total Factor Productivity Project
GREEN PAPER

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INTRODUCTION

Why Are Productivity Policies Becoming Important?

Increasing productivity is fundamental for long-term economic growth and prosperity. The resulting added value is reflected in high profitability for capital investors, high wages for employees and low prices for consumers. The innovations seen in the field of steam machines and electrification in the past century and in digitalisation in the present day have transformed forms of production, increased productivity and driven economic growth.

Total Factor Productivity (TFP) is one of the three main channels which economic growth is achieved and the remaining two are employment increases and capital investments. Essentially, productivity is the ability to produce more outputs with fewer inputs. Inputs are divided into five groups: capital (C), labour (L), energy (E), materials (M) and services (S). Concepts such as labour productivity or energy efficiency indicate the relationship of one of the inputs with the output (partial productivity indicators), and the relationship of all of these inputs (C + L + E + M + S) with the output indicates the total factor productivity. Therefore, TFP is part of the produced input that cannot be explained with the amount of outputs used in the production. The size of TFP varies depending on how efficiently and intensively the outputs are used in the production.

The contribution of TFP in the economic growth performance of our country is limited and follows a fluctuating course. This creates a disadvantage in terms of the sustainability of growth. In the period after 1990, the main source of Turkey's increase in productivity was the shift from sectors with low productivity (agriculture) to sectors with higher productivity (industry and services), i.e., structural transformation. In this period, the contribution of productivity growth within the sectors was limited. The contribution rate of TFP in the growth rate, which was 5.5% between 2012 and 2016, is 0.7%. TFP's contribution to the growth rate was 24% in the industrial sector and 13% overall in the economy. During this period, it was the capital accumulation that contributed the most to growth (53%). In the manufacturing industry, in the period of 2003-14, the share of labour in 82 different sub-sectors of production was 9%, the share of materials 75-80%, the share of energy 4% and the share of other unexplained factors including TFP was 9%. Lastly, the level of labour productivity by 2015 in enterprises with 1 to 19 employees is about one-sixth of the enterprises with more than 250 employees.

In order to offset the disadvantages observed in the recent productivity performance of Turkey, a new economic growth perspective focusing on TFP increase should be designed. Due to the trends of industrial digitalisation (robots, 3D printers, smart factories, etc.), the competition strategies containing low-skilled labour, which are based on low wages, are becoming more and more ineffective. The goal of this policy framework, which is open to public opinion with this consultative document, is to contribute to the policies on increasing productivity in our country. The policy framework focuses on the manufacturing industry and highlights the microdynamics in this area, aiming to understand the factors determining the productivity in our country and to develop relevant policy interventions.

How Can You Contribute?

This study consists of due diligence and policy recommendations to increase the contribution of total factor productivity to growth. It serves as a consultative document (Green Paper) and seeks the opinions of stakeholders regarding the final policy framework (White Book) design.

The final policy framework (White Paper) will be completed following the consultation process and submitted to the Ministry of Development to be included in upper-scale policy papers such as the Development Plan as well as policy papers such as the Medium-Term Economic Programme and the Annual Programme and in the preparation of sectoral and thematic strategy documents in the future.

The Green Paper contains questions about determinations and policy recommendations that specifically target stakeholders, whose opinions will help with recommendations.

The questions are provided at the end of sections and subsections regarding thereof and in whole at the end of the document. Moreover, following table will show the link and page numbers of the boxes with the consultative questions.

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Consultative Questions 2
Accelerating the Digitalisation Process (Question 18-26) 51
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You can send your answers to the consultative questions via the communication form at **www.tfvp.org/yesilkitap** or by e-mail to **yesilkitap@tfvp.org** or by mail to Yıldız Kule Yukarı Dikmen Mah. Turan Gunes Bulvarı No:106 06550 Cankaya / Ankara by 30 April 2018 at the latest.

How Was the Green Paper Prepared?

The Green Paper was prepared within the scope of the Support to Development of a Policy Framework for Total Factor Productivity Project (TFP Project). Jointly financed by the European Union and the Republic of Turkey, this project is being implemented by the United Nations Development Programme, the main beneficiary of which is the Ministry of Development of the Republic of Turkey.

A study comprising the following five components was conducted in the preparation of the Green Paper. Works being implemented are outlined on the project's website www.tfvp.org.

(i) Background Studies. These include an analysis of baseline data regarding productivity dynamics in the manufacturing sector, a review of literature on global value chains and productivity, a comparative study with cases in Germany and South Korea and observing trends in selected value chains (food, textile-apparel, electric household appliances, automotive).

(ii) TFP Company Survey. In these four value chains, Turkey's top 100 companies constitute the first tier companies. A total of 2,903 companies that have supplier relations from top to bottom participated in the survey on three tiers. The productivity and innovation dynamics of the companies were analysed.

(iii) Face-to-Face Interviews. In line with the framework that has been determined for the survey, in-depth interviews were conducted with companies in the first tier. The company owners and managers were assessed in regards to growth, productivity and innovations within the scope of a structured framework and the results were synthesised and reported.

(iv) Thematic and Sectoral Workshops. Eight different workshops were held with 153 representatives from the private sector, non-governmental organisations and public institutions to discuss matters determined as a result of field surveys, comparative studies, sector evaluations and trend analysis and within the scope of the four value chains selected. The topics included digitalisation in value and supply chains; public policies for investment needs at the stage of commercialisation

of R&D; advanced technology materials entering our country in a timely manner; taking part in the production processes of SMEs; and SMEs gaining an understanding of more institutional and globally competitive management and administrative structure.

(v) Synthesis Report. The synthesis report is prepared by combining all quantitative and qualitative data obtained. The report consists of basic trends and determinants of productivity in the manufacturing industry, design rationale of the policy framework and policy recommendations and serves as a technical background planning document. This Green Paper is prepared by refining the synthesis report as a consultative document during transformation thereof into a policy document.

Determinants of Productivity in the Turkish Manufacturing Industry

The main condition to develop a consistent policy framework for total factor productivity is to have up-to-date and comprehensive knowledge of the dynamics that determine TFP in Turkey. To this end, a series of studies has been conducted to highlight the factors that can affect productivity in manufacturing companies in the focus of the TFP Project. As a result of the field research, analysis of TURKSTAT data, screening of relevant international and national literature and qualitative and quantitative analysis conducted for the four value chains selected (automotive parts, white goods, apparel, food) as well as stakeholder meetings, the factors that may affect the productivity of the companies were divided into two parts:

• **Internal factors:** company organisation structure; production organisation; entrepreneurial qualities; quality of workforce; learning mechanisms in the company; use and dissemination of information; quality of inputs; physical capital; machinery and equipment quality; R&D activities; information technology; product and process innovations; scale economy; strategy; and forms and stages of integration in the global value chain

• **External factors:** competitive environment; regulatory framework; institutional quality; flexibility in the input market; infrastructure quality and competence; access to finance; macroeconomic and political stability; policy predictability; technology policies; demand elasticity; and production location (regional dynamics).

Since many institutions and policy frameworks currently affect external factors, the focus of the TFP policy framework is on internal factors. As a result of the synthesis of the trends regarding internal factors on the company level determined during the study, seven critical elements have been identified that determine TFP at the company level. This section summarises the findings of the seven critical elements listed below:

1. Business models: Positioning in value chains
2. Integration into global supply chains
3. Access to information, innovation and technology transfer
4. Co-operation between companies and long-term customer relationships
5. Use of modern production techniques
6. Company management quality and institutionalisation
7. Labour productivity and human resources practices

Business models: Positioning in the Value Chain

According to interviews done within the scope of the TFP Project with companies in the manufacturing industry, one of the most basic factors that cause productivity deficit with competitor countries/companies is stated as differentiation of business models. The "business model" concept includes the stage in which the value chain of companies is located, how they are positioned and how they create value. Unconventional business models emerge with technological progress reducing transaction and co-ordination costs. In a study conducted by major aviation and defence industry companies in the United States, it was found that companies which changed business models and adapted to market dynamics increased their financial performances by seven times compared to those who could not (Fischer, 2016). In business models, it is possible to say that three critical trends accelerate transformation and affect productivity growth:

• The quality and quantity of the operations that machines can perform are rapidly increasing, taking over the basic functions of the workforce and forcing the workforce to acquire new skills.

• The number and scope of products and platforms that bring customers together without intermediaries (such as Alibaba in the retail sector, Uber in the transportation service, Facebook in the media, Airbnb in the accommodation service, etc.) have a destructive effect on the traditional actors.

• Mass resource management methods are increasing in number, which enables companies to concentrate the knowledge, experience and skills of people from around the globe, in addition to the knowledge, experience and skills that companies have accumulated in-house or with their suppliers or with suppliers in their value chains into an area such as a product design (McAffee and Brynjolfsson, 2017).

In addition to the transformation of business models, the share of manufacturing and assembly of items that determine the value of a product is decreasing, and the share of components such as R&D, design, marketing and services provided with the product is increasing. The level of adaptation and utilisation of technological developments experienced at an exponential

rate in the world directly affects the increase of TFP and the competitiveness of companies in the manufacturing industry. Very different economic and technological trends, such as globalisation, regionalisation, smart systems, advanced materials, digitalisation of information and processes and 3D printers, are forcing companies in the manufacturing industry to transform. As a result of these developments, companies in the manufacturing industry are able to sell "results" rather than "products", and the importance of providing solutions that are tailored to the needs of the customer increases. In the manufacturing sector, the main condition of maintaining profit margins is a matter of ensuring this transformation, namely being able to produce specialised and unique products tailored to the needs of the consumer. For example, the reason why Germany can still achieve high added value in the manufacturing industry lies both in its ability to expand the value chain to different countries (in Eastern Europe, China, Korea) as well as its ability to mass customisation with methods such as robotisation and automation (World Bank, WTO and OECD, 2017).

These global developments also affect Turkey's manufacturing industry; companies that adopt innovative business models in the direction of technological development can increase their competitiveness and productivity. In the field study conducted under the scope of the TFP Project, it was seen that companies focusing only on manufacturing and product sales tend to lose profit margins, whereas the companies that can strengthen their functions outside of manufacturing in the value chain are able to increase their added value, profitability and international competitiveness.

The following findings were obtained from fieldwork, surveys and workshops conducted within the scope of the TFP Project regarding the relationship between the business models and the productivity of the manufacturing companies in our country:

• Companies that want to achieve branding and higher added value are investing in marketing/distribution processes.

• Information technology with relatively standard business processes is widely used in areas closely related to productivity such as production planning,

management of the supply chain, product and material management and design, in addition to accounting and purchasing.

• Companies that use information, e-commerce and materials technology are more productive and innovative.

• Successful companies have separate independent units working in production planning, procurement, human resources, quality control, productivity, supplier selection and development areas.

• As one of the issues of the companies, the distribution network is not being operated effectively. It has been stated that information communication technology should be utilised for more effective regulation of logistics.

Integration into global supply chains

One of the leading factors that affects and strengthens the solid relationship between exports and productivity is the increase of the share of global value chains within world trade. By separating the production process into different successive steps, the global value chains are broken down into different countries. Up till the 2008-09 global financial crisis, the share of global value chains in global added value grew steadily but entered a period of stagnation after the crisis. Although protectionist trends in developed countries seem to be gaining strength, 60%-67% of total world trade is realised when added value is taken into the global value chains (World Bank, 2017).

One of the main ways to improve TFP at a company level is to integrate the company into global value chains. A study conducted with the detailed official data gathered on Japanese manufacturing industry companies on an annual basis reveals that companies which are integrated into global value chains, regardless of size, factor intensity and industry, are more productive than domestic companies (Tomiura, 2007). Productivity increases are generally accompanied by a trend of "upgrading in value chains" (Gereffi, 2001; Taymaz, 2016c). This takes place on four different levels:

• The first and the most common one is when there is a shift from workshop to serial production and from serial to lean and non-stock production as a result of

companies using their resources more productively. Companies that focus solely on the internal market do not find it profitable to shift to productivity-enhancing practices such as automation, while companies that can grow their markets by integrating into global supply chains can focus on productivity-enhancing investments (Gereffi, 2014).

• The second is that companies shift from ordinary products to more "sophisticated" products demanded by global buyers. These are more complex products and require high quality skills, better quality inputs and effective quality management systems. The level of sophistication of these products can be measured by unit value, labour productivity or the content of required skills (tasks).

• The third includes the transformation of the business models discussed in the previous subsection and the ability of companies to undertake different and more value-added functions (design, R&D, branding, marketing and distribution channels, etc.) in the value chain.

• The fourth one is that the company starts using the capabilities built by that company in a value chain for another industry. Especially in our country, the recent case of companies switching from the automotive to defence industry is an example of this trend (Beltramello, De Backer, and Moussiegt, 2012).

The impact of the integration of companies into global value chains is also related to the governance structure of the value chain. The governance determines how profitability and risks are distributed across the value chain. The profitability of a company in the value chain is directly related to the power of companies in the value chain (Gereffi, 2014). In value chains driven by manufacturing companies, a significant portion of the power lies with companies that produce end products. These value chains are often capital-, technology- and information-intensive industries and high entry barriers are encountered due to scale economies. In the value chains driven by buyer companies, retailing and marketing companies have a considerable portion of their power because they can shape mass claims. Determining where companies will be positioned in the value chain depends on the main company's supplier choice, and this depends on the market structure. In markets where major companies generate more revenue by

producing more (where the demand is flexible), there is a tendency to strengthen and transform the subcontractors in the value chain, while the opposite tendency is seen in markets where the demand is not flexible (Antràs and Chor, 2013). Finally, it should be taken into account that some elements that may be regarded as issues for small companies may be a result of the search for productivity of large companies; while policy intervention is contemplated, impact analysis should be performed for the overall value chain.

Depending on the capacities, objectives and characteristics of the business of companies, it is possible for them to integrate in the global value chains at different densities. Increasing productivity levels of companies depends on the development of their competencies. Non-price elements such as quality, conformity with the demand and delivery times are becoming more important than price for competitive conditions in today's global value chains (Taglioni and Winkler, 2016). The table below shows the skills required to integrate into global value chains, the stage of integration for the buyer side and the sales side. It can be said that Turkey's private sector companies have the diversity to be positioned from the bottom level to the top level. It would be beneficial if the framework of the TFP policy was structured in consideration of the stages and competence requirements in this context. In particular, institutions play a central role in the development of high added value competencies such as R&D and branding.

Table 1: Stages of integration forms into value chain and required competencies

Integration into the value chain	Buyer side	Sales side
Level of mature interaction	• Harmonisation of procurement processes between the parent company and the supplier • Deep and systematic relationships with suppliers • Deep and systematic relations with technology/ R&D institutions	• Institutional capital becoming the most basic competence • Being a leader in research and development • Be a brand with global recognition • Functional development, jump to other sectors
Upgrading in the value chain	• Quality of inputs • Increase in capital intensity • Research and development for implementation/adaptation (for use of inputs in the product)	• To acquire intangible capital competencies • Company management and organisation skills • To learn demand conditions • R&D for application, product and process development
Connecting to global value chains, first contact	• Ensuring consistent access to inputs • Development of investment competencies	• Effective use of intermediaries and interfaces • Learning through imitation
One stage before connecting to the global value chains	• Overcoming difficulties for importing and purchasing	• Overcoming the difficulties for export and international sales

Source: Mariscal and Taglioni, 2017.

The basic trends briefly summarised above yielded a set of hypotheses in the TFP project; these have been tested through the TFP survey, face-to-face interviews and thematic workshops. The findings obtained as a result of these studies are summarised here:

• Companies that supply to global companies are making considerable progress in terms of technological development. In the interviews conducted within the scope of the project, it is seen that a company's level of internalisation of elements that are critical in terms of productivity performance, such as lean production, quality processes, cost accounting, motivating working environment, relies on the depth of interactions with global companies. On the other hand, it is also easier for companies that pass the certification process of global companies to access other networks and markets. In line with customer requests, companies inspect their suppliers, which leads to an increase in this quality in the production process.

• Nowadays, parent companies/customers/buyers adopt a more systematic approach in the regulation and management of the supply chains of companies to maintain the required quality and production speed. Particularly in the automotive and white goods sectors, there is a systematic structure both in terms of supplier selection and monitoring of suppliers' performance, as well as in terms of the development of the suppliers. The selection of suppliers in the apparel sector has shown a significant improvement under the leadership of foreign buyers. In the automotive and white goods sectors, vertical integration and developing suppliers for this integration are present, while there is development of contracted manufacturing in the apparel sector and contracted production in the food sector.

• A tendency for consolidation is dominant in the management of the supply chain. Two to three alternate suppliers have been identified overall to ensure supply security in the examined sectors. In the company interviews, forecasts were shared that the number of suppliers working in the automotive and white goods sectors will decrease in the coming period.

• More than half of the companies participating in the TFP survey stated that they intend to maintain their customer relationships, while 26% said they will find new customers in Turkey. In this context, the second most frequently expressed plan

(9%) is to diversify the goods sold to customers. Approximately 10% of companies emphasise that the target market will be changed (export orientation, working with large-scale customers, etc.).

• The proportion of companies with connections abroad among those participating in the TFP survey is 21%, excluding exports and imports. This is higher than 60% for automotive and electric household goods companies, which are directly in the supply chain of global companies (OEM-Original Equipment Manufacturer) (Tier 1).

• Econometric analyses show that large companies with foreign connections engaged in R&D activities have a greater productivity and a stronger tendency for innovation.

• There is a strong positive relationship between the productivity performance expanding to overseas markets and having a foreign capital share in the ownership structure.

• One of the preferred methods that companies use to increase their overseas connections is to purchase a brand abroad. In addition to some automotive companies, there is a tendency to purchase foreign brands in the apparel and white goods sectors.

Access to information, R&D, innovation and technology transfer

The ability of a company to access knowledge, to use knowledge, and to process and develop it for its production directly affects the productivity of that company. In neoclassical growth theory, information and technological progress is seen as an external factor (Solow, 1957), while in today's growth models, knowledge is regarded as an internal factor (Romer, 1990). Since it is difficult to measure knowledge, it is generally estimated via information channels such as R&D, patent, information technology use and staff training. Moreover, direct foreign investment has begun to be seen as an information transfer channel. A special role is attributed to innovation for the continuity of technological progress and the TFP-accelerating effect of the emergence of new products, production processes and organisational changes are underlined in all these models (UNIDO, 2007). On the other hand, it is necessary for companies to access information through

fast infrastructures in order to access new consumers, labour and raw material markets, accelerate business processes and develop new consumer applications and services. Having fast broadband access by businesses to the internet increases factor productivity and contributes to growth (ITU, 2012)[1]. Turkey ranks low[2] among OECD countries in terms of broadband access (OECD, 2017).

The following findings were obtained from fieldwork, surveys and workshops conducted within the scope of the TFP Project regarding the relationship between access to information and innovation dynamics and the productivity of manufacturing companies in our country:

• **Basic sources of information.** The basic information resources of companies vary significantly among sectors. Feedback from users/customers, open information sources and fairs/international trips have become prominent in all sectors. As a source of information, in-house R&D activities and joint R&D activities between agencies are important mostly for companies in the first tier in the automotive and household electrical appliances sectors. Information sources include research and development studies and foreign partners in leading companies in the automotive and white goods sectors; design work, global buyers and staff transfer in the apparel sector; machinery and equipment manufacturers, suppliers of raw materials and additives, and staff transfer in the food sector. Significant factors that could lead to productivity deficit compared to competing countries/companies have been specified as the higher production scale of foreign competitors, higher levels of mechanisation/automation and higher skills in information and communication technologies.

