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# Support to Development of a Policy Framework on **Total Factor Productivity Project** **WHITE PAPER**



Empowered lives  
Resilient nations



Support to Development of a Policy  
Framework on Total Factor Productivity Project  
**WHITE PAPER**

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The White Paper was prepared within the scope of the Support to Development of a Policy Framework on Total Factor Productivity Project (TFP Project).

Support to Development of a Policy Framework on Total Factor Productivity is a technical assistance project financed by the European Union (EU) and Republic of Turkey and it is executed by the United Nations Development Programme (UNDP). The beneficiary of the Project is the Presidency of Republic of Turkey Strategy and Budget Office and the contracting authority of the Project is the Central Finance and Contracts Unit (CFCU).

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## **ACKNOWLEDGEMENT**

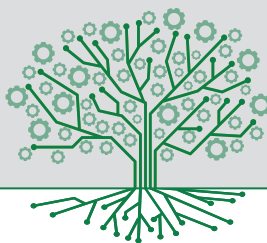
White Paper was prepared within the Support to Development of a Policy Framework on Total Factor Productivity Project, which is a technical assistance project financed by the European Union (EU) and executed by the United Nations Development Programme (UNDP). The beneficiary of the Project is the Presidency of Republic of Turkey, Strategy and Budget Office.

This project, which aims to develop a public policy framework with a new perspective to increase the share of total factor productivity in our country's development and secure political activities within this context, has been created with active participation of public institutions, private enterprises, and non-governmental organizations.

On behalf of the Presidency of Republic of Turkey Strategy and Budget Office, I would like to extend my sincere gratitude to all of our stakeholders, especially the United Nations Development Programme, the Central Finance and Contracts Unit, the Delegation of the European Union to Turkey for their dedicated efforts within the Support to Development of a Policy Framework on Total Factor Productivity Project since November 12 2015, and all other public institutions, private enterprises, and non-governmental organizations for their active participation in the Project; to the Scientific Committee, the Steering Committee and members of all working groups; to Project experts and the Project team; to Istanbul Ready-Made Garment Exporters' Association, to Turkish Composites Manufacturers Association and Turkish Quality Association for undertaking the leadership of our Pilot Projects; and to the, Head of Economic Modeling Department, Strategy and Budget Office , as well as all strategy and budget experts.

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## Executive Summary

The contribution of increases in productivity on our country's economic growth performance remains limited and follows a fluctuating trend. Only 0.8% of the recent 5.8% growth (2012-2017) is due to increases in Total Factor Productivity (TFP). On the other hand, it is known that the underlying dynamics behind long-term economic growth and developments are the increases in productivity. Limited TFP increases in Turkey pose a disadvantage in terms of the sustainability of growth.

This White Paper brings forth a policy framework for TFP to contribute more to economic growth in Turkey. The project's main beneficiary is the Strategy and Budget Office of the Presidency of the Republic of Turkey. The project was financed by the European Union and the Republic of Turkey and implemented by UNDP. This project established the determining factors for the increase in TFP through studies conducted at company and value chain levels. A policy framework was developed in line with the analyses and this framework was tested in pilot studies.

## Current Situation: Determinants of Productivity in the Turkish Manufacturing Industry

The study approached TFP in terms of the company perspective and firstly, the factors which affect productivity were categorized into internal and external factors. Factors such as the quality of human capital, the tax system, the competition environment, the regulatory framework, and corporate quality were evaluated within context of the external factors. Since many organizations and policy frameworks currently have an impact on the external factors, the study aims to shed light on internal factors. As a result of synthesizing the trends identified in terms of the internal factors, seven fundamental pillars were established in order to define TFP at the company level, and the critical research findings regarding these pillars are summarized below:

**1. Business models:** Positioning in value chains. The concept of a "business model" covers how and at what stage of the value chain companies are positioned and how they create value. In this context, the fact that the share of manufacturing and assembly in elements that determine the value of the product is decreasing, while the share of components such as R&D, design, marketing and services offered with the product is increasing is a significant trend. It is observed that companies that



want to develop branding and a higher level of added value invest in marketing/distribution processes. It is also determined that companies using information, e-commerce and material technologies are more productive and innovative.