• **Innovation trends.** More than half of the companies participating in the TFP survey registered trademarks and one-third of them made product innovations. Approximately one-fifth of them have made industrial design registration and patent applications. In a significant part of the companies that innovate products, the innovation is new for their own market (72%) and for the most part (85%), it is new only for their own companies. The revenue from new products for their

[1] *The relationship between productivity and companies' broadband access and the use of websites/social networks was found to be negative in the TFP survey. It is thought that this relationship was in contrast to the mainstream findings in this subject in this reference and should be further investigated.*

[2] *Turkey ranks 31st out of 35 countries in broadband access for companies and 29th out of 34 countries in using cloud computing services.*

own markets is equal to turnover and the income from the products that are new only for its own company is equal to about one-fifth of the total turnover.[3]

• **Process innovations.** Approximately one-third of companies that implement process innovation has applied new or improved manufacturing methods, and about one-fifth has applied logistics, delivery and distribution methods and processes support.

• **Reasons for not engaging in innovation.** The vast majority of companies are not engaged in innovation since there is no factor that forces them to innovate (83%), while innovation activity is considered in the remaining 18%, but no innovation can be done due to obstacles. The most frequent reason for not innovating is that there is a low demand for innovation in the market.

• **Relationship between productivity and innovation.** The relationship between productivity and innovation is estimated in line with the model established by the survey data. When there is only the innovation variant, the relationship between productivity and innovation is positive and statistically significant. The relationship between innovation and productivity does not change when the tier and sector variables relating to the company are included in the model. When the R&D variant is included, the relationship between innovation and productivity is completely lost because R&D activities have a strong influence on innovation and productivity.

• **R&D and productivity relationship.** R&D activities are shown to make a very strong contribution to productivity and technological innovation in the model established with the survey data.

• **Technology transfer methods.** It is concluded that companies that transfer information and technology through "transfer of qualified senior manager/ technical staff", "transfer of information from the parent company" and "transfer of technology through patent and licence" are more productive. The use of open

[3] *The questions about innovation in the World Bank Regional Investment Climate Assessment business surveys and in the Total Factor Efficacy surveys are different, however they are conceptually based on similar hypotheses such as product and process innovation and innovation in terms of market. The World Bank survey requires that the innovation be disclosed as open-ended, and the answers are filtered according to the content of these explanations beyond asking whether there is an innovation or not.*

sources of information has also made a partial contribution to productivity. Moreover, technological innovation also has a positive but weak influence on productivity. Companies that transfer knowledge and technology directly from the parent company or through recruitment of more qualified staff and through licence agreements are more productive. However, this does not make the companies with the information source more innovative.

• **Technology use and productivity.** Technology-use variables (embedded software, cloud computing, the internet of things, big data, flexible automation, smart robot, e-commerce, international digital payment, radio frequency identification (RFID), new material, 3D printers, etc.) have positive effects on productivity. The influence of "broadband internet access" and "website/social networks" seems to be negative. It was found that companies using information, materials and e-commerce technologies are more innovative and companies using management information systems and web (social networks) technologies are less innovative.

• **Reverse engineering.** Companies that acquire knowledge and technology through reverse engineering are less innovative companies. These results show that companies following the strategy of passive imitation could not make technological innovation and that for technological innovation, companies should follow active policies such as R&D and technology transfer.

Critical findings were obtained in the thematic workshops conducted within the scope of the TFP project on how to increase the effectiveness of R&D spending, in particular, how to accelerate the commercialisation process. Despite the recent rapid increase in R&D expenditure in our country, it is stated that there are serious issues in commercialisation and the effective use of funds. The inability to make sufficient market-needs determination/analysis comes at the top of the main deficiencies in commercialisation. It is imperative to prioritise capacity building on R&D and to do so with a productivity perspective towards the private sector. To this end, some factors were emphasised such as encouraging R&D and design work, together with the main industry and subsidiary companies, the need for the presence of flexible conditions when creating R&D centres and building capacity for calculating how much intellectual capital affects company assets.

Co-operation among companies and long-term customer relationships

Survival in the supply chain is related to the fact that companies are able to establish trust-based relationships with customers as much as it is related to factors as quality, speed and cost. The healthy development of relationships and co-operation with customers contribute to the development of the company's information management capacity, obtaining better knowledge on demand dynamics and the tailoring of production and after-sales support functions to the unique needs of the customer. The effect of co-operation of the main industry and the subsidiary industry, especially in the stage before a new product is introduced to the market, regarding issues such as product design and R&D on the productivity and innovation, is known to be positive (OECD, 2015; Barajas et al., 2011).

Important findings were obtained as a result of the TFP survey, company interviews and thematic workshops to determine the status of long-term-customer (LTC) relationships in the manufacturing industry in our country and to measure how this affected productivity. These findings primarily focus on determining the current situation. In addition to this, the main issues restricting the strengthening of inter-company co-operation, its effect on productivity and the solutions proposed for developing them have been compiled. Key findings that shed light on the current situation are summarised below:

• **Share of LTC.** The average share of long-term customers in the turnover of companies is about 66%. The sector with the highest share of turnover from long-term customers is the second tier's chemical industry, which obtains 78% of its turnover from long-term customers. Among the third tier companies, the mineral/metal industry's share of the turnover obtained from long-term customers is the highest at 71%.

• **Co-operation and support areas among companies.** Around 81% of companies do not receive any support from their customers. Seven percent of companies receive support from their customers in terms of transportation/transport; around 5% receive support in the areas of finance, compliance with environmental standards, common input procurement and information on market/demand conditions. Despite the small proportion, companies receiving

support from customers can reduce their costs as a result of this support. The most important support for these benefits is financing of common input. While 29% of the companies receiving this support have a cost advantage, 22% of those receiving financing support have a cost advantage. Those receiving transportation support face a 20% reduction in costs.

• **Differences in sectors.** The average number of long-term (two years or more) customers that were asked questions in order to identify companies in the supply chain is 95. The highest number of long-term customers belongs to second-tier food companies, with approximately 242 customers. In the same tier, mineral/metal sector companies rank second, with an average of 236 long-term customers, while the third-tier wood products industry has an average of 166 customers. The sector with the highest number of long-term customers among the companies that ranked third in the value chain is the food industry, with 113 customers. The lowest number of long-term customers was observed in the third-tier machine industry, with 75 long-term customers.

• **Domestic and international distribution of LTC.** The average percentage of long-term customers of companies in Turkey was found to be 81. The percentage for companies in the second tier in the value chain, which mainly serve domestic customers, is generally above 90. For customers of companies in the third tier, it is lower. For example, in the food industry, the rate decreases to 72%.

There are significant findings regarding the impact of the practices and trends in this area on productivity:

• Taking part in a value chain has a positive contribution on productivity and innovation. To this end, the share of LTC turnover increases the productivity of companies, but its effect on technological innovation is not positive or significant. Companies with an increased number of LTCs in the past five years are more productive than those with an unchanged number of LTCs, and those with an unchanged number of LTCs are more productive than those with a decreased number of LTCs. The tendency for innovation of companies with an increased number of LTCs is higher than the other groups, but the innovation tendency of companies with an unchanged number of LTCs is less than that of companies with a decreased number of LTCs.

• Companies with joint R&D and design with customers are more productive and this effect is applicable for all models. It also makes a positive contribution to the technological innovation tendency. However, it is ineffective in the model where all variables are included.

• The support provided by customers has a positive but weak influence on productivity. The impact on technological innovation is positive and statistically significant, but this effect is lost when the technologies used, staffing and variables in the organisational structure are included in the innovation model.

• The joint projects made with manufacturers using machine-equipment positively affect the productivity of companies. In particular, successful companies in the food sector have carried out joint productivity projects with local and/or foreign machinery-equipment manufacturers.

Finally, the main issues and future expectations in this area are summarised under four chapters:

• The main issues. The most frequently mentioned issue experienced with customers is the irregular payments. Approximately 71% of companies complained about this matter. Nevertheless, there are no significant differences among the sectors regarding this issue. The second most frequently encountered issue by companies with their customers is the suppression of prices, with an average of 51%. Then the third most frequently encountered issue with customers is the brief time period for orders. Those companies with a higher productivity than their global competitors have responded (39%) above the rate of all other companies (33%) only in this particular issue. Thirty-two percent of companies consider that the fourth biggest issue is that orders are given in very small quantities. The fifth most important problem experienced by companies with their customers (28%) is the disturbances in information flow.

Table 2: Issues faced with long-term customers (percentage of companies experiencing problems)	Productivity compared to global competitors			Total
	Lower	Almost the same	Higher	
Irregular payments	81.4	70.4	56.3	70.7
Suppression of prices	46.4	55.2	50.9	51.3
Brief time period for orders	30.1	33.0	39.1	32.8
Orders in very small batches	32.6	34.2	27.4	32.0
Disruptions in information flow	24.7	34.0	19.4	27.6
Failure to comply with the contract	26.8	26.4	18.7	23.8
Lack of support for supplier development	26.3	20.6	18.2	20.8
Frequent change of product specs	12.5	24.2	16.1	18.5
Not sharing production planning in time	19.4	27.6	21.7	18.2
Lack of financial support	17.3	22.9	12.5	18.2
Lack of production capacity to meet the demand of customers	3.6	10.7	9.0	7.9
Inconsistency in quality	5.2	9.8	5.6	7.1

Note: The "Total" also includes the companies that have not responded to the productivity question.

• **Transparency.** Emphasis is placed on ensuring transparency in the refinement of trust among companies. While the most important issues encountered in the development of inter-company relations were related to logistics and infrastructure in the past, nowadays the most important issue is transparency. Clear communication among the suppliers, logistics companies and parent company as well as software including effective Enterprise Resource Planning (ERP) systems and end-to-end solutions are gaining importance. On the other hand, the processes of transparency can make SMEs uneasy; companies may have some reservations for their internal processes to be disclosed. Emphasis is placed on creating an ecosystem in which the main industry and the sub-industry can act together, and on the key role the main industry will play in this ecosystem. At this point, the regulatory role of the government in the sharing and protection of commercial/financial secrets is important.

• **Turnover rate.** The total customer turnover rate of the companies participating in the study is 44%. This indicates that an unstable relationship has been established with customers. This ratio increases to 60% in mineral/metal industry companies in the second tier, which is the highest rate on the table. The lowest customer turnover rate at 18% is in the chemical industry. The view of customer relationships is generally more unstable for companies that are in the third tier of the value chain.

• **Future expectations.** Companies often indicate that they will not change their relationship with their suppliers in the future. The most pronounced plan for the future is to work only with the better suppliers among the existing ones. Reducing the number of suppliers by eliminating unsatisfactory ones among the existing suppliers is the second most frequently mentioned plan. The third most pronounced plan is the willingness of companies to attach greater importance to the development of the institutional/organisational skills of existing suppliers.

Use of modern production techniques

Studies conducted to measure the productivity performance of the manufacturing industry in our country showed that the production techniques adopted by companies have an effect on the productivity of the company. It has been observed that suppliers with high productivity performances have developed lean manufacturing techniques and some applications for their employees to undertake multi-tasking, to optimise workflow and production areas, and to measure the performance of staff (McKinsey, 2003). Although public policies play a limited role in the adaptation of such techniques, contributing to the indirect adoption of these applications by accelerating the integration process into global supply and value chains will be critical for productivity performance.

The findings obtained from the TFP survey, company interviews and thematic workshops on the use and productivity of modern production techniques are summarised below:

• **Standard operating procedures (SOP).** The rate of application of SOP is 55%. This figure is much higher than the average in the first and second tier company groups and far below average in the third tier company groups. Nearly half of the companies implement SOP for frequently repeated non-production activities. SOP is not implemented in most of the third tier companies. Almost all of the companies that implement SOP provide training to their employees prior to starting any new task.

• **Targeting overall equipment effectiveness (OEE).** The number of companies targeting OEE for their equipment equals about half of the sample. This indicator is similar to SOP implementation in terms of both sectors and the differentiation of company tiers. It can be deduced that the companies which implement the SOP also performed the equipment targeting at the same time. The proportion of companies that track OEE losses separately for each equipment is about half of the companies. Around half of the companies take the necessary measures to improve OEE.

• **Quality processes.** The quality control processes of companies are most often implemented at every stage of the quality performance process or during every manufacturing batch. Quality processes are relatively well-functioning in the first tier and second tier companies, but there are significant shortcomings in almost all of the covered sectors. It was stated in the thematic workshops that some companies received quality certificates at very low costs only to fulfil some obligations, and therefore the effects of the certificates on productivity are limited.

• **Kaizen system.** Some companies, especially those in the automotive sector, were noticed to have made efforts to integrate the "Kaizen Value System" in order to improve their production process. Some companies implement a strategy of structuring their production taking into consideration the proposals of blue collar workers, but the majority of companies perform production in a traditional way.

• **Benchmarking and key performance indicators (KPIs).** Approximately half of the companies identify KPIs for the different stages of their production processes. This ratio is significantly higher in the firstt and second tiers than in the third tier. Benchmark values for productivity are available for a limited number

of companies. These values are obtained through the parent company, buyer companies/customers, transfer of staff, "catalogue values" in the installation of machine-equipment, sector-based organisations and consultancy companies. Important performance indicators that companies observe are the cost structure of production, partial productivity indicators, "changeover" time, waste rate and stock cost. The material/raw material costs, labour payments and energy costs included in the production cost are widely monitored and indicators such as production per capita, capacity utilisation rate, production per energy consumption, factory productivity and production line productivity are monitored as partial productivity indicators.

• **Productivity measurement trends.** Efforts to measure and evaluate productivity and development in companies have become widespread. Leading companies, especially those in the automotive and white goods sectors, have systematically developed productivity measurements and policies compatible with this measurement and the measures they took then led to a strong increase in productivity. It is determined that productivity measurements and evaluation studies are initiated at the request of the parent company or global buyer companies and productivity studies are more common and comprehensive among the companies' part of a holding. On the other hand, despite large-scale and branded production especially in the food and apparel sector, the effort and desire to measure productivity is still in its infancy in many companies.

• **Consultation for audits.** Receiving consultancy services for productivity audits is becoming widespread. The main companies in the automotive and white goods sectors usually try to improve their productivity levels through the efforts of their staff and they outsource temporary consultancy services. In the apparel and food sectors, productivity audits are widely carried out with support given from outside the company.

• **Basic skills.** Companies that have remedied their basic production shortcomings focus on innovation. For example, if a company's waste rates are too high, innovation in that company cannot be prioritised. The fact that the level of innovation is not high indicates that there are still serious problems in basic production capabilities.

Company management quality and institutionalisation

Studies carried out by microdata collected at the company level show that management quality is an important factor in explaining the differences in intra-country and inter-country productivity. Companies can look at management practices such as pursuing what is happening internally, evaluating the results obtained from targeted research and converting them into precautions, as well as looking at how to get the best performance from their employees. These tools, processes and systems, together with the skills of the human element that manages them ensure that new information, including the most appropriate methods and technology for the company, is integrated in the functioning of the company and contributes to the company's productivity.

Turkey's status can be examined in the World Management Survey, which questions basic management practices in comparison with other countries. Accordingly, as of the 2013-14 period:

• Turkey ranked 21st out of 35 selected countries according to the quality management scores. A score of 2.7 out of 5 obtained by manufacturing companies in our country points to an average performance.

• The method used in the survey makes a comparison between actual values and some of the values indicated by the managers, so that it can measure "excessive confidence" levels of the managers. Deviation from real values can lead to managers not being open to change and not seeking to improve management (Carpio and Taşkın, 2016).

• There is a positive and statistically significant relationship between the management quality values and the added value obtained in return for the period of labour spent at the sub-sector level of the manufacturing industry (Carpio and Taşkın, 2016).

• Multinational companies have a higher management quality value than domestic companies and those companies established by a family or an owner have a higher

management quality value than other company types. Better companies have more power in areas such as hiring, sales and production and they employ staff (administrator or non-administrator) with higher levels of education (Carpio and Taşkın, 2016).

Findings from the TFP survey, company interviews and thematic workshops are summarised below:

• **Companies affiliated to holding.** The proportion of companies that are affiliated to a holding as an institutionalisation indicator is 25%. It is observed that this ratio is high for the companies in the first tier in the value chain and decreases in the other tiers. The highest rate of being affiliated to a holding in the first tier is in the electrical household goods industry at 86%. This percentage is the lowest at 21% in the machinery industry companies in the third tier. In some cases where there are different sectors within a holding, processes of learning/ transfer of information among sectors are observed. For example, a successful application in automotive is adapted to the electronics sector. Being affiliated to a holding group has a positive effect on productivity and technological innovation trend in all models, but as new variables are included, this effect diminishes and eventually neutralises.

• **Institutionalisation.** Approximately 20% of the firms experienced institutionalisation when they were family businesses. The percentage of companies forming new organisational units within the company is 19%. There are also companies that make geographically based changes and structural changes. The percent of companies that have appointed managers among relatives, which is regarded as another indication of non-institutionalisation, is about 32%. This was measured the lowest in the automotive companies at 8% and in the household electrical appliances sector at 13%. On the other hand, this is much higher for main industrial food (39%) and textile and apparel (57%) companies. For the firms in almost all sectors in the second tier, this percentage is well above average.

• **Family businesses.** The percentage of family businesses is higher for companies in the first and second tiers. About 29% of the companies in the sample are family businesses. The highest number of family businesses is in the food and textile and

apparel industries. The lowest percentage of family businesses is in the wood products industry in the third tier in the value chain.

• **Transition to the second generation.** Industrial companies experience a transition to the second generation in many sectors and regions. A change is also seen in business models in companies that successfully manage this process; a transition can gain more value-added steps of the value chain or add higher value-added areas. Second generation managers approach more keenly activities such as mentoring, coaching and clustering. The positive influence of the transition to the second generation largely relies on the skills of the second generation. It would be beneficial to monitor and support these change processes in family companies, which constitute a significant part of SMEs. Softening this transition by means of tools such as coaching, mentoring and counselling in particular can be beneficial for the competitiveness of the country.

• **Strategic planning.** Sixty-five percent of the companies regularly conduct strategic planning. Strategic plans are usually prepared with the participation of employees, and the actual implementation of plans is monitored and evaluated.

• **Advantages of family businesses.** The advantages of family businesses compared go companies totally run by a professional team should be underlined. For example, when a family business encounters a difficult situation, family members can sell their individual assets. However, similar behaviour cannot be expected from the general manager of a corporate company. It is necessary to seek to transfer without losing the founding spirit and transfer the story of "clawing up to today in the process of transition to the second generation. However, although not as aggressive as the founding generation, the new generation is well-educated and more likely to place institutional business rules. The softening of this transition with "coaching" services gains importance for the sustainability of the companies.

• **Institutionalisation and flexibility.** Most of the tools related to institutionalisation are based on the standardisation of processes. On the other hand, significant changes are anticipated in processes due to technological improvements. Companies, especially family businesses, should be flexible and not turn into "bureaucratic kingdoms" during the transformation.

• **Impact of different applications on productivity.** The productivity of companies that made changes in their organisation structure and established a performance management system is partially higher, but this effect is weak. The productivity of companies applying flexible labour force policies (flexibility of staff), performance-based rewarding systems (awarding staff) and Key Performance Indicators (KPIs) was lower than other companies. Companies that established quality control and performance systems, implemented changes in organisational structure over the past three years and implemented KPIs tend to be more technologically innovative. Flexible labour force policies also have a negative effect on technological innovation. Companies using Management Information Systems are found to be more productive but less innovative.

• **Digitalisation.** Information technology affects all forms of business making, behaviour, work flow and processes in the company's (i) relationship within the company, (ii) relationship with suppliers and (iii) relationship with customers. Significant breakthroughs in informatics should definitely be supported by organisational change. While information systems require technological maintenance for machines and software, there also needs to be a cultural change for those who use these machines and software. In this regard, it is necessary to give continuous training to employees to use the systems in the best way and to evaluate the data coming through the systems. Nevertheless, no matter how much digital conversion and how many artificial intelligence applications are developed, the human element is determinative. Information tools and systems can only lead to increased productivity when considered together with corporate transformation, management quality and the quality of human resources.

Labour productivity and human resources practices

Human quality is determinant in terms of all functions of a firm such as introducing innovations and delivering them to customers, both in the operation of the means of production and in making managerial decisions. In a study comparing Danish citizens' data on work and education experience between 1980 and 2001 and the value added data obtained between 1992 and 2001 at the firm level, it has been proven that human capital inputs have a significant positive effect on firm outputs (Fox and Smeets, 2011). Another study

that examines the labour force data of 26 sectors in five countries between 1979 and 2000, which takes into consideration the work experience and the on-site training received by the labour force as well as the certified education level (i.e., high school, university, etc.) of the labour force, proves the positive impact of the human capital on the outputs (Mason and Vecchi, 2012).

Findings from the TFP survey, firm interviews and thematic workshops are summarised below:

• **White-collar employee ratio and productivity level.** The percentage of white-collar employees, which is an indicator for the quality intensity of the sector, is approximately 20% on average. The highest white-collar percentage is in the automotive industry in tier one with 36%. The percentage of white-collar employees in the food main industry and the second-tier firms is about 32%. In the wood products industry, it is 30%. The firms with a high percentage of white-collar employees are more productive on average. The amount of white-collar employees working in the firm has a positive impact on productivity; however, when R&D operations are monitored, the proportion of white-collar employees does not have a strong impact on technological innovations.

• **Labour turnover rate.** The high turnover rate is a major problem for firms. Labour turnover is around 2-2.5% in quite a limited number of firms. This goes up to 60% in many firms, which is considerably above the acceptable level. The labour turnover rate is low in the automotive and white goods industries, and high in the apparel and food industries. Labour turnover is 30.6% for white-collar employees and 34.6% for blue-collar employees. The labour turnover for white-collar employees is higher in the food sector. This percentage is higher in the third-tier firms. It is noteworthy that the labour turnover rate in blue-collar workers is higher in the wood products and textiles/apparel sectors.

• **Numbers of shifts.** The average number of shifts the firms are working is 1.6. While the highest number of shifts is implemented in the main food industry firms with 2.7, the number of shifts in the main industry textile and apparel firms is 1.7.

The number of shifts in the electrical household goods and automotive industries is 2.1. The number of shifts in the second-tier firms is 1.8 on average in the majority of sectors. The lowest number of shifts is in the third-tier wood and machinery firms with 1.3 on average.

• **Human resource policies and labour productivity.** In institutional and professional firms, good human resources practices such as career opportunities and performance-based promotion, etc., are in place. In most firms that cannot progress in terms of institutionalisation, stable and systematic human resource policies are not implemented. The vast majority of firms regularly monitor the performance of their employees. Firms implement strategies such as regular payment of wages, in-house training programmes, non-wage social opportunities in order to increase labour productivity. It is remarkable that the first two strategies are implemented in all sectors and tiers. The impact of personnel management and organisational structure on productivity and technological innovation activities is complex. Firms that prioritise labour flexibility are those that are unproductive and less innovative. Firms that implement quality control, KPIs and a performance system and transform organisational structures are more innovative. Firms that have adopted rewarding and similar practices in KPIs and personnel management are found to have lower productivity on average. Trust overweighs loyalty in employment.

• **Firms' perception of labour.** Firms generally scored their employees with about 3.5 points (medium-high) over 5 in terms of their knowledge/skills and motivation levels. In all sectors, white-collar employees have been assessed slightly more positively than blue-collar employees in terms of both the level of knowledge/skills and motivation. Satisfaction with the levels of knowledge /skills and motivation is higher in firms in the automotive sector.

Consultation Questions 1: Determinants of Productivity in the Turkish Manufacturing Industry (Question 1-17)

1. What kind of technological innovations that might have a possible destructive effect do you observe in your sector; what type of precautions can be taken to turn these innovations into advantages?
2. Should an intervention be performed through public policies to renew business models of firms? If so, how?
3. How can the success stories of firms that have gained a competitive advantage by changing their business models be used to inspire other firms?
4. How does the young generation born after 1980 affect the way firms conduct business as both employees and consumers?
5. What can we learn from digitalisation and digital transformation practices for Turkey's productivity agenda?
6. What does the diffusion of platforms that bring mechanisation, artificial intelligence, products and customers together without a mediator mean for Turkey's industries? Are there any missed opportunities? What kind of new opportunities are there?
7. How can Turkish firms in the global value chains be protected in a world where protectionist tendencies have increased?
8. Is there any role that the government can play to increase the level of interaction between main firms and suppliers for integration into global value chains? If so, what kind of role?
9. Is it possible for the government to develop an incentive mechanism for main firms and suppliers to conduct joint R&D activities? What kind of a mechanism would it be?
10. How can it be possible for industrial firms based on manufacturing to build capacity in such areas as R&D, design, branding, marketing and integrated services accompanying products?

11. What aspects need to be improved in R&D support provided to firms and universities?
12. How is it possible to facilitate technology transfer by means of public policies?
13. Is there any part the government can play to help firms build long-term relationships (B2B) especially with foreign clients and reinforce the trust factor in their relationships? If so, what is this role?
14. How can the use of modern production methods and management practices be extended; should public policies be developed in this regard? If so, how?
15. Is the transition of firms to more educated second or third generations a factor that increases the quality and productivity of firm management? How can this transition process be managed in terms of a company's sustainability and growth; is there any role that the government can play in this regard? If so, what?
16. What kind of policy interventions ensuring rapid achievements could be provided to improve the skill level of human resources and increase labour productivity?
17. Can you think of any company in Turkey that has gained a competitive advantage in global markets through one or several of the seven elements listed here as determinants of productivity in the manufacturing industry? What is the success story of this firm in brief?

TFP Policy Framework

Studies carried out at different times for different purposes for different countries point to the role of a number of factors affecting Total Factor Productivity (TFP).[4] Many different policy areas, such as technology use, labour skills, management quality of firms, investment climate, incentives to support innovation and entrepreneurship, and ease of access to finance, can play a role in the increase in TFP. At the macro-level, the macroeconomic conditions (policy predictability, price stability, factor prices) and the regulations towards the overall market (product markets, capital markets, labour market, liberalisation of professional services) are determinants of TFP trends. At the micro-level, there is a field of "black box" because of the fact that the research examining company dynamics both globally and in Turkey in terms of public policies and interventions is not rich in scope and frequency. It can be said that the micro-level consists of three basic elements:

- **Factors related to production:** scale; capital intensity; production technology; the quality of machine park and equipment; labour quality; and the level of capacity utilisation
- **Factors related to management quality:** organisation structure; human resources and performance management; cost accounting; cash flow management; lean production techniques; quality standards; and co-operation with suppliers
- **Factors on business model, product and service innovations:** diversity in presented products and services and marketing; design capabilities; R&D and product development competencies; and entrepreneurship and innovation

In general, there are four main policy areas for the government to intervene in the micro-level elements:

- **Development of business environment:** infrastructure and improvement; higher education system; vocational education system and development of labour skills; free trade agreements; and applicability of contracts
- **Increasing demand:** tax incentives; public procurement and localisation; regulations; consumer financing; and branding
- **Promotion of production:** technology transfer and diffusion; direct foreign investments; capital support; supply ecosystem; import regulations; and development of industrial and technology areas
- **Supporting innovation:** R&D support; university-industry collaborations; facilitating the diffusion of new technologies to firms; financial support for supporting innovative entrepreneurship; and support for clustering

[4] *For a more detailed literature review, see Isaksson, A., 2007, Determinants of Total Factor Productivity: A Literature Review, Research and Statistics Branch Staff Working Paper 02/2007, United Nations Industrial Development Organisation.*

In the broad policy areas mentioned above, what topics should be selected as a priority in the period of 2019-23 that will be covered by the 11th Development Plan? In response to this question, a policy framework was designed from the synthesis of the results of the business survey developed within the scope of the project, a literature scan and an examination of practice examples from abroad, workshops conducted on thematic areas and with value chains, and face-to-face interviews with decision-makers and stakeholders.

According to the results of the business survey, companies see external factors, such as financing problems, unusual contractions/fluctuations in external markets and labour quality, as the most important factors preventing an increase in productivity, followed by the quality of machine-equipment and insufficiency of suppliers. When the survey results are evaluated as a whole, it is seen that a significant portion of the firms in Turkey are struggling to gain competitiveness, with cost-lowering passive strategies such as labour flexibility and the suppression of suppliers' prices. The more productive companies follow active strategies such as long-term customer relationships, joint R&D and design, and technological innovation. These findings point to the need for regulatory and incentive mechanisms to force/direct firms to adopt active strategies to increase productivity in the manufacturing industry.

As a result of the synthesis of non-survey works, a number of critical determinations emerge that will shape the design of the policy framework:

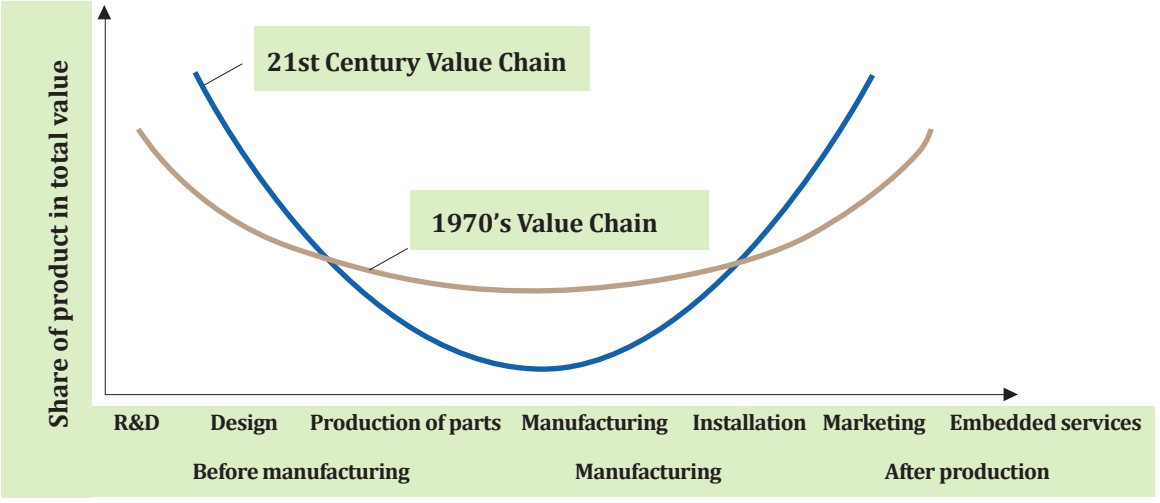
• In line with the Germany and South Korea cases that are examined under the scope of the background works, it is seen that there is a small number of policies that are not being implemented in Turkey to increase TFP. Compared with these countries, three basic deficiencies can be underlined at the level of public policy in Turkey: (i) a perspective to assess firms in terms of their productivity performance; (ii) an effective implementation capacity that can be selective among the firms with better and worse performance; innovative entrepreneurs; and those who establish businesses based on need; (iii) the willingness to assess the effects of policy implementations on the firms (Çağlar, 2017).

• The main factor in the difference in productivity with the competing countries/firms is the differences in product range and business model. Today, firms with new business models that blend new technologies are increasing their competitiveness

by methods such as platform revolution, industry-service integration, result sales instead of product sales and so on. Firms state that their foreign competitors with a higher performance in terms of productivity have: (i) higher production scales, (ii) higher levels of mechanisation/automation, (iii) higher skills in information and communication technologies, (iv) capacity to employ more innovative employees and (v) different business models.

• Supporting the integration of firms into global value chains is one of the main ways to improve productivity and reduce the difference between large and small firms. On the other hand, manufacturing/assembly activities are becoming the lowest value-added stage in the value chain. The assessment of the global needs that are not yet met, developing new concepts these needs; doing laboratory experiments; developing prototypes; conducting international market research and testing; improving the concept based on feedback; making, testing and developing functional products/prototypes; implementing engineering processes; investing in and marketing small-scale production and ensuring that it is accepted throughout the market; establishing distribution networks; and providing complementary services are the leading higher added value stages of the value chain (Figure 1).

Figure 1: Value chain stages and distribution of added value, 1970's and 21st Century Manufacturing Industry



Source: World Bank (2017), "The trouble in the Making? The future of manufacturing-led development" World Bank Policy Report, World Bank, Washington, DC.

In line with the findings and synthesis above, in order to increase the contribution of TFP to economic growth in the 11th Plan 2019-23 period, a policy framework that consists of three elements is recommended based on the approach to increase Turkey's high value added industrial product exports:

(i) The first policy plane consists of horizontal policies; contains the approach towards firms aiming to increase productivity, regardless of technology, sector and region difference.

(ii) The second policy plane consists of vertical policies; contains the interventions that require selectivity and focusing specific to certain sectors, technologies and regions.

(iii) The third plane contains the outlines and principles of a new implementation approach (interfaces) for the realisation of policies towards TFP.

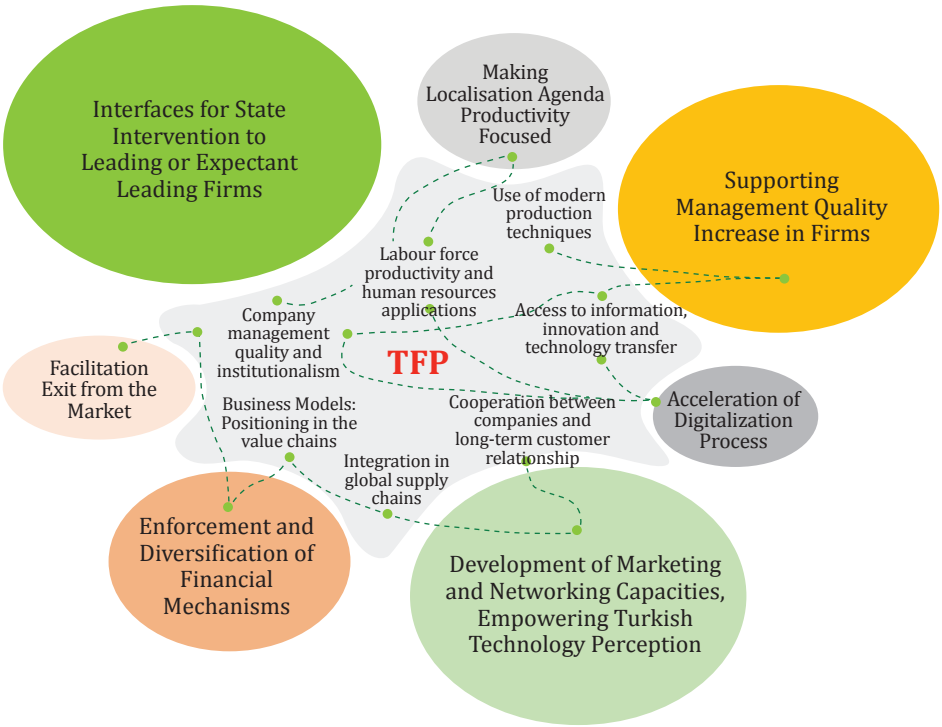
The proposed policy framework contains suggestions for the public to intervene with an accelerative perspective to the elements identified in the second part of this report that have been found to affect TFP at a micro-level. The factors expected to explain the TFP differences among the firms will vary according to the analysis period and perspective. However, it is possible to say that in the process that the manufacturing industry of Turkey is passing through today, seven elements, which are mentioned as the Components of Productivity in the Turkish Manufacturing Industry in the first chapter of the report, are at the forefront:

- Business models: Positioning in value chains
- Integration into global supply chains
- Access to information, innovation and technology transfer
- Co-operation among firms and long-term customer relationships
- Use of modern production techniques
- Frim management quality and institutionalisation
- Labour productivity and human resources practices

It is expected that the seven main policy headings proposed in this part of the report will systematically accelerate the transformation of the seven TFP elements.

Each of these seven elements should be realised not as an accelerator for a single factor, but as an accelerator for more than one factor. As described below (Figure 2), each policy intervention has the potential to transform some elements directly and some indirectly.

Figure 2: Relationship between policy priorities and total factor productivity determinants



Because of the integrated and systematic approach described above, it is inevitable that the framework proposed in this part constitutes a far more comprehensive policy towards economic development. The TFP increases are the most fundamental variables explaining the differences in economic development in the long run among countries.

It is suggested that policy bundles consisting of various tools in this triple frame should be structured with respect to value chains, specific technologies and regions.

The scope of the policy framework proposed in this document is determined by the assumptions as follows:

• The policy framework focuses primarily on the manufacturing industry sector; it also includes the subjects closely related to the performance of the manufacturing industry, such as software, design, marketing and e-export.

• A number of issues that are of critical importance for TFP have been left out in order to maintain the focus and priorities of the document. These include energy productivity, labour productivity, productivity in the public sector and the effectiveness of market regulations. Most of these issues have comprehensive strategies and action plans in place.

• The proposed TFP policy framework does not target all firms, but provides a framework for firms that have a growth potential and demonstrate a willingness to grow, regardless of their size. Policy recommendations should be taken into account according to the businesses that can benefit most from improvements, regardless of the SME or large company whose scope has been defined by legislation based on the number of employees and turnover.

Box 1: Examples of Germany and South Korea for the TFP Policy Framework

Examples of Germany and South Korea were examined under the scope of the TFP project. Accordingly, the policy framework in these countries is summarised below at the macro level.

Germany's approach: indirectly supporting global leaders by creating a competitive environment

Germany's TFP framework:
i. State aids to increase innovation capacity,
ii. Regulations for labour market,
iii. Vocational education system

Korea's approach: to improve technological capabilities nationally for rapid convergence, to strengthen large firms and technological entrepreneurs with effective public intervention

Korea's TFP framework:
i. Policies to develop technology ecosystem
ii. Innovative entrepreneurship and support for strengthening SMEs
iii. Human resource development and vocational training
iv. Increasing competition and global economic integration

Source: Çağlar (2017)

1 TFP-Accelerating Policies

As a result of the synthesis of the studies carried out under the project with the aim of increasing TFP, at the forefront are three critical horizontal policy areas that will directly affect the performance of the manufacturing industry in the coming period:

(i) Digitalisation: E-export, cloud computing, infrastructure, software industry developments towards manufacturing industry

(ii) Institutionalisation: Management quality, organisational problems, quality processes in production

(iii) Effectiveness of regulations for exiting the market: Preventing resource allocation to firms that do not show an efficient performance in increasing their productivity, and accelerating market exit processes in parallel with strengthening the necessary social support programmes

Within the scope of this policy area, it is suggested to implement programmes to push the firms, sectors and regions that have fallen behind in terms of levels of productivity, up to the national average. It is important to develop approaches aimed at building and strengthening, and the co-ordination of strategic public interventions within these programmes to directly impact an increase in TFP. In addition, it is of crucial importance to ensure the existing firm support mechanisms implemented in these areas are addressed in terms of productivity and that their efficiency is increased.

Accelerating the digitalisation process

It can be predicted that the role of digitalisation in the forthcoming period will be similar to how energy and transportation increased the productivity of industry in the past. It is expected that new areas bringing together such software and data sciences as the internet of things, artificial intelligence, layered manufacturing, cloud computing will have a significant effect on productivity in industry, besides their advantages of speed, quality and flexibility. Today, most countries allocate resources for projects and applied research on advanced manufacturing within the scope of "industry 4.0" or "digitalisation in industry" policy agendas, especially prioritising capacity building for SMEs in this area.

According to the World Bank's 2016 World Development Report, Turkey ranks 28th out of 173 countries in terms of the level of digitalisation of the public. Turkey ranks 51 in terms of the level of digitalisation of firms. On the other hand, the level of awareness about digitalisation of firms is increasing in our country, and both the public and private sectors are in the process of producing road maps for digitalisation. It is envisaged that digitalisation will become an important growth axis within the scope of the 11th Development Plan. Thus, when viewed from the TFP perspective, digitalisation is one of the most critical horizontal policy areas.

Thanks to the internet, it is easier for firms to access global markets and it is possible for value chains to spread across different countries. In the near future, by 2020, the electronic (B2B) trade volume in the global economy is expected to reach $6.7 trillion (Frost and Sullivan, 2015). E-export systems can solve the problems of lack of information and confidence in the traditional method, and there are rapid improvements in the issues such as rating, feedback, dispute resolution and payment systems. E-export represents an important opportunity to enable access to remote markets, to develop competencies by opening new marketing channels between product and customer, to enable design- and knowledge-intensive products to access markets through internet technologies and, in parallel, to promote online open innovation platforms. To fully appreciate this opportunity, policymakers need to proactively support e-export and remove any obstacles in front of it.

Increased information access by firms enables the supply chains and customer relationship management to be optimised, thus directly affecting capital productivity and labour productivity. All these developments in the field of digitalisation are reducing the transaction costs in the economy overall and have the potential of increasing the contribution of TFP to growth. To harness this potential and manage potential risks/disadvantages, it is necessary to increase the skill level of the labour, for the competition policy to prevent unfair competition, and protect personal rights by applying the accountability principle.

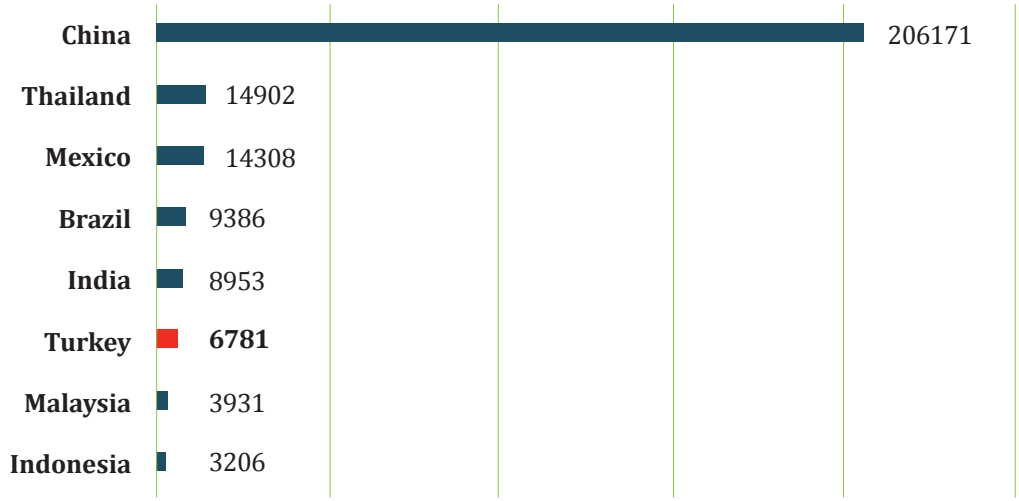
The digitalisation agenda can consist of two elements. The first is facilitating the diffusion of new technologies into firms. For this, it is of utmost importance to take steps to increase the level of digitalisation, such as lowering the cost of

infrastructure services and raising their quality. One way to close the productivity gap between large firms and small firms is reducing the huge digital gap between them. Second, it is important to strengthen the capacity essential for the production of new technologies. For this priority, the policy measures in the vertical plane discussed in the first part can be applied.

Internet connection speed in Turkey is the lowest among European countries with an average of 7.6 mbps, according to 2017 data, and Turkey ranks 75th among 143 countries (Akamai 2017). The low connection speed makes it difficult for domestic cloud services to develop and reduces the likelihood of Turkey becoming a determinant on global internet trends.

According to data from the International Federation of Robotics, in terms of the use of industrial robots, Turkey is at a similar level with medium-technology-intensive countries, with approximately 7,000 robots as of October 2016. On the other hand, in 2016, the number of new industrial robots that were put into use in South Korea was 38,000, and this number is 20,000 in Germany (IFR, 2017).

Figure 3: : Number of Industrial Robots in Operational Situation, October 2016



Source: International Federation of Robotics

Today in Turkey, there are only a small number of informatics and industrial actors that could accelerate the digital transformation of firms. Even in the automotive industry, where this level is the highest, big players can only partially affect the suppliers' level of digitalisation. Suppliers need to make more effective use of digitalisation to do basic planning, market research, demand and technology forecasting, and there are only few players who can ensure co-ordination in industries overall and lead the digital evolution. On the other hand, the fact that the structure of most sectors develops based on SMEs plays an important role for the public in solving co-ordination problems.

The role of the public in digitalisation as a new emerging field can be summarised as focusing on areas that will have a horizontal impact, prioritising accelerative and facilitative factors, ensuring co-ordination among stakeholders, and using the existing tools for these purposes, rather than selecting sector or technology. The alternative to providing convenience to firms through tax advantages should be providing them with an infrastructure that will help them reach more customers. In this context, with the digitalisation efforts within companies, the synergy to be emerged from the digital interaction among suppliers, customers, banks and investors including public actors should be used effectively.

Priority # 1: Increasing digital skills in firms and improving the software industry

In order to reduce the digital gap among firms, online activities should be encouraged and public resources allocated for the improvement of digitalisation skills in firms should be increased. In this context, it should be a priority to support the capacity building processes in areas such as information and content management (ERP, MRP), customer relationship management (CRM), communication and interaction, transaction ability (public, finance, e-sales), problem solving using digital tools and content development to increase customer/employee satisfaction.

A new incentive instrument for financing support for digitalisation and automation investments in firms should be established; it is an essential requirement that the projects to be developed in this context have a tripartite structure consisting of financing provider, demandant and the technology company that will provide the solution. It should not be focused merely on selling technology; factors such as operation, maintenance and services to be used permanently should be included in the scope. To this end, while longer term engagements are promoted, the growth of solution provider firms, especially in the software sector, should be encouraged. Measures to encourage online activities of firms should be improved; co-operation

among chambers, development agencies, municipalities, NGOs and large-scale technology companies should be promoted by increasing local initiatives towards this endeavour.

Programmes to boost digital skills should be implemented in education; it should be ensured that the quality and quantity of the labour having the technical skills to use the opportunities offered by digital economy should be increased. It is important to increase the basic information literacy and featuring IT subjects within lifelong learning programmes.

Active investment promotion efforts should be made so that the global players in the IT sector can be attracted to Turkey in a way that will enable us to gain a share of high value-added services in global value chains; TDZs and OIZs should be authorised in this regard.

Priority # 2: Improvement of digital infrastructure

In line with the cost/benefit analysis to be made, an ambitious policy objective should be adopted to reduce the cost and to increase the broadband[5] speed, access and utilisation and to be one of the top 10 OECD countries.

To increase the breadth of the broadband infrastructure, the national broadband strategy should be completed, competition in the market for wide new generation broadband investments should be increased and private sector investments should be encouraged through demand-enhancing tax regulations.

In certain OIZs to be selected, each firm should be provided with high-speed fibre internet access (equivalent to the highest orders in OECD ranking); it should be monitored and documented how fast internet access can change the competitive power of a region under the scope of the pilot. In line with the results of the pilot application and the benefit and cost analysis, the decision of extending the programme should be taken.

Priority # 3: Increasing e-export capacity

In addition to the goal of becoming a regional centre in production, an e-export strategy should be implemented for the target of Turkey becoming a regional e-commerce centre; the process for Turkish goods and services to take place in international markets via e-export should be accelerated. The existing support framework should be expanded to increase the access of SMEs to external markets through e-commerce, and capacities should be developed in terms of finding customers, logistics and payment systems specifically for the B2C area.

[5] *For the OECD statistics with regard to broadband speed, access and use by the businesses, see http://bit.ly/2p6UY7p*

For logistics, a programme should be developed that can meet the costs of logistics centres, which are a particularly common infrastructure to support a portion of the logistics costs in their international e-commerce dispatches, and that will not conflict with WTO rules.

Firms exporting abroad via e-commerce should be defined with a special status and facilitating arrangements in customs and logistics processes should be made in B2C sales of these enterprises.

Programmes that provide entrepreneurs with the accumulation of information in this area should be developed, by means of e-export education and support programmes within universities, chambers of commerce and KOSGEB (SMEDO).

For e-commerce stores, training programmes should be organised so that the firms that want to start e-commerce and that subscribe or want to subscribe to existing external platforms, such as Amazon, eBay, Alibaba, can increase their software usage and marketing capacities and get organised in these networks. For those who want to establish their own trading platforms and those who operate already-existing e-commerce platforms, support should be provided on areas such as design and software, marketing, translation to the languages of the countries where the sales will be made, and adaptation to payment systems.

Firms should be provided with support for the distribution centres, as well as offices and information centres that they will open abroad, and the logistics resources of e-exporters should be expanded.

Support programmes for e-export and platforms that bring together the single e-commerce players with the other ecosystem players such as logistics, payment systems, location and content providers should be created. By this means, e-commerce collaborations should be encouraged, and competitiveness with international rival networks should be improved through the promotion of scale economies and interstakeholder learning.

Priority # 4: Extending cloud computing

As envisaged in the Information Society Strategy, priority should be given to the target of "Turkey's becoming a regional data centre and extending the cloud computing".

The increase of applications of cloud computing by companies should be encouraged; the aim should be to increase the number and quality of initiatives

that develop original applications in this field. Within the scope of the incubation support programme, specific support should be provided for accelerator programmes to improve cloud computing initiatives.

A campaign for the advantages of cloud computing should be organised for SMEs. In order to prevent firms hesitating in the area of cybersecurity, it is essential to take the necessary legal measures in the field of data security of cloud computing service providers in accordance with European Union legislation.

Consultation Questions 2: Accelerating the digitalisation process (Question 18-26)

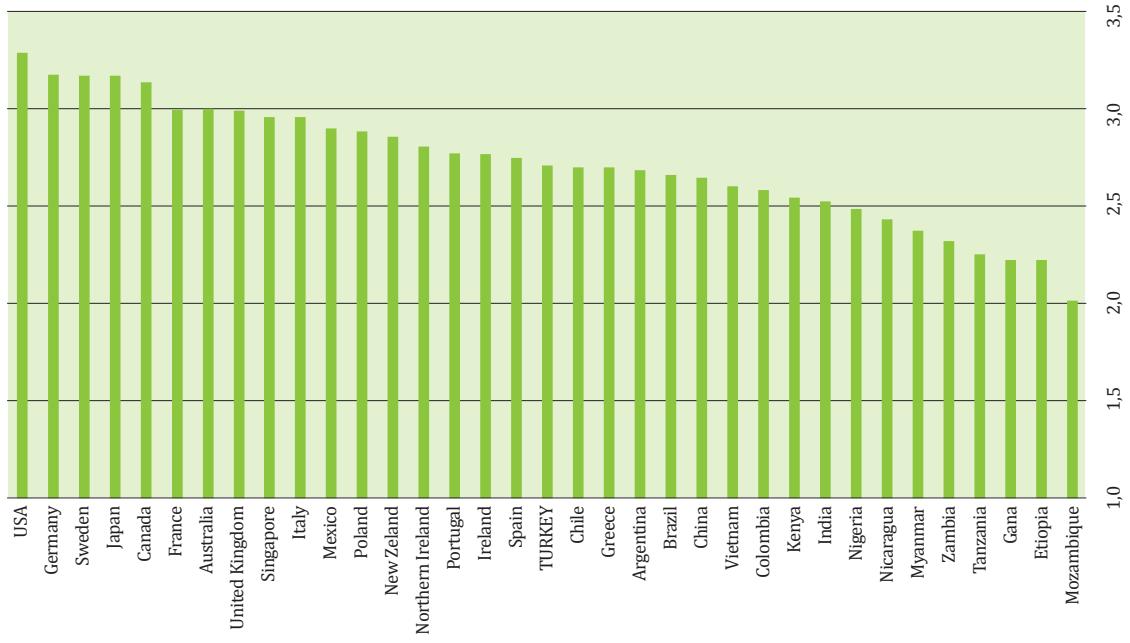
18. How can the huge digital gap between large firms and small firms in terms of access to and use of technology be reduced in order to close the productivity gap between them?
19. What kind of practices can the government implement to encourage firms to use digital forms of business making (e-procurement, e-invoice, etc.) to accelerate their digital processes? To what extent can these practices be efficient in the digital transformation of firms?
20. Should the government take steps to promote firms' online activities? If so, what kind of steps can be taken?
21. Which additional capacities should be built for the development of firms' digital skills? What are the most crucial capacity building areas that can provide the biggest achievement within the shortest time?
22. How can the global players in the information technology sector be attracted to Turkey in a way to enable us to gain a share of high value-added services in the global value chain?
23. Should the government provide financial support for digitalisation and automation investments in firms? If so, what should be the primary elements of this support?
24. Does the government have any role in increasing the accessibility of broadband speed in terms of geographical coverage and price? If yes, what role should this be?
25. What are the barriers to the development of e-export and what additional measures can be taken in this area?
26. How far does the dissemination of cloud computing applications among firms contribute to productivity according to your experience? How is it possible to disseminate these applications and at the same time support the domestic software industry?

Supporting the increase in companies' quality management

Studies carried out by microdata collected at the company level show that management quality is an important factor in explaining the differences in intra-country and inter-country productivity. This involves looking at practices such as to what extent firms are pursuing what is happening internally with specific targets, to what extent they can evaluate the results obtained, and what they are doing to get the best performance from their employees. These tools, processes and systems, together with the skills of the managers, ensure that new information, including the most appropriate methods and technologies for the firm, is integrated in the functioning of the company and contributes to the firm's productivity. The adoption of examples of successful management practices by firms reduces the productivity gap among firms with global leaders in their sectors and contributes to increased productivity across the economy (OECD, 2015).

In the World Management Survey, which looks at basic management practices in comparison with other countries, Turkey's status can be examined. Accordingly, as of the period 2013-14, Turkey ranks 21st among 35 countries selected according to management quality scores. A score of 2.7 out of 5 obtained by manufacturing companies in our country points to an average performance.

Figure 4: Average management quality scores for manufacturing industry firms (at a scale of 1 to 5), 2014



Source: LSE Centre for Economic Performance World Management Survey, 2013-14 wave

Considering the history of industrial growth in Turkey over the past 30 years, it is seen that the industrial firms that make a contribution to this growth fall within a generation of periodic transition. A corporate transformation is required so that this generation transition does not negatively affect firms, and firms ensure their sustainability. Firms that successfully manage this transformation process are experiencing a change in their business models. There is a shift towards higher levels or areas of the value chain. It is seen that the second generation of managers have embraced new technologies and applications. In this way, it is important to support the transition to the second level with the right mechanisms.

When we look at companies' use of technology, such as for design and product development, we see an increase in productivity due to the information transfer, especially through the relationships they have established within the value chain with the main firms they are suppliers to. Firms that use methods such as qualified senior executive/technical personnel transfer, information transfer from the parent company to ensure production standards and information transfer through patents and licences make positive contributions to their productivity.

It is important that companies can attract qualified human resources and contribute to the performance of the firm with the right policies so that new information enters and spreads in the firm. Companies need access to qualified advisory services so as to access knowledge on institutional approaches and systems that will help develop and manage the skills of human resources.

Management quality is related to the stages of the value chain before and after production such as R&D, design, marketing, as well as the management of production processes. It is important and necessary to establish minimum bureaucratic processes such as operating management systems, defining processes and roles. In addition, two factors are critical in the R&D, design and marketing stages, which have particularly high added value in the value chain. The first is the social side of institutionalisation. Social/behavioural management practices that will increase knowledge transfer and creativity should be developed both within the firm and among the units/employees and firms. The second is the ability to take risks in the direction of medium-to-long-term visions. Firms need to be aware of the technological transformation that destructively affect their business models, and to be able to capture the opportunities to be created by this transformation, they need to develop their medium-to-long-term visions. To invest in those visions, they need a business environment in which they will not hesitate from taking risks.

Priority #5: Acceleration of Quality and Innovation Movement
The quality movement in Turkey began thanks to the initiative of the private sector and it has created awareness about the understanding of quality necessary so that firms can compete in the European market in the first years when Turkey signed the Customs Union Agreement. It should be reinforced by an innovation movement aiming to increase global competitive advantage, taking into account the structural transformation expected in the industry by accelerating the quality movement.

The quality and innovation movement should aim to increase the exporting motivations to the competitive foreign markets by developing the management practices and innovation skills of companies and raising public awareness about the manufacturing sector, as well as fostering a sense of pride in Turkish products and in Turkish technology.

A programme to increase the quality of working environments in OIZs should be developed, and in this scope, it should be encouraged to implement creative solutions to meet the expectations of white-collar and blue-collar employees, especially regarding problems such as mass transportation, the quality of social facilities, capacity of nurseries, etc., in OIZs. Special priority should be given to research the working environment-related expectations of the new generation born after 1990 that has grown up with the internet.

In addition to such practices as rewarding the performances of firms and sharing good practices, some programmes should be developed so that leading international experts in selected technologies are brought to Turkey for a period of six to 12 months, in co-operation with universities, to bring the global knowledge accumulation to Turkey.

Priority #6: Dissemination of access to advisory services
In some of the state subsidies, costs for consulting services are included in the expenses to be supported. Especially in the Turquality programme carried out by the Ministry of Economy, detailed analyses of the current situation of the company are carried out in co-operation with the authorised consultancy firms, and road maps and improvement projects for brand development are designed. Firms and industrial organisations state that this programme contributes to the increase in firms' export vision and skills. "Experience working with consultants" obtained through such a programme should be disseminated.

The executive development programme is also carried out within the scope of Turquality. The aim of this programme is for companies to keep up with the latest training developments, which will be given in co-operation with distinguished universities to managers of the supported companies and to integrate the acquired academic knowledge with business practices. The scale of the manager development programme should be moved beyond Turquality and developed in co-operation with the willing companies.

The Operational Programme for the Development of Human Resources in Firms should be established. Through this programme, projects are prepared in partnership with consulting firms, academic institutions and companies. The programme should provide co-financing for capacity building projects in priority issues to be identified (e.g., marketing, supply chain management, human resource management, team work, digital transformation, management of intergenerational differences, and improvement of working environment in workplaces).

Academic personnel at universities should be able to be employed in firms under temporary or flexible working conditions or to provide consultancy services without the contribution of a revolving fund.

Consultation Questions 3: Supporting the increase in companies' quality management (Questions 27-30)

27. Does the management quality of firms improve within its own dynamics through the challenges arising with the competition conditions? Does the state play a role in the improvement of the management quality of firms? If yes, what can this role be?
28. What should be the main elements, the scope and the actors of a quality and innovation movement aiming at increasing the motivations of firms for export in competitive foreign markets through the development of the management practices and innovation skills of firms?
29. What other horizontal elements that are improving the ecosystem, such as work environment quality, can be considered within the scope of a quality and innovation movement?
30. Is there a role the state can play regarding the development of the consulting sector and for the provision of consulting services of good quality to firms? If yes, what can this role be?

Facilitation of exit from market

If in-house dynamics (new technologies, operational productivity, etc.) is one way to improve TFP, then another way is the redistribution dynamics within the market. In other words, separating unproductive firms from the market and allocating resources (capital, employment) to more productive firms makes a positive contribution to TFP. One dimension of this process is to increase the share of high value-added sectors and activities in the economy and decrease the share of relatively low added value activities, which we call the structural transformation. Especially in the past 50 years, as the urbanisation process has accelerated, it has been an important structural transformation success that the weight of the agricultural sector in our country has decreased and the share of the services and industrial sectors has increased. Another dimension of this process is the reduction of the share of relatively less productive firms within each sector and the allocation of resources towards more productive firms.

The ease of exit will accelerate the creative destruction in the manufacturing industry and increase productivity. The contribution of a small number of exiting barriers to productivity in Asian countries is striking: companies that could not survive in the 1990s exited from the market and this contributed to the productivity by 19% in Taiwan, by 23% in Korea and by 39% in Indonesia. Exits from the market in Turkey between 1993 and 2000 yielded a return of 1.5% to the overall productivity on average per year.[6] The contribution of net market entrance dynamics to productivity increases was close to zero between 2004 and 2007, 2% in 2008-11 and negative in 2012-14 with -2%.[7] Therefore, in order to increase productivity in the manufacturing industry, policies should be followed to facilitate firm closing/bankruptcy transactions.

Factors such as attracting foreign direct investments and supporting innovative entrepreneurship ensure that highly productive firms enter the market; activating the bankruptcy system and the practices preventing the allocation of public support to firms with low productivity levels are accelerating the exiting process of unproductive companies from the market.

[6] *Ninth Development Plan, Specialisation Commission Report on Industrial Policies*

[7] *World Bank Information Note*

According to the World Bank's Doing Business Index 2017 results, Turkey ranks 69th while it ranks 126th in "resolving insolvency". The fact that Turkey is in such a poor position in this area suggests that a series of steps to facilitate the market exit process will have a positive impact on the increase in TFP.

The bureaucratic obstacles to establishing a business have been inadequate in reducing the barriers to exit from the market, although they were remedied by reforms in 2003. The closure of companies in Turkey still takes a longer time than in many countries. When we look at the indicators under the sub-title "resolving the bankruptcy" in the World Bank's Doing Business Index, 73 cents of every dollar are recovered during the bankruptcy process in OECD countries, while this rate is 38 in the European-Central Asian region but only 18.5 in Turkey. The average length of bankruptcy is 1.7 years in the OECD, 2.2 years in the Europe-Central Asia region and 4.5 years in our country. Due to the difficulty of the bankruptcy proceedings, many unproductive companies in the industry continue to exist instead of withdrawing from the market and leaving their place to more productive firms. This indicates that a number of steps regarding the speed and cost of bankruptcy proceedings can be evaluated within the TFP policy framework.

The approach of increasing the role of the interface structures in the implementation of the state support, which is proposed in the sixth part, can ensure that less public resources are allocated to firms with limited/no productivity improvement performance, thus contributing to making the market-exit dynamics healthier.

Priority #7: Facilitation of exit from market

In order to simplify and speed up the liquidation process, necessary amendments should be made in the Turkish Commercial Code and the Execution and Bankruptcy Law.

It is important to make necessary legislative amendments to solve the problems arising from the "bankruptcy postponement" system and to charge legal and criminal responsibilities against those who exploit this system and to ensure the healthier functioning of this system.

The capacity of the "Directorate of Execution and Bankruptcy Services" unit established in 2013 within the Ministry of Justice should be increased and the work of establishing, developing and activating the standards related to the audit procedures and principles of executive offices should be concluded.

In addition, with regard to the facilitation of exiting from the market, factors such as increasing the number of judges and judicial personnel, regulating the ethical principles of members of the judiciary in the light of universal criteria, speeding up the judicial process, increasing the accessibility to the judiciary, improving the execution offices and expertise mechanism and raising quality in legal education and training play significant roles.

Consultation Questions: Facilitation of exit from market (Question 31)

31. Do you agree that it is difficult in Turkey to close a firm whose economic activities need to cease? What should be done to facilitate the bankruptcy process?

2 Perfection of the ecosystems that contain initiatives with global competitiveness targets

If the manufacturing industry, which has been transformed from a low-tech structure to a medium-technology structure, accelerates the conversion to a high-tech structure, it will accelerate an increase in productivity. The increase of the share of high-productivity firms in the industrial structure depends on the technology and innovation ecosystem becoming available for this transformation. In recent years, important steps have been taken in this direction; in particular, the share of R&D activities in national income has exceeded 1%, and the number of R&D personnel has exceeded 122,000. The share of the private sector, which made only 20% of R&D expenditure in the 1990s, reached 50%. However, the number of success stories in the country based on innovation and/or high-tech among our production structure and exports is still limited. This high-tech export rate, which is about 20% in OECD countries, is still about 2% in Turkey.[8]

In terms of productivity levels, our leader firms and expectant-leaders should (i) expand their scales, (ii) increase their market share in global competition and (iii) open new markets. It is important to increase the number of such qualified firms and strengthen the value/supply chains. In line with this goal, there is a need for a perspective and a policy towards perfecting the elements of the ecosystem that contains the firms with growth potential and the will to grow.

The common feature of policies to be implemented in this area needs to be selectivity. The resources to be allocated under the scope of these policies should not be distributed equally across the private sector; they should be directed to the areas most likely to have a positive impact on the economy as a whole and to increase their productivity. The priority areas will be clarified as a result of the preparations for the 11th Development Plan. It is recommended to consider the following elements during the selection phase:

• **Public procurements.** Priority can be given to areas, which public procurements can use, that are open to development in the world economy. Areas highlighted in the 10th Development Plan such as health, energy and transportation may be the starting point; they can be elaborated as a result of analysis, and long-term road

[8] *Source: World Development Indicators of the World Bank; https://data.worldbank.org/indicator/TX.VAL.TECH.MF.ZS?locations=TR-OE*

maps can be prepared by taking into consideration the perspective of productivity increase. It is important that the local competencies and demand are at a certain level in the selected areas, but the global competitiveness perspective should be a common prerequisite. Targeting global competitiveness is vital for sustainable productivity growth.

• **Horizontal areas.** Priority should be given to horizontal areas that can accelerate the productivity growth in many sectors. Accelerating the acquisition of competencies in areas such as material technologies, informatics and robotic technologies will have a positive impact on TFP growth in the economy as a whole.

• **Intersection and application areas.** Priority should be given to areas where sectors and value chains intersect. For example, there can be important interactions between defence and medical, automotive and electronic, and apparel and furniture; as a result,, creative business models can emerge. By adopting multidisciplinary and interdisciplinary approaches, focusing on the high potential areas of application of specific technologies in our country can accelerate TFP growth. In areas such as smart cities, education, agriculture and health, important opportunities that can affect the manufacturing industry can be identified.

Within the scope of this policy area, it includes how the ecosystems in critical technologies and sectors can be developed with a strategic approach, as outlined above, and recommendations are presented as priorities and policy tools that can be used in this regard.

In the process of the implementation of the mentioned policies, it is envisaged that, in the process from the field selection to the firm selection, important tasks will be undertaken by the interface structures to be covered in the sixth part.

Strengthening and diversifying financial support mechanisms

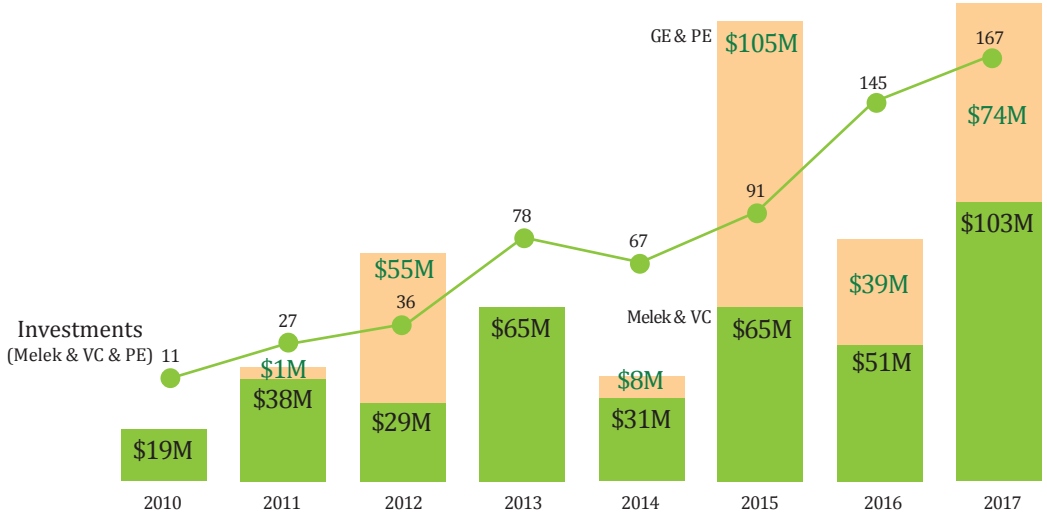
In Turkey, there is no serious problem for companies in the manufacturing industry to access working capital, while there are major constraints in accessing investment capital. The reasons supporting this include structural problems such as low domestic savings and dependence on foreign financing. Existing commercial banking services are inadequate for long-term and high-risk financing needs for entrepreneurs in particular with innovative business models and high technology.

In many countries, there are public-supported venture capital funds for early stage ventures and development banking opportunities for enterprises in the growth stage, whereas these tools are limited in Turkey.

Early stage venture capital is the most important element in supporting a fast-growing technology company in a country. Early stage investments can be classified as follows: (i) Seed stage: Companies that have not yet commercialised products but have high-value product and business ideas, (ii) Early stage: companies that have final products that have passed the prototype stage but that have not been able to obtain a positive turnover from the sales, iii) Early growth phase: companies that have reached a strong product/service position in the market and need additional financing to grow.

In the Global Competitiveness Index, Venture Capital sub-component, Turkey ranked 73rd in 2013, then declined to 93rd in 2016. Although the Turkey Investment Fund was established in 2016, it could not become operational. In 2016, the number of enterprises receiving early stage investment was 137 and the investment amount was realised as $70 million. In 2017, 167 enterprises received an investment of $174 million. In 2017, $8.2 billion was invested in the United Kingdom, $3.6 billion in Germany and $3.1 billion in France.

Figure 5: Early stage venture capital investments in Turkey, 2010-2017



Source: Startups.watch

Korea Venture Investment Corporation (KVIC), on the other hand, was founded in 2005 as a fund of funds and fund matching mechanism and has so far mediated 4,300 entrepreneurs receiving investments of $14 billion. 70% of these funds are directed to the manufacturing sector and 20% to the software sector (Çağlar, 2017).

Similarly, the asset quantity of the Korea Development Bank in 2016 was $191 billion, while the asset quantity of the Development Bank of Turkey is $2.1 billion. In all development-aiming banks in Turkey (Eximbank Provincial Bank, Development Bank, Industrial Development Bank), the total assets do not exceed 5% of the financial system (Çağlar, 2017). The German Development Bank (KfW), which was established in the 1950s, focused on the financing needs of large-scale companies in the first era of its establishment but later focused on the investment and project financing of SMEs (UNCTAD, 2016).

Beyond the various kinds of state aid for innovative and high-tech investments, there will be a focus on venture capital and project financing in the upcoming period. It is critical that the steps to be taken in this direction are co-ordinated with other policy priorities and national technological goals.

Priority #8: Supporting venture capital funds

The Medium Term Programme (2018-20) contains the target to "develop public support, credit guarantee and venture capital systems specific to this area in order to contribute to the commercialisation of R&D activities and the financing of innovation". In this context, the Turkey Investment Fund, whose legal framework was prepared in 2016, should become functional; it should act as a national ecosystem development platform.

The Turkey Investment Fund should implement a flexible and innovative strategy and take a leading role in the ecosystem to go beyond an investment platform; it should not be content with the fund managers coming to it, but attract fund managers showing the highest investment performance on a global scale and encourage them to establish funds with local partners in Turkey. In addition, the attention of both the global institutional investors and local institutional investors and wealthy families should be directed to venture capital.

Approaches should be developed to address the challenges of initiatives to increase the number of venture fund beneficiaries (deal flow), at the jumping-off stage, particularly Series A to Series B and Series C (See Box 2).

Priority should be given to the precautions, such as making the necessary legislative changes, in particular, the Capital Markets and the Commercial Code, facilitating market-exit procedures, eliminating uncertainties in regulations affecting business plans of the initiatives and improving perceptions for domestic technology products.

The establishment of funds to specialise in the areas to be determined in the 11th Development Plan should be encouraged. In the first place, considering the possibility that a deal flow will not occur that will provide a portfolio in accordance with the fund in a narrow area, incentive funds may be encouraged to invest in these areas, but only later; only the funds that specialise in these areas can be supported.

Box 2: Venture Capital Funds and Investment Stages

New entrepreneurs grow up with funding provided by venture capital investors at different stages. Funding usually takes place from being a partner to a certain part of the enterprise established by the entrepreneur. Funding stages are divided according to the level of maturity of initiatives. Funding begins with seed capital and continues with the A-B-C series.

At the seed stage, the business idea is adapted to the prototype/product and the market.

In the Series A stage, venture capital investors finance employees, market research and product/service development processes as partners to the initiative in order to spur the "seeds"; they ensure that products or services are scaled to various markets and a business plan is developed that will generate a long-term profit.

The aim of Series B stage investments is that the initiative gets a share in the market among the competitors and reaches a point where it makes a net profit and business development, sales, marketing etc. structures are developed within the corporate organisation.

At the Series C stage, investors invest capital to get much more return on a successful business. These funds can be in the form of putting the enterprise into new markets, buying another company and merging. Hedge funds, investment banks and private equity firms can be engaged for financing as the level of risk of company operations decreases.

Source: Investopedia

Priority #9: Developing project financing possibilities for innovative initiatives aimed at growing the global scale

Priority should be given to the implementation of the policy "Development Bank will be restructured to provide long-term funding for innovative and high value-added production investments in strategic industrial sectors" in the Medium Term Programme (2018-20).

At the heart of the Development Banking reform, the aim is to establish programmes for the development of long-term financing models in advanced technology and innovative fields. The scope of these programmes should include businesses that have been able to develop a prototype for a global need that has not yet been met or that has been insufficiently met, and that have been able to verify the innovative business model and reached a certain level of maturity. The main objective of these programmes should be the development in a quick and productive manner of functional products, real prototypes, product and test development by the businesses, passing through small-scale production, market testing, medium and large-scale production, marketing, distribution, creation of sales and after-sales support network, perception management and branding stages.

Effective use of Eximbank resources should be ensured for innovative entrepreneurs on a global scale and the use of the country's credit and guarantee programmes should be increased.

Another support mechanism that can be applied in this context is credit guarantee mechanisms that will support the borrowing of the enterprises receiving venture capital investment, to finance project financing. Specific credit guarantees given to such companies will ensure that the financing entry provided into the company by the venture capital fund is leveraged by debts. Thus, taking into account the productivity objective, it will ensure the consideration of the macro-economic balances through the selective use of the loan guarantee support.

Priority #10: Establishment of the Industrial Technology Award Fund for innovations that will meet the strategic needs of the country

A new incentive approach based on the award model should be introduced in financing projects that have the potential to accelerate TFP growth.[9] In this context, it is important to adopt approaches based on supporting platforms (electric vehicle platforms, etc.) to accelerate the change of doing and supporting R&D in the first

[9] *For the examples of structures similar to the industrial challenge fund, see: http://www.rcuk.ac.uk/funding/iscf/; https://www.darpa.mil/program/darpa-robotics-challenge*

place. In this approach, it is necessary to compete with companies and research institutions around specific critical platforms for government-designated targets. Under the scope of the reward, priority should be given to projects with a high diffusion effect, which will contribute to the development of strategic patents. These areas should contain selection criteria such as higher socio-economic impacts, higher market potential on a global scale, the ability to raise public awareness and local competencies reaching a certain level of maturity level, as well as meeting the mid- and long-term needs of our country.

In order to solve an important identified problem, the emergence of interdisciplinary structures can aim to encourage co-operation among different structures and areas of expertise such as large firms, small technology firms and research institutes that do not co-operate under normal conditions. Finding, receiving or improving technology can be defined as the responsibilities of those who develop the project, within the rules of the award. Firms that have passed the technical qualification during the invitation stage can be allocated some pre-financing, and the announced total prize can be shared among the companies meeting the criteria in the given time period.

In this context, some pre-competition consortium projects, which consist of qualified partners representing the critical mass in Turkey and aim to develop new, original knowledge that the industry can use (for emerging technologies that are at least three to five years away from the market), should be developed. Moreover, fair and common use of the produced information should be encouraged (SMEs, universities and research institutions benefiting free of charge, mandatory commercialisation within three years, etc.). In this context, the Pre-Competition Co-operation support programme whose legislation was prepared in the previous year should be made functional.

Consultation Questions 5: Strengthening and diversifying financial support mechanisms (Questions 32-33)

32. Are the priorities proposed for increasing the technological innovation-related entrepreneurship in the manufacturing industry sufficient? What other support mechanisms should be set up?
33. Is giving rewards an adequate policy tool to encourage innovations that will meet the strategic needs of the country? What other policy tools might be developed in this regard?

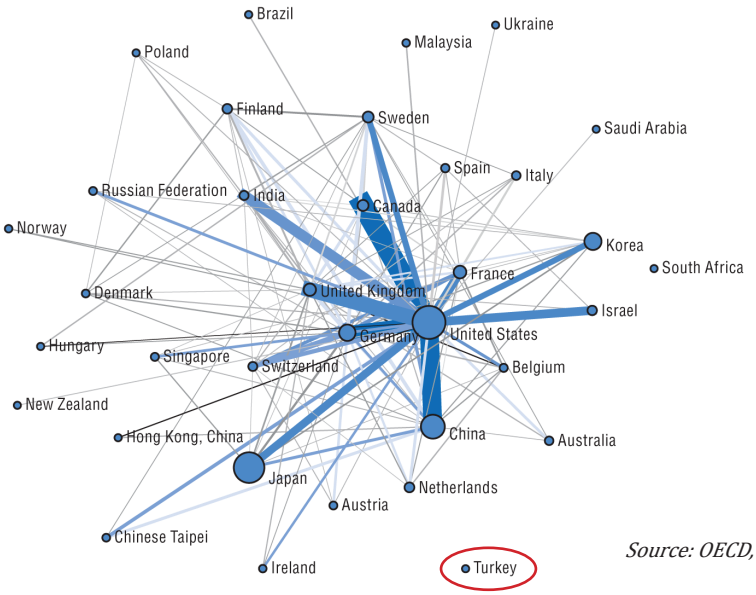
Development of marketing and networking competencies, strengthening the "Turkish technology" perception

As handled in the second part of this synthesis report, to enhance a company's productivity, factors such as how the company is positioned in the value chain, the way it integrates with global supply chains, the methods of accessing information and the long-term partnerships that can be established with other companies can be determinative. The said elements increase the importance of firms' marketing and networking competencies.

One of the ways to progress in the value chain is to strengthen the relationship between innovation activities and marketing activities. In the upcoming period, while the share of the private sector in R&D activities is reaching over 50%, the main objective should be to increase the economic productivity of the research conducted. As in many developing countries, the leading basic deficiency in the commercialisation in Turkey is the weakness of the bond between R&D activities and market needs determination/analysis. Due to this weakness, the economic benefits of many patents are limited. There is a lower risk of commercialisation of R&D activities to meet the demand arising from the market.

In these areas, our country is very disconnected from international networks (Figure 6). The human resource in the leading firms and leading-candidate firms and in the interfaces supporting them should be supported to take a more active role in international collaborations and networks. The closer monitoring of design, R&D, production and market trends and the development of proactive strategies at both the company level and ecosystem level will make an important contribution to TFP.

Figure 6: Network Map: International collaborations in patents related to Information Technologies, 2010-2012



Source: OECD, Patent Database, February 2015

The transition to a high-tech structure entails some paradigm shifts as well. One of these changes includes the development and improvement of the perception of technologies developed in our country. As in the past, making an effort for "Turkish technology", similar to the one made to improve the "Made in Turkey" perception at the stage of transition from low technology to medium technology, can also contribute positively to the acceleration of technological transformation processes and thus to the increase in TFP. During the focus group work and face-to-face interviews carried out under the scope of the TFP project, it has been determined that there is a strong belief that domestic technological skills are limited and problematic in large-scale firms and public purchasing agencies. It is emphasised that this has a negative impact on the performance of entrepreneurs operating in high-tech areas.

This problem also has an international dimension. It is important that entrepreneurs with innovative business models that develop high technology see the government lobbying support with them, so that they can get a share from

foreign markets, especially from public procurement. In this process, importance should be attached to increasing the "brand value" of our country on a global scale, and measures should be taken for the development of Turkey's brand value, which ranks 53rd out of 75 countries in the "Country Brand Index" study.[10] The perception of high quality products of foreign people for our country's products, the level of the demand to visit and study in our country and their perception about the quality of our infrastructure are determinative in increasing the country's brand value.

Priority #11: Developing marketing competencies

Marketing processes of branded products and services with high added value, that are based on R&D and/or that have innovative business model should be supported and awareness should be raised in this area. Within this scope, support mechanisms should be established to include the development and commercialisation activities of products oriented to international markets, especially the areas and sectors in priority as determined in the Development Plan, Medium Term Programme, Annual Programme and the decisions of the Science and Technology Higher Council.

For selected technology and value chains, there should be support for market entry studies for the target markets, general, sectoral trade delegations, procurement delegations, and fairs and projects. The number of firms that are R&D work-intensive and benefit from Turquality and brand support programmes should be increased and a branding and marketing support programme focusing on the needs of such innovative firms should be established.

In addition to country-based approaches to marketing, it is important to adopt approaches to the development of city-based strategies.

Direct access to distribution channels in foreign markets should be supported, especially by purchasing foreign companies and brands operating in high-tech sectors. Mechanisms for providing information, counselling and technical support in this regard should be made operational and their effectiveness should be enhanced.

[10] *http://www.futurebrand.com/uploads/CBI2014-5.pdf*

Priority #12: Strengthening of relationship networks (between national and international entrepreneurs, researchers, funders and public administrators)

With the impact of the lack of international links of our entrepreneurship ecosystem, the business models of new ventures are directed towards the local market, not the global one. R&D teams should be encouraged to closely follow global trends, market conditions and technology trends. Such environments and programmes should be prepared as are appropriate for R&D centres to establish closer relations with domestic and foreign funders, big technology companies, research institutions and one another. Mechanisms should be established to facilitate not only big-scale companies but also small-scale enterprises to follow the global trends more closely, and the development of long-term relationship networks should be supported.

International links to the entrepreneurship ecosystem should be developed. Entrepreneurs in the commercialisation phase should be encouraged to establish more and more effective communication and business relationships with actors in these markets by increasing the level of connections in international markets. The aim should be to increase the proportion of network-based incentives in R&D, and different engineering fields and competencies should be encouraged to establish consortiums and co-operate.

In order to introduce the actors abroad into the entrepreneurship ecosystem in Turkey, foreign early-stage funds should be encouraged to open offices in Turkey or become shareholders of domestic funds and foreign institutional investors should be encouraged to invest in the funds in Turkey. On the other hand, in parallel with the "Istanbul Finance Centre" works, Istanbul should be made a "hub" not only in Turkey but also for entrepreneurs in the Balkans, the Caucasus, the Middle East, North Africa and Central Asia. To this end, the "Turkuaz Card" application, which was commissioned in March 2017, should be facilitated and disseminated to offer the ease of working permission for entrepreneurial youth and qualified human resources coming from other countries; the necessary promotion campaigns should be carried out. In particular, a programme should be developed to support the competent personnel with languages such as Arabic and Russian, which will serve the consumer in the e-commerce process.

It is recommended that the government undertake some of the costs related with co-operation developing activities and with the relations to be sustained among OIZs, TDZs and university research institutions, within a certain programme. Public support for capacity building processes (formation of teams capable of providing high added value services) in these institutions is important.

High-achieving undergraduate and graduate students should be encouraged to work in start-up SMEs in order to speed up innovation. Academic staff in universities should be encouraged to take part in research projects in the private sector with one-to-two-year leave programmes (sabbatical).

It is recommended that, in co-operation with universities, a programme is developed that will ensure that leading international experts in the selected technologies are invited to Turkey for a period of six to 12 months, that their research in the interfaces is supported and that will allow interaction with managers of leading companies that fall within their areas of interests. It would be appropriate if the financing of this programme be shared by beneficiary companies, interfaces and the public.

White-collar employees and entrepreneurs invested in the companies should be encouraged to participate in domestic or abroad qualified graduate and doctoral programmes, in short-term (one month to one year) trainings and capacity building/research programmes to develop their knowledge and skills.

Collaborations and experience sharing programmes between implementing institutions and organisations should be strengthened and more systematic.

Priority #13: Strengthening the perception of Turkish technology and increasing its brand value

The following steps are recommended to improve the domestic perception:

- Expand the scope of technology awards to increase visibility
- Carry out work to document and disseminate success stories through case studies
- Conduct network creating and develop activities to strengthen the ties between research laboratories, R&D centres, TDZs, public institutions and companies

The following steps are recommended to improve the perception abroad:

• Carry out promotional, information and capacity building efforts to include more technology companies in the Brand Support and Turquality programme; adapt the current support mechanisms to the branding needs of technology companies
• Support the integration of clusters around specific technologies, especially in technology development zones with critical mass, with major technology centres abroad
• Trade advisors in our overseas missions need to be informed about the capacities of technology firms in our country
• Prioritise steps towards the objective of developing the manufacturing industry's position in the global value chains, in our international relations and in the diplomacy area
• Give priority to areas such as embedded software, the internet of things, and cloud applications for SMEs that will constitute a ground for the clustering especially in Turkey's broad industrial information technology industry

By means of these investments, resources should be provided so that the mentioned sectors can develop in our country, and a "demonstration effect" should be established in the eyes of global investors to show that these investments can be made in Turkey.

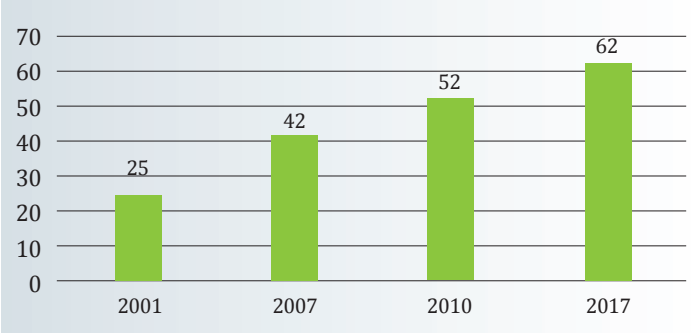
Consultation Questions 6: Development of marketing and networking competencies, strengthening the "Turkish technology" perception (Questions 34-36)

34. What lessons have you learnt from your business experiences in the development of city-based strategies in addition to the country-based strategies in product development for international markets?
35. Which actors do you find beneficial in the development of networking at home and abroad? What roles can the state undertake in this area?
36. How do you consider the domestic and foreign perceptions about Turkish technology and Turkish brands? Are the recommendations listed here for the development of perceptions sufficient? What other measures can be taken?

Making the agenda of domestication (and nationalisation) productivity-focused

Having started with the foundation of the Undersecretariat for Defence Industries in 1985, the perspective to develop domestic production capabilities through public procurements in the field of defence has been considerably achieved. In this process that first started with the procurement of primary equipment (in the 1980s), the joint production phase first came into play with global players (in the 1990s) and then, it was focused on partial design and fundamental platforms (in the 2000s), after which it has recently been entered into the process of unique design and domestic production. The next objective is the full domestication of primary and advanced technologies. In this regard, domestic products are defined as "products that are produced within the country and whose design, patent and international intellectual property rights belong to foreign agencies or institutions" (for example, car production in our country), whereas national products can be defined as "products that are produced either within the country or abroad and whose design, patent and international intellectual property rights belong to domestic agencies or institutions" (for example, white goods production in our country).

Figure 7: Domestication Rate of the Defense Industry



Note: Domestication Rate of the Defence Industry shows what percentage of the public procurements in the field of defence in a country is met utilising the products produced within the country.

Source: Undersecretariat for Defense Industries

In the phase of preparing the 10th Development Plan, how to apply the experience in question into fields other than defence has become an important area for debate. Both the developments and achievements experienced in the defence industry and the fact that most countries have started to reuse their more efficient industrial policies after the 2008 Global Financial Crisis increase the importance of domestication policies. Although the rules titled the public procurements of the World Trade Organisation (WTO), EU Customs Union and EU Acquis restrict domestication programmes, the bindingness of such rules under new conditions shaped after the global crisis is gradually decreasing. Only three of the 117 different domestication programmes that can be identified around the world are included in the WTO's enforcement mechanism (PIIE, 2013).

As a repercussion of these developments, the 10th Development Plan includes the following policy: "Public procurements will be used as an efficient tool to increase the innovation and green production capacities of domestic firms. In this context, the capacity to prepare and assess quality tender specifications will be developed, and examples of good practices will be made widely-used and promoted in public." In addition, one of the 25 Prioritised Transformation Programmes is the "Programme for Technology Development and Domestic Production Through Public Procurement". Then, a series of programmes took place, in particular, the Industrial Co-operation Programme, the foundation of the Health Industries Steering Committee and the introduction of the Renewable Energy Law. The main objective here is to drive the budget for annual public procurements, which cost around $50 billion, making use of not only the minimum cost perspective but also the objectives to develop domestic industry and increase technological competencies. The technology transfer in public procurements, especially in the fields of health, transportation and energy, plays an important role in accelerating innovation and domestication processes.

There is a series of factors that make the feasibility of the approaches applicable to the defence industry difficult for other industries. The centralised conduction of public procurements in the defence industry makes the orchestration among market players more feasible. The processes of concept and prototype development and validation are carried out in co-ordination due to the small number of players on the procurement side and thus, guidance is ensured. Moreover, the fact that national security concerns are at the forefront in such processes naturally pushes elements such as cost, productivity, etc. into the background.

Therefore, the domestication programmes, which are gradually becoming one of the most critical tools of the industrial policy, pose a risk in that they may not contribute to the increase in TFP and beyond this, may have an impact on them. The management of this risk and turning it into a gain in terms of TFP should be one of the fundamental elements of the TFP policy framework.

Priority #14: Making the agenda of domestication productivity-focused

The prediction that domestication-focused industrial policies will be implemented more and more in the next period makes an approach that will increase the positive effects of such policies on TFP compulsory.

The public procurement policy (see Box 3) included in the Medium-Term Programme (2018-20) should be prioritised, along with the TFP perspective.

Box 3: Public Procurement Policy in the Medium-Term Programme (2018-20)

Public procurements will be used for the investments that will contribute to R&D and innovative activities and encourage domestication and technology transfer. In this regard:

- Long-term procurement plans will be prepared for public procurements and joint procurements will be made possible among institutions.
- The pharmaceutical and medical device industry, rail system and airway vehicles, defence systems, energy equipment, information and communication systems will be prioritised.
- New products will be prioritised in the procurements of the State Supply Office (DMO) and TOKI projects

Source: MTP 2018-2010, Page 53

It is recommended that the following principles are adopted to increase productivity effects when carrying out these policies, and that steps to make these principles operational are taken:

• It should be ensured that the projects within the framework of technical support are constructed with a global vision taking into account global market dynamics and demand conditions as much as the priority of import substitution in products to be included in the domestication programme; co-ordination with project-based incentive mechanism will be of great importance in the investments mentioned.

• A long-term perspective should be adopted for the design, implementation, monitoring and assessment of programmes; an approach consisting of development phases and competency-building steps should be adopted as in the development of the defence industry.

• Priority should be given to the public development of human resources that could define the characteristics of products and services to be purchased by the public, and would have a global perspective on innovation, productivity and technology; in this regard, capacity-building programmes should be created.

• Domestication practices should focus on developing domestic competencies. In this context, complementary measures should be developed not only for individual firms but also for the general environment; an approach that focuses on market malfunction and co-ordination problems should be adopted. The decision to generalise practices should depend on the existence of suppliers in the relevant field; beyond compulsory domestication, focus should be given to accelerating

domestic productivity increases and strengthening competencies. For example, priority may be given to the development of human resources that could integrate different technologies, especially system engineers.

• Priority should be given to creating demand for technologies that could be produced domestically as well as for public procurements; in this regard, arrangements and support mechanisms should be developed dynamically in consultation with the producers of technology. For example, arrangements concerning structuring and public works may be used as a tool in collaboration with municipalities in order to increase the use of composite materials in the construction sector.

• A healthy and constructive dialogue environment should be ensured between the public and private sectors. Domestication and nationalisation criteria should be set out in a way to be adopted and internalised by private sector players.

• Priority should be given not only to tender cost but also to "total procurement cost" in public procurements to guarantee the positive reflection of programmes on production quality.

• Encouraging the use of domestic advanced materials in public procurements, especially in the fields of railway, airway, underground carriage and wind turbines, may considerably contribute to increasing the total factor productivity in our country.

• With reference to the fact that the process of domestication is not a short-term race but a long-term marathon, efficient consultation processes should be developed with international firms. When carrying out such consultation processes, a comparative bargaining framework with the Eastern European and Middle Eastern countries, which could be competitors to our country in these fields, should be prepared taking into account Turkey's bargaining power and with which products it can bargain.

Consultation Questions 7: Making the agenda of domestication (and nationalisation) productivity-focused (Questions 37-39)

37. What products or product groups could be put on the agenda of domestic production?
38. What could be done to use public procurements more efficiently in this area?
39. Which policy tools could be used along with public procurements to encourage domestic production? How?

3 Interface Approach for the Efficient Implementation of TFP Policies

In recent years, a great number of support programmes and implementation tools have come into play in order to increase the high value-added production and exports of firms in our country. (see Box 4) The main programmes and tools within this ecosystem include R&D support, research infrastructures, branding support, cluster structures and cluster support, UR-GE support, the Turkish Investment Fund, technology development regions, technology transfer offices, organised industrial zones, the Undersecretariat for Defence Industries (UDI) and development banking with decades of experience in implementation. Despite all these support systems and practices, the exportation of high-technology products has not yet reached the desired level; the economic value triggered by innovation and productivity outcomes have remained limited.

In addition to cost and quality, speed and readiness gain importance due to the exponential growth in many sectors. Turkey has a risk of falling behind in terms of these factors. Turkey has a large amount of infrastructure and tools required to increase its high-technology production and exportation, or the need for infrastructure and tools has been identified. Nevertheless, there are shortcomings with regards to i) co-ordination among policies, programmes and implementation tools in the interests, responsibilities and jurisdiction of different ministries, ii) assessment of implementation results and iii) focusing on the selection of technology, themes and firms.

• Ranking 53rd among 137 countries in the World Economic Forum's Global Competitiveness Index Report 2017-18, Turkey ranks 74th in the category of "innovation capacity" and displays a performance that is deteriorating year by year (However, Turkey ranked 47th among 125 countries in 2006).

• In terms of the sub-components of the above-mentioned index, Turkey ranks 100th, 69th, 66th, 49th, 39th and 64th among 137 countries in the "Quality of Research Institutions" sub-component, in the R&D expenditures for the private sector, co-operation between universities and industries, number of engineers and scientists, patent applications and high-technology public procurements, respectively.

• According to the results of the Global Innovation Index 2017 published by Cornell University, INSEAD and WIPO, Turkey ranks 43rd among 127 countries (Turkey ranked 45th among 107 countries in 2007).

• In the World Management Survey of the Centre for Economic Performance (LSE), which measures the management qualities of firms, Turkey ranks 21st among 35 countries selected according to the average value of the management quality of firms in the manufacturing industry in the 2013-14 period.

The general trend in designing policies, especially government support, is to try to cover all firms with interventions in firms, thus taking the average of firms as a base. Each year, on average, 42,000 firms are supported by the Small and Medium Enterprises Development Organisation (KOSGEB); 3,000 firms are provided with R&D support by the Scientific and Technological Research Council of Turkey (TUBITAK) and the Technology and Innovation Funding Programmes Directorate (TEYDEB); 4,500 firms are provided with investment incentive certificates and 3,000 firms are provided with expo support by the Ministry of Economy. The attitude adopted by government support to cover all firms on an equal footing hampers differentiating the productivity and value-added performances of firms in the market. Therefore, policy interventions fail to serve as a tool to encourage and accelerate an increase in productivity. On the other hand, the centralised management attempts to remain within the policy implementations and fails to sufficiently concentrate on its cycle of transferring/sharing its implementation authority, monitoring and assessing its policy results and taking measures.

The evaluations of firms about the current state aids have been compiled through the thematic and sectoral workshops as well as the in-depth interviews. These evaluations generally focus on the mechanisms through which state aid is provided, particularly making the system leaner and trust-based, as opposed to placing the emphasis on a high risk of abuse. Based on the findings, firms request that (i) state aid is better aligned with productivity performance of firms, (ii) firm-level differences should be better accounted for through increased flexibility and (iii) evaluation mechanisms should be in place. All these factors, which imply a revamp of state aid schemes in Turkey, require redefining business-government relations in line with the requirements of the 21st century. These factors also necessitate the establishment of new "interface structures" that would focus on effective programme implementation on behalf of the government. Such interfaces could focus on programmes that are designed in line with the strategic priorities of the 11th Development Plan and enhance TFP growth both at the ecosystem and firm level.

The implementation of the TFP policy framework should focus on the interventions to be conducted on pioneer and candidate pioneer firms. The government should make preferences utilising transparent, objective and professional criteria in order to achieve its objectives concerning an increase in TFP; structures in compliance with the principles that would bring continuity to these preferences in the long term should be created, or existing structures should be transformed. In this context, interface structures that i) ensure the most required, efficient and productive use of government support by pioneer and candidate pioneer firms and the government and ii) take initiatives with regards to matters that require mutual action are needed. Such interface structures, the design principles of which are given below in detail, should aim to redefine the relationship between the government and firms according to the needs of the 21st century and reflect the effects of government support on the desired TFP results.

Box 4: Government Support and Expectations on the Implementation of Government Support

Firms expressed their various demands and expectations in the thematic and sectoral work and in-depth interviews carried out within the framework of the project. Providing inputs for the TFP policy framework, these recommendations are summarised in headings for the direct support interventions that will ensure total factor productivity and for the interventions that will ensure an environment suitable for productivity.

- Government support and the application processes should be plain and simple.
- Government support should not be based on the assumption that the beneficiary will exploit this, but on trust.
- Government support should be associated with productivity performance.
- Government support should be flexible in a way to be managed in accordance with the firm's desires.
- Support should have a long-term perspective; the firm should be selected by anticipating the estimated effects of the support.
- The validity period of support should be determined; government interventions on the incentives granted should be foreseeable.
- The type of firms to be supported should not be determined according to inputs such as turnover and number of employees, but according to the objectives, effects or outcomes.
- Solution partnerships should be established with regards to consultancy on support programmes.
- Effects regarding the outcome of support should be evaluated.
- Cash support and tax deductions should be useable within the same support at different intensities.
- A good application for support should not be rejected just because it is not suitable for the conditions of a certain programme; flexible solutions should be found for support.
- Investments to be made by firms in critical technological areas such as automation, software and special machinery equipment should be supported in a way to include the integration of these investments in business processes.
- In addition to tax deductions and cash support, the government should make it obvious in its approach and attitudes towards firms that it supports the private sector.

Government support in practice is monitored by the General Directorate of Government Support of the Undersecretariat of Treasury, and the list of legislations constituting the basis for government support is published. A list of government support, which directly concerns the manufacturing industry and has taken into account the announcements made by the Undersecretariat of Treasury, is presented below.

MINISTRY OF SCIENCE, INDUSTRY AND TECHNOLOGY

- Supporting Industrial Dissertations Projects
- Supporting Research, Development and Design Activities
- Supporting Technological Products Promotion and Marketing
- Technological Products Investment Support Programme
- Technological Development Zones
- Organised Industrial Zones
- Clustering Support Programme

MINISTRY OF ECONOMY

- Government Support in Investments
- Project-Based Government Aid for Investments
- Attraction Centres Programme
- Government Aid for Exportation
  - o Employment Aid
  - o Branding of Turkish Products Abroad and Development of "Made in Turkey" Image and TURQUALITY
  - o Design Support
  - o Supporting Overseas Department, Branding and Promotional Activities
  - o International Competitiveness Development Support
  - o Market Research and Market Entry Support
  - o Sectoral International Domestic Expo Participation Support
- Supporting Market Entry Documents
- Export Refund Support in Products
- International Expo Participation Support
- Government Support for Technical Consultancy Services
- Supporting Foreign Exchange Trade Services
- Branding Support for Foreign Exchange Service Sectors
- Inward Processing Regime
- Free Zones

MINISTRY OF ENERGY AND NATURAL RESOURCES

- Supporting Projects for Improving Energy Productivity in Industrial Enterprises
- Research and Development Projects Support Programme for the Energy Sector (ENAR)

MINISTRY OF DEVELOPMENT

- Development Agencies Project and Activity Support
  - o Interest Support
  - o Credit Support Without Interest
  - o Direct Financing Support

MINISTRY OF TRANSPORT, MARITIME AND COMMUNICATIONS

- Research and Development Projects Support

CREDIT GUARANTEE FUND (KGF)

- Credit Guarantee Support

TECHNOLOGY DEVELOPMENT FOUNDATION OF TURKEY

- Support for Environment Projects
- Advanced Technology Projects Support
- Technology Development Projects Support
- Support for Commercialisation Projects

SCIENTIFIC AND TECHNOLOGICAL RESEARCH COUNCIL OF TURKEY (TÜBİTAK)

- Research Support Programmes
  - o Support Programme for Increasing the R&D Potential of Universities
  - o Scientific and Technological Research Projects Support Programme
  - o Fast Support Programme
  - o R&D Projects Support Programme for Prioritised Areas
  - o National New Ideas and Products Research Support Programme

- o The Participation Programme for International Scientific Research Projects (UBAP)
- o Rules and Procedures for the R&D Initial Projects Support Programme
- o National Career Development Programme for Young Researchers (Career Programme)
- European Union's Framework Programme
- Public Institutions Research and Development Projects Support Programme
- TÜBİTAK's Technology and Innovation Support Programmes
  - o Industrial Research Technology Development and Innovation Projects Support Programme
  - o Support Programme for Project Markets
  - o University-Industry Collaboration Support Programme
  - o SME R&D Initial Support Programme
  - o International Industrial R&D Projects Support Programme
  - o Research Technology Development and Innovation Support Programme for Prioritised Areas
  - o Entrepreneurship Progressive Support Programme
  - o Technology Transfer Offices Support Programme
  - o Venture Capital Support Programme
  - o Support Programme for Pioneer R&D Laboratories
  - o Capacity Building Support for Innovative Entrepreneurship Areas
  - o TÜBİTAK's Patent Support Programme

SMALL AND MEDIUM ENTERPRISES DEVELOPMENT ORGANISATION OF TURKEY (KOSGEB)

- KOSGEB Support Programmes
  - o General Support Programme
  - o Entrepreneurship Support Programme
  - o SME Projects Support Programme
  - o Thematic Support Programme
  - o Co-operation Collaboration Support Programme
  - o Research Development Innovation and Industrial Application Support Programmes
  - o Emerging Companies Market SME Support Programme
  - o International Accelerator Support Programme
  - o SME Development Support Programme
  - o Technological Product Promotion and Marketing Support Programme
  - o SME Technological Product Investment Support Programme
  - o Strategic Product Support Programme
- KOSGEB SME Credit Interest Support

EXPORT CREDIT BANK OF TURKEY

- Export Credits, Customer Support and Credit Insurance

CENTRAL FINANCE AND CONTRACTS UNIT (CFCU)

- Support for Instruments for Pre-Accession Assistance (IPA I and I)

Principles for designing interfaces in government interventions towards pioneer and candidate pioneer firms

It is recommended that R&D and firm support is restructured, programme-based approaches are adopted and a series of design principles are taken into account in accordance with the synthesis of the examples of good practices in technological transformation and the increase in TFP. In this context, interface structures that could undertake responsibility in the phase of policy implementation would redefine the relationship between the government and firms on the basis of trust

and development, and would support not only individual firms, but also the value chain and ecosystem should be made operational.

Such interface structures should be constructed so as not to undertake one single function but different functions and focus on different intervention types. Different technological priorities and value chains will require different interface structures; it is therefore of great importance to ensure variety in the system. Some examples of the responsibilities that can be undertaken by the recommended interface structures are given below:

• **Increasing inputs for technology and innovation:** R&D grants and tax incentives; public funding for venture capital; programme development for fixing shortcomings with regards to the market and system; and decreasing the risk of R&D activities

• **Improving non-financial (skills, expertise) competencies:** Carrying out joint research projects; providing technological consultancy services; the use of intellectual property; providing technical support services; attracting highly-qualified migrants; and carrying out mobility programmes

• **Focusing on developing and strengthening ecosystems:** Carrying out work to develop new sectors or technologies (green technologies, biotechnology, nanotechnology, etc.); and creating support mechanisms for clustering, relationship networks, R&D joint ventures, technology transfer offices (TTOs) and incubators

• **Improving framework conditions:** Ensuring improvements on investment and business environments, and implementing new policies and programmes in order for the innovation ecosystem to function more efficiently utilising an experimental approach

• **Developing duties, discourse and preparation:** Focusing on work that attempts to resolve big social and economic problems and aims for a radical change rather than slow improvements (defence, energy, environment, etc.); carrying out vision and horizon works; and preparing technology road maps

• **Disseminating information and innovation:** Carrying out work to improve the fundamental skills of firms, improving management quality and improving human resources management (digital transformation, branding and marketing skills, etc.)

Interfaces can be considered as mechanisms that determine the government intervention towards pioneer firms or candidate pioneer firms and act in accordance with the principles defined in line with the TFP policy framework. They can be any legal entity (fund, association, corporation, etc.) that undertakes a defined mission depending on a contract, as well as existing public entities or private entities. The aim should be that such structures have at least the following qualifications:

• **Qualified personnel employment.** They must be the structures that go beyond what is written in the legislation, "concern themselves" with the mission assigned to them and have the competency to develop creative solutions to the relevant problems. It is therefore necessary to create highly qualified teams that can learn through trial and error, take risks and canalise outcomes to the areas with future potentials.

• **Performance-based work.** The performances of interfaces should be monitored on the basis of the programmes they carry out and the effects of those programmes. Moreover, the performances of interfaces should be evaluated. A competitive environment should be ensured, and high performance should be rewarded in the process of accessing public funding resources by interfaces.

• **Sustainable financing.** Interfaces should have their own budget and incomes, performance-based funding, tax exemptions and exceptions. Moreover, their capacities to manage funding and portfolio and make investments when required should be developed.

• **"High-frequency" relationship with pioneer and candidate pioneer firms.** Attention should be paid to carrying out all kinds of interventions towards firms on the basis of information concerning the firm's ecosystem and productivity potential. Interfaces should not serve as structures that will provide firms with funding only once and then end their relationship with the firms, but as mechanisms that will get to know firms closely and can continuously monitor and evaluate their performances. They should be the structures that contribute to turning grants and support into tools rather than objectives, and carry out support programmes for a certain number of groups of firms in a value chain relationship.

• **Co-ordination function.** Interfaces should be able to conduct activities such as building joint infrastructure, establishing companies, becoming partners to other companies or creating platforms, developing their relationship networks and

supporting their joint ventures in order to take initiatives on matters requiring co-ordination and joint action. They should be able to ensure joint action and co-ordination required by the programme conducted between the government and firms, and to build trust on both sides in this regard rather than being a representative or lobbying institution that advocates for the common interests of firms of a certain type or in a certain sector before the government. Interfaces should be able to exchange information and collaborate not only with the actors within their scope of responsibility but also with other interfaces; they should be able to become a part of a relationship network when required, and act as the centre of a network in some cases. In this context, priority should be given to joining international networks in particular.

• **Spatial network.** Interfaces may be at a national, regional or local level. In addition, they should be able to see the advantages of spatial scale and clusterings, and the dynamics of urban economies. Organised industrial zones (OIZs), trade and industry chambers (TICs) and development agencies that provide services with a certain geographical limitation may collaborate with the interfaces that provide services independently from locations as well as undertaking some interface roles.

Apart from the above-mentioned fundamental qualifications, adopting a series of principles in designing the programmes to be implemented by such interface structures may accelerate the restructuring process of the existing incentive system. In the next period, it will be useful for the programmes to be carried out through interfaces to meet the following criteria:

• Differentiating the roles of "programme owner" (resource provider) and "programme co-ordinator" (service provider) within the system; ensuring performance-based management and monitorability so as to facilitate the impact assessment of support channels

• Allowing the expiration terms of some critical programmes to be extended in terms of technology development

• Making the monitoring of support, the content, the amount of the support and information about beneficiaries transparent

• Constructing programmes in which risk is shared publicly (public bail, temporary status of State Economic Enterprise (SEE), automatic privatisation, etc.)

• Adaptability of interventions according to the needs of individual firms, the ability of support to resolve the unique problems experienced by firms, continuous monitoring of the changing needs of firms and developing measures in this regard, close monitoring of firms for project financing and mentoring (development banking and funding, etc.)
• Increasing awareness with regards to which steps should be taken to increase the productivity of firms; the ability to design the support to be provided to the firm within such needs

• An holistic approach towards technological advancement; support focuses not only on the solution of technical problems, but also on the required administrative, organisational and technological changes; and increasing capacity on matters such as the product design of firms that intensively work on R&D in particular, product diversification, branding, marketing and promotion

• Support to increase the use of technology includes different elements (information sharing, workshops, demonstrations, training, network activities, technical support); the elements to be focused on are provided if firms fail to provide them under normal market conditions and they provide considerable added value to firms

• The support granted to firms is not only limited by the knowledge of co-ordinators; help is received from external experts as much as possible

• The ability to respond to the request for support made by firms within the shortest time possible; application processes are simple and can be quickly taken into the scope of support; decreasing the level of bureaucracy in the application and implementation processes; focusing more on outcomes rather than inputs; and punishing infraction rather than failure in the use of support

• Programmes are both sensitive to global market dynamics and have a perspective on how to transform domestic competencies and skills

Although each programme or institution implementing it should be evaluated within their own unique context and conditions, it is possible to learn from the examples of international practices with regards to the design of interfaces. In Annex-1, a series of example countries is examined in order to contribute to the design of interface structures in Turkey. Some examples for the potential programmes that can be developed in Turkey are given in Box 5 below.

Box 5: Some examples for the potential scope of activities/programmes of interfaces

- **Automotive Test Centres.** There are 71 different directives that determine the market entry process of a product in the automotive sector. Compliance with these directives and manufacturing competence must be tested. While big players in the main industry may assume the costs of testing themselves, it is important that small-sized suppliers are supported in this regard so that their access to value chains can be increased. Interfaces to resolve externalities and co-ordination problems in this field may be supported (for example, Istanbul Technical University's Automotive Technologies Research & Development Company [OTAM]).

- **Technology Support Company.** In order to extend the model of the Undersecretariat for Defense Industries specifically for some strategic sectors, an interface can be established that would use public funding but have a minimum level of bureaucracy, and act with a private sector rationale; conduct technology audits for the critical industries for which they are responsible; closely monitor and assess the market developments around the world (for example, the technologies in which investments have been recently made using venture capital in the USA) and the competencies in Turkey; assume the function of enriching the content of information of strategic decisions to be made in this regard may be built. This interface may also assume the function of carrying out appraisal analyses and feasibility audits of the strategic projects that come from the private sector to the public sector. This interface may be complementary for the contribution of the project-based incentive system to increase.

- **Production Technologies Centres.** Platforms can be set up where good practices can be shared about "Digital Conversion in the Industry", digital conversion performances and impact analyzes of the companies can be performed, the related contact persons in the companies will be introduced to each other, and innovations in production technologies can be demonstrated.. In these interfaces, programmes may be carried out to do with the integration of IoT solutions supporting services such as interoperability tests and developing IoT products and services. These programmes may focus on the opportunities to observe environments, in which products and services in some of these programmes will be seen to operate together, and to trigger new initiatives. Big data and analytical programmes may be carried out in pilot firms/regions/sectors and in collaboration with industrial zones. Among these programs, the successful ones can be disseminated later on; specialized interfaces.

- **Pilot programme on promoting the use of advanced materials.** The infrastructure of laboratories must be strengthened to increase the use of advanced materials. In order to use a new material in any field, detailed measuring of the strength values of materials is a prerequisite. For example, 3,500 to 7,000 tests must be conducted for a new material to be used in an aeroplane, and design values must be developed according to these tests. Establishing laboratories in which these tests can be carried out and supporting the human resources required to conduct such tests may have a critical effect on productivity. An interface to assume such tasks may be created. This interface can perform raw material diplomacy for critical materials, and function with regards to the security of raw material supply (rare earth minerals, etc.) in case its capacity is built in this regard.

Fundamental steps for transition to interfaces

1) Selecting the areas where interfaces will be built is a matter of priority in the process of creating interfaces. Interfaces must be first created in the following areas so that their accelerating and transforming effects will be effective. In this regard, the 11th Development Plan should be provide the guidelines. These are the four critical area groups:

• **Public procurements.** Priority may be given to areas in which public procurements can be used and which are open to development in the world economy. Areas indicated in the 10th Development Plan such as health, energy and transportation may be a starting point. They can be examined by conducting detailed analyses and long-term roadmaps can be prepared taking into account the perspective on productivity increases. It is important that in the selected areas the domestic competencies and demand are at a certain level; however, global competitiveness perspective should be the common prerequisite. In order for productivity increases to be sustainable, it is of vital importance to aim for global competitiveness.

• **Horizontal areas.** Horizontal areas that can accelerate the productivity increases in many sectors should be prioritised. Accelerating the acquisition of competencies in areas such as material technologies, informatics and robotic technologies will have a positive effect on the TFP increase throughout the whole economy.

• **Overlapping and implementation areas.** Areas in which sectors and value chains overlap should also be prioritised. For example, important interactions take place between defence and health, automotive and electronics, ready-made clothing and furniture; as a result, creative business models may be developed. Adopting multidisciplinary and interdisciplinary approaches and focusing on implementation areas of some technologies in Turkey with a high potential may accelerate the increase in TFP. Important areas of opportunity, such as with smart cities, education, agriculture and health, that may influence the manufacturing industry may be defined.

2) Before interfaces come into play, it is important that the efficiency, effects and results of the existing innovation and productivity policies, especially government support are analysed. Today, there are significant problems experienced in measuring, monitoring and assessing the effects of government support, and in applying the necessary policy lessons and designing more efficient government

support. It is necessary to broaden the "post-practice evaluation" culture in public administration. In parallel with this, increasing transparency in processes concerning the transfer of public funds will be useful. The policy on "enabling decision and support processes of R&D and innovation system; reconstructing institutional structures; reconstructing the Scientific and Technological Research Council of Turkey (TÜBİTAK) and its institutes in this regard; performing necessary improvements in programmes by regularly carrying out impact analyses with regards to the R&D support programmes" included in the Medium-Term Programme (2018-20) should be immediately implemented.

3) A series of design principles and elements recommended to be taken into account when determining governance with regards to interfaces is given below:

a. Perspective change in public intervention towards firms. In policy implementation, the public sector traditionally focuses on inputs and outputs. In order to develop efficient practices, the focus must shift from inputs-outputs to results and effects. In this regard, interfaces must be constructed with a perspective of five years, and decisions such as closing, continuing, growing or downsizing must be made according to the obtained results and effects.

b. Accountability. The construction of accountability mechanisms is of great importance for the continuity of interfaces. In this context, the concepts of "public interest" and "public loss" should be defined with an innovative and realistic perspective and evaluated within the process. Concepts such as complementarity/additionality and economic rate of return will allow the expansion of the definition of "public interest". As interfaces use more funding from the government budget, this definition narrows down and thus, the risk of making a loss cannot be borne. The success of the structures that cannot take risks in the field of advanced technologies will be extremely limited.

c. Implementation and budget term. Since budgeting is an activity performed annually in public institutions, thinking and action terms inevitably are narrower down on matters that require a long-term perspective such as technology and productivity. It will be useful to design interfaces as off-budget tools in order to resolve this problem.

d. Determining the right assignment. Any specific problem to be resolved for each interface must be clearly defined. The type of companies and institutions that

will need support to resolve these problems must be determined. The structure of governance must be constructed in a unique and realistic manner, taking into account the characteristics of these institutions.

e. Selecting the right governance structure and the necessary tools and skills. A crucial question is deciding at what level autonomy is required to achieve a mission. It is also important to select the resources, skills and tool sets required to achieve goals. In particular, support tools should be defined, at what geographic level the interface will work should be clarified.

f. Defining the success criteria. The particular systems and processes required to understand the results must be determined beforehand. How the value of firms will be understood in general must be defined, and there must be clear and efficient communication about this. When defining the success criteria, focus must be given not only to quantitative indicators but also to qualitative elements as much as possible; it must also focus on the management quality of interfaces, what kinds of lessons are learned from the implementation, and the skills to carry out programmes.

Consultation Questions 8: Interfaces (Questions 39-42)

40. Are the design principles specified for interfaces suitable and sufficient? What other principles should be specified?
41. Which existing organisations, institutions, mechanisms and structures can be transformed into interface institutions, the design principles of which are defined in this report?
42. You can access the updated list of support programmes provided by different institutions and organisations as of February 2018 on the Undersecretary of Treasury's State Support Information System (link: http://bit.ly/2FKd6Li). Within your field of activity, interest or expertise, which aspects of those programmes are sufficient? What aspects need to be developed?

Consultation Questions 9: All Consultation Questions (Questions 1-40)

The Green Paper's Consultation Questions

Determinants of Productivity

1. What kind of technological innovations that might have a possible destructive effect do you observe in your sector; what type of precautions can be taken to turn these innovations into advantages?
2. Should an intervention be performed through public policies to renew business models of firms? If so, how?
3. How can the success stories of firms that have gained a competitive advantage by changing their business models be used to inspire other firms?
4. How does the young generation born after 1980 affect the way firms conduct business as both employees and consumers?
5. What can we learn from digitalisation and digital transformation practices for Turkey's productivity agenda?
6. What does the diffusion of platforms that bring mechanisation, artificial intelligence, products and customers together without a mediator mean for Turkey's industries? Are there any missed opportunities? What kind of new opportunities are there?
7. How can Turkish firms in the global value chains be protected in a world where protectionist tendencies have increased?
8. Is there any role that the government can play to increase the level of interaction between main firms and suppliers for integration into global value chains? If so, what kind of role?
9. Is it possible for the government to develop an incentive mechanism for main firms and suppliers to conduct joint R&D activities? What kind of a mechanism would it be?
10. How can it be possible for industrial firms based on manufacturing to build capacity in such areas as R&D, design, branding, marketing and integrated services accompanying products?
11. What aspects need to be improved in R&D support provided to firms and universities?
12. How is it possible to facilitate technology transfer by means of public policies?

13. Is there any part the government can play to help firms build long-term relationships (B2B) especially with foreign clients and reinforce the trust factor in their relationships? If so, what is this role?
14. How can the use of modern production methods and management practices be extended; should public policies be developed in this regard? If so, how?
15. Is the transition of firms to more educated second or third generations a factor that increases the quality and productivity of firm management? How can this transition process be managed in terms of a company's sustainability and growth; is there any role that the government can play in this regard? If so, what?
16. What kind of policy interventions ensuring rapid achievements could be provided to improve the skill level of human resources and increase labour productivity?
17. Can you think of any company in Turkey that has gained a competitive advantage in global markets through one or several of the seven elements listed here as determinants of productivity in the manufacturing industry? What is the success story of this firm in brief?

Accelerating the Digitalisation Process

18. How can the huge digital gap between large firms and small firms in terms of access to and use of technology be reduced in order to close the productivity gap between them?
19. What kind of practices can the government implement to encourage firms to use digital forms of business making (e-procurement, e-invoice, etc.) to accelerate their digital processes? To what extent can these practices be efficient in the digital transformation of firms?
20. Should the government take steps to promote firms' online activities? If so, what kind of steps can be taken?
21. Which additional capacities should be built for the development of firms' digital skills? What are the most crucial capacity building areas that can provide the biggest achievement within the shortest time?
22. How can the global players in the information technology sector be attracted to Turkey in a way to enable us to gain a share of high value-added services in the global value chain?
23. Should the government provide financial support for digitalisation and automation investments in firms? If so, what should be the primary elements of this support?

24. Does the government have any role in increasing the accessibility of broadband speed in terms of geographical coverage and price? If yes, what role should this be?
25. What are the barriers to the development of e-export and what additional measures can be taken in this area?
26. How far does the dissemination of cloud computing applications among firms contribute to productivity according to your experience? How is it possible to disseminate these applications and at the same time support the domestic software industry?

Supporting the increase of the management quality in firms

27. Does the management quality of firms improve within its own dynamics through the challenges arising with the competition conditions? Does the state play a role in the improvement of the management quality of firms? If yes, what can this role be?
28. What should be the main elements, the scope and the actors of a quality and innovation movement aiming at increasing the motivations of firms for export in competitive foreign markets through the development of the management practices and innovation skills of firms?
29. What other horizontal elements that are improving the ecosystem, such as work environment quality, can be considered within the scope of a quality and innovation movement?
30. Is there a role the state can play regarding the development of the consulting sector and for the provision of consulting services of good quality to firms? If yes, what can this role be?

Facilitating exits from the market

31. Do you agree that it is difficult in Turkey to close a firm whose economic activities need to cease? What should be done to facilitate the bankruptcy process?

Strengthening and diversifying financial support mechanisms

32. Are the priorities proposed for increasing the technological innovation-related entrepreneurship in the manufacturing industry sufficient? What other support mechanisms should be set up?
33. Is giving rewards an adequate policy tool to encourage innovations that will meet the strategic needs of the country? What other policy tools might be developed in this regard?

Improving marketing and networking competencies; strengthening the perception of "Turkish technology"

34. What are the lessons you have learned from your commercial experience in developing urban-based strategies in addition to the country-based strategies in developing products for international markets?
35. With which actors abroad and within the country would it be useful to develop networks? What other networks would be beneficial to be developed? What are the roles that can be assumed by the government in this regard?
36. What do you think about the perception of Turkish technology and the Turkish brand abroad and within the country? Are the recommendations listed herein sufficient? What other additional measures can be taken?

Making the agenda of domestication (and nationalisation) productivity-focused

37. What products or product groups could be put on the agenda of domestic production?
38. What could be done to use public procurement more efficiently in this area?
39. Which policy tools could be used along with public procurement to encourage domestic production? How?

Interfaces

40. Are the design principles specified for interfaces suitable and sufficient? What other principles should be specified?
41. Which existing organisations, institutions, mechanisms and structures can be transformed into interface institutions, the design principles of which are defined in this report?
42. You can access the updated list of support programmes provided by different institutions and organisations as of February 2018 on the Undersecretary of Treasury's State Support Information System (link: http://bit.ly/2FKd6Li). Within your field of activity, interest or expertise, which aspects of those programmes are sufficient? What aspects need to be developed?

ANNEX-1 International implementation examples on interface design

In this chapter, examples from various countries are examined in order to contribute to designing interface structures in Turkey. Although it is the unique context and conditions of each public institution implementing public policies that are determinants, it is possible to take lessons on interface design from international implementation examples. Table 10 presents fundamental data regarding the institutions assuming critical roles in creating interfaces in different countries. In addition, different examples are examined in the four information boxes:

- Box 6: Industrial Technology Research Institute of Taiwan (ITRI)
- Box 7: The Catapult Programme of the United Kingdom
- Box 8: The Framework of Incentive Policies in Germany and South Korea
- Box 9: Fraunhofer Institute in Germany

Table 3: : Fundamental data on the innovation-focused institutions supporting employees and interfaces

Agencies	Foundation year	Year they started to support firms	Number of employees	Annual budget (million USD)	Budget share of the firms' supports
FFG, Austria	2004	2000's	275	660	%56
FINEP, Brazil	1967	2000's	740	2100	%37
CORFO, Chile	1939	1980's	685	345	%26
Tekes, Finland	1983	1980's	400	660	%64
CTI, Switzerland	1943	2000's	35	165	%17
ITRI, Taiwan	1973		5650	625	
OCS, Israel	1974	1970's	100	450	%95
DARPA, USA	1958	1960's	220	2900	
VINNOVA, Sweden	2001	2000's	35	165	%17
Innovate UK, United Kingdom	2007	2000's	300	870	%84

Box 6: Industrial Technology Research Institute of Taiwan (ITRI)

The Industrial Technology Research Institute of Taiwan (ITRI) is an R&D interface institution that is partly managed and financed by the the Ministry of Economy's Department of Industrial Technology. Founded in 1973, ITRI aims to transfer advanced technologies to the domestic industry in order to contribute to the economic growth and to help industries remain competitive and sustainable thanks to its "industrial technology R&D" objective. Since its foundation, ITRI has undertaken important roles in transforming Taiwan's labour-intensive industry into an innovation-focused industry. Accordingly, ITRI has made significant contributions to the country's development by carrying out the R&D activities of the industry, and it continues to carry out various projects both in the business market and in collaboration with SMEs.

Without any direct financial support (credits, grants, etc.), ITRI aims to create new products, services and technologies; to undertake assignments such as testing, piloting and prototyping; and to ensure the validity of technologies. ITRI provides an "incubating" service to start-ups in the field of high technology as well as carrying out directly applied technology R&D activities. ITRI's work focuses on smart living, quality health and sustainable environment.

ITRI receives half of its budget from Taiwan's Ministry of Economy and the other half from the enterprises, to which it provides services. Its inclusion in the public financing brings with it the fact that it is subject to external auditing according to annual goals and targets. The authorities of the Ministry of Economy are also involved in the Board of Regulations and contribute to shaping the research agenda. Therefore, more than 60% of the budget granted can be allocated to projects and programmes, which are jointly decided upon. On the other hand, the budget it receives from the private sector is independent allows ITRI to carry out its own projects and to determine its risk threshold on its own. The fact that ITRI is subject to annual performance within public financing and obtains independent income from the private sector makes this model an example.

ITRI has affiliated centres. Of its 6,001 employees in total, 1,393 have a doctoral degree, 3,422 have a master's degree and 1,186 have a bachelor's degree. Most of the employees studied engineering. Although there are two large campuses other than the central campus, the majority of its employees work in the central campus. This campus includes the "Core Labs" that are developing new technologies, research centres, the ITRI Academy, in-house think tanks and a technology transfer office. In addition to the large campuses, the start-ups of Taiwan establish small offices at strategic points (Silicon Valley, Berlin, Eindhoven, Moscow and Tokyo), thus strengthening bilateral relations between researchers and international shareholders.

ITRI has focused on commercialisation activities in recent years, which has allowed outputs and findings to be measurable. It has more than 23,100 patents and made contributions to the establishment of 260 new companies. In 2014, its annual budget was USD 625 million; it developed 14 new start-ups in the areas of health services, system services, advanced materials and production; it made 626 technology transfers to various companies and provided more than 15,000 consultancy services. It had 1,573 patents (1,544 new patents, 28 utility model patents) for the year 2016 alone. Its total income in 2016 was 21,364 million new Taiwan dollars, showing an increase from the previous year. A large part of this income – 10,405 million new Taiwan dollars – has been obtained from technology projects and 9,515 million from industrial service contracts . Its total expenditure in 2016 was 21,358 million new Taiwan dollars, 10,389 million of which was spent on technology projects and 8,860 million of which was spent on industrial service contracts.

Sources
ITRI. "Annual Report 2016. Smart Convergence, Innovating a Better Future"
https://www.itri.org.tw
https://catapult.org.uk

Box 7: The Catapult Programme of the United Kingdom

Founded in 2010 by Innovative UK, an innovation institution of the government, the Catapult Programme is a network of world-leading technology centres designed to change innovation skills in certain fields of the country, to increase productivity and to trigger economic growth. The Catapult Programme was developed due to the fact that the UK could not fully benefit from scientific, technological and research bases in different fields around the world in any commercial sense. In addition, despite the UK's achievements in inventing and production, there were shortcomings regarding commercialisation. This played a significant role in the establishment of the programme. Similarly, Dr. Hermann Hauser stated, in his research report, that the critical gap between universities (academia) and industry must be closed for business-oriented capacity and competence that do not link research and technology trade, is one of the inspiration sources of the Catapult Program.

Catapult's vision is to close the gap between the expertise of innovative enterprises wishing to grow and first-class research communities. The Catapult Programme has so far made over 3,000 academic and industrial collaborations and has become an important partner to Innovative UK in order to improve industrial strategy. It researches innovative technologies and supports new products, processes, new job opportunities, skills and investments. In addition, it provides services on new business models, the recognition of innovation by consumers and new market mechanisms. It supports the adaptation of innovations in collaboration with regulators. It collaborates

with start-ups, small and big companies, the academy and the public sector on an equal footing, and helps start-ups grow by supporting them.

Catapult has become a structure that provides solutions to problems with its technical support and consultancy and plays an effective role in developing innovation. Its expert employees work in collaboration with the academy and companies, playing an active role in the process. In its facilities, which do not have any large capital investment and are open to public, it facilitates the conduction of processes such as testing, first sampling and sample development, and scales new generation products and processes. The Catapult centres provide actors in the market with areas in which they can work, meet up, display their products and collaborate with each other. Moreover, the safe sharing of personal, closed and licensed data helps make technological advancements more accessible.

Catapult aims to accelerate companies' survival rate in commercial business by researching new concepts and developing innovation. It helps companies reach out to global markets utilising information about grants, investment financing and markets, and investment publicity and financing solutions. In addition, it expands the network of suppliers for different sectors and makes recommendations about market access, business plans and market opportunities.

There are 18 Catapult centres that are operational in 10 different areas in the United Kingdom. While each Catapult centre is specialised in a different area of technology, it also has the status of "company limited by guarantee" (CLG), which is a separate legal entity from the Innovative UK. Each Catapult centre is controlled by its own administrative rules through an administrative team. The centres specialise in cell and gene therapy, compound semiconductor applications, energy systems, future cities, high-value manufacturing, pharmaceutical research, offshore renewable energy, satellite applications and transport systems.

The centres receive funding from commercial financing earned competitively and also from direct investment by Innovative UK. The financing model is diversified according to life-long technology and innovation centres, and follows the one-third model (it gets equal financing from three sources). According to this model, financing is obtained from R&D contracts financed by enterprises (obtained competitively), R&D projects co-financed by the public and private sectors and implemented in collaboration (obtained competitively), and public financing for long-term structure, expertise and skills development investments. While the units affiliated to Catapult are operational in a decentralised manner, the services and activities provided by these units are evaluated according to their economic and social effects (technological advancements, high economic growth and social benefit).

The Catapult network has proven itself to be an important programme. It operates facilities worth £850 million in the United Kingdom, and provides researchers and

enterprises at all levels with open access to the most developed equipment and resources. In its first four years, it delivered more than 2,400 projects. It continues its active projects and support in 24 countries. It supported 636 academic collaborations, 2,851 SMEs and 2,473 industrial joint ventures. In 2016, 900 apprentices were trained in these projects.

Sources
Catapult Network. "Fostering Innovation to Drive Economic Growth 2017".
Catapult. "How Catapults can help your business innovate". Innovation UK. 2016.
Department for Business, Energy & Industrial Strategy and Innovate UK. "Catapult Programme: A Framework for Evaluating Impact". Nov 2017.
Glennie, A. and Bound K., Nesta. "How Innovation Agencies Work: International Lessons to Inspire and Inform National Strategies". May 2016.
Hauser, H. "The Current and Future Role of Technology and Innovation Centres in the UK". Secretary of State Department for Business Innovation & Skills. 2010.
Department for Business Innovation & Skills. 2010.

Box 8: The Framework of Incentive Policies in Germany and South Korea

The performance-based system in South Korea is an inspiration for the design of interfaces. R&D incentives in Germany are not granted on the basis of certain sectors or technologies, but on areas such as sustainability and smart transport. Thus, incentives are both wide-ranging in that they can influence many sectors and narrow-scoped in that they require specialisation in certain areas and increase competitiveness.

The incentive policies in South Korea are based on supporting enterprises that show better performances. The world trade system limits the incentive tools of Korea. The existing tools are as follows:

- Tax incentives for R&D activities
- Customs duty exemption for equipment used in R&D activities
- Tax reductions for expenses incurred in developing human resources
- Encouraging venture capital funding activities to accelerate commercialisation processes

There are three types of incentives in general at a federal level in Germany:

- Incentives for investments
- Incentives for company operations that aim for new employment and decreasing R&D costs
- Incentives for project-based R&D that meets personnel and equipment expenses

Grants are provided by public research infrastructures such as the Fraunhofer, and more than one firm within the infrastructure combine resources for specific projects and benefit from federal support.

Source: Çağlar (2017)

Box 9: The Fraunhofer Institute in Germany

The Fraunhofer Institute is an applied research institution founded in 1949. The institution has 67 different institutes within Germany and abroad. The institution has an autonomous governance structure enacted by law, and its ownership is shared between federal and local governments.[11]

Governing Structure

The General Board of the institute consists of members of the Executive Board, honorary members, members of the Senate and representatives of public institutions paying membership fees. The General Board meets once a year, and the members of the Senate make high-level strategic decisions such as approving the annual activity report and appointing or changing the Executive Board.

The Senate of the institute comprises 18 members selected from leading representatives of the scientific and business worlds, and the public. The federal and state governments appoint seven of the 18 members, and three members are selected by the Scientific and Technical Board, which functions as an advisory board. The chairman of the board and the Executive Board, research and development policies are determined by the Senate. It is the Senate that decides to establish the research institutions to be included in the institute, and to include them in the system or to close them down.

The Executive Board determines the Fraunhofer's general policies, organises its financial affairs and performs its planning, activities and external affairs. This board is responsible for finding external funding and distributing it to the institutes within the institution. The directors of the 67 different institutes within the institution are appointed by the Executive Board. This board comprises four full-time members, one of whom is the chairman of the Executive Board. Two of the members are selected from the scientific and technological community, one of the other two members is selected from private sector and the other is selected from the public sector.

The Scientific and Technical Board functions as an advisory board, and its members are the research and executive personnel within the institution. The main function of this board is to support and make recommendations to the institutes within the institution with regards to R&D, commercialisation and general administration.

[11] *The Fraunhofer Institute's Law of Establishment (in German) https://www.fraunhofer.de/content/dam/zv/de/ueber-fraunhofer/Satzung-Fraunhofer-Gesellschaft.pdf*

The institutes are basically responsible for carrying out research affairs. In general, these institutes do not have any separate legal entities. They carry out their daily activities independently under the supervision of the Executive Board. They can carry out small short-term research projects without any approval from the Executive Board. However, they need to get approval from the Executive Board for long-term and high-level research projects. The directors of the institutes focus on the daily management of the institution, research and business-focused activities, the organisation of research projects and obtaining external funding.

The centralisation of executive functions under the roof of the Fraunhofer helps local centres focus on research, which is their main mission and, in practice, contributes to developing standards.

The institutes within the institution may establish project-based groups or units among one another. There are seven different groups that are active today: information and communication technologies, life sciences, micro-electronics, light and surfaces, production, materials, and defence and security.

Financing

As required by a decision made by the Federal Government in 1973, the Fraunhofer made a transition from a model fully funded by public resources to a mixed model. In the mixed model, the public funding received is supported by the income obtained from the institution's own activities. These income resources include items such as research grants from public institutions and contract-based fundings from the private sector. As of today, 70% of the general budget of the Fraunhofer and 90% of its research budget worth 2.1 billion euro are from income obtained by the institution itself. A large part of the remaining 30% of its general budget is funded by the Federal Government. These "unconditional" resources from public institutions are usually used for independent research on future technologies, and funding from the private sector focuses on the projects aiming for commercialisation.

TFP and the Fraunhofer

The Fraunhofer's institutes make significant contributions to domestic competitiveness by ensuring the development of innovative clusterings in the areas they are located. The institutes are operational in the fields specific to the characteristics of the cities/regions in which they are located. For example, the Fraunhofer Institute located in Jena, which hosts Zeiss that has a strong optical industry and is one of the world-leading lens manufacturers, focuses on research in the field of optics.[12] The Fraunhofer's institutes help the academic institutions and companies in the areas they are located use their

R&D capacities more efficiently, and strengthen their clustering networks by gathering them together. With this aspect, the Fraunhofer contributes to the cluster development objective, which is a part of the German Federal Government's high technology strategy.[13]

The transitionality between the private sector and the Fraunhofer is remarkable. After working at the Fraunhofer, many experts are observed to be employed for the executive positions of the leading firms in the manufacturing industry in the following phases of their careers. These firms include world-leading manufacturers such as Audi and Porsche. Many start-ups were established by former Fraunhofer employees. Fraunhofer employees are encouraged to commercialise their research within the institution and to establish companies after they leave the institution.

There are also some limitations of the contributions made to the TFP by the Fraunhofer's model.[14] The most important is that the Fraunhofer's institutes traditionally focus on meeting the R&D requirements of already-existing industries. The financial and governing structures of the institutes are not suitable for the risky and costly R&D projects that would create new business models to ensure high productivity increases. The structures of the institutes, which are based on short-term and low-risk projects, are not suitable for the needs of sectors that have R&D projects that are risky but whose return is high, such as biotechnology. Finally, in order to obtain positive network effects in regions where research institutions such as the Fraunhofer are located, it is necessary to have a developed industrial and research clustering in the relevant sectors in these regions.[15]

Source: Çağlar (2017)

12 *http://file.scirp.org/pdf/AJIBM_2015121513514536.pdf*

13 *http://reports.weforum.org/manufacturing-growth/fraunhofer-gesellschaft-germany/#view/fn-33*

14 *https://www.nap.edu/read/18448/chapter/13#232*

15 *ftp://ftp.zew.de/pub/zew-docs/dp/dp3798.pdf*

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