**2. Integration into global supply chains.** It is seen that companies that are integrated into the value chain of global companies have made significant progress in terms of technological development. The deepening of the interaction with global companies helps companies internalize elements such as lean manufacturing, quality processes, cost accounting, and create a motivating environment. On the other hand, it is also easier for companies that have passed the certification processes of global companies to reach other networks and markets. Econometric analyses reveal that those companies with overseas affiliations and engaged in R&D activities are more productive and have a stronger tendency to develop technological innovations.

**3. Access to information, innovation and transfer of technology.** The ability of a company to access information, to use and develop the information for its production directly affects the productivity of that company. R&D activities appear to greatly contribute to trends in productivity and technological innovation. In all sectors, feedback from users/customers, open sources of information and trade fairs/overseas trips appear to be the most common sources of information. It is concluded that companies that transfer “qualified senior executives/technical personnel” and technology via patents and licenses as well as knowledge from the company for which it acts as a supplier are more productive.

**4. Intercompany collaborations and long-term customer relationships.** The company’s network structure (network) is decisive in terms of the efficiency of the company. As much as a company’s ability to maintain its position in the supply chain depends on factors such as quality, speed and cost it is also related to its ability to develop trust-based relationships with its customers. The companies engaged in R&D and design activities in collaboration with their customers are more productive and innovative. On the other hand, companies with a high share of long-term customers in their turnover are more productive.

**5. Use of modern manufacturing techniques.** It is seen that companies with higher productivity scores have developed lean production methods, enhanced their employees’ multi-tasking duties and they often optimize corporate workflows

and production platforms as well as applying specific procedures to evaluate the performance of employees. The companies that have already overcome shortcomings in terms of basic production skills often focus on innovation.

**6. Company management quality and institutionalization.** Studies using microdata collected at the company level reveal that management quality is a significant actor in explaining in-country and intercountry differences of productivity. In the World Management Survey, Turkey ranked 21st out of 35 countries in terms of the quality of management practices. Companies that can achieve productivity gains out of the digitization processes manage these processes together with corporate transformation, management quality and a quality workforce.

**7. Labor productivity and human resources practices.** The quality of human capital is a determining factor in corporate functioning, such as the operation of production tools, corporate decision-making processes, innovation development and the delivery of goods and services to customers. The companies with a high rate of white-collar workers among personnel are more productive on average. In corporate companies, good human resources practices, such as career opportunities and performance-based promotion, are observed, while stable and systematic human resource policies are not implemented in most companies that have not been able to make progress in terms of institutionalization.

Considering these results as a whole, a considerable portion of Turkish companies appear to attempt to gain competitiveness through cost-reducing, passive strategies such as labor flexibility, supplier price repression, etc. On the other hand, more productive companies pursue active strategies such as building long-term relationships, utilizing collaborative R&D and design activities and implementing technological innovation. These findings indicate that there is a need for regulations and incentive mechanisms regarding companies' adoption of active strategies in order to increase productivity in the manufacturing industry.

## **Policy Framework**

The policy framework proposed in the White Paper aims to contribute to a new perspective on economic growth based on productivity gains highlighted in the Medium Term Program (2019-2021). While this study focuses on micro dynamics in the manufacturing industry to improve the contribution of TFP to growth, the

macro dimension of productivity should not be neglected. Increased quality in human capital and micro-structural reforms in taxation, the labor market and regulatory institutions play a critical role.

In order to increase the contribution of TFP to economic growth, a policy framework consisting of three elements is proposed:

1. The first policy level consists of horizontal policies and includes an approach that aims to increase and incentivize productivity, regardless of technology, sector, size and region. Policies at this level mainly focus on companies that are far from the global borders of technology.

2. The second policy level is composed of vertical policies that seek the perfection of ecosystems in which businesses with a competitive edge find themselves, and includes interventions that require selectiveness and a focus on specific sectors, technologies and regions. Policies at this level mainly focus on companies that are essentially close to the global borders of technology.

3. The third level includes the outlines and principles of a new corporate design (interface) for implementation and effective execution of policies towards TFP.

## 1. Policies That Accelerate TFP

### 1.1 Accelerating Digitalization

**Priority #1: Increasing digital skills of companies and improving the software sector**

**Priority #2: Improving digital infrastructure**

**Priority #3: Improvement of e-commerce capacity**

**Priority #4: Extending cloud computing**

#### **Sample interventions:**

- A new incentive tool for financing support for digitalization and automation investments
- Policies and pilot projects to increase broadband Internet access and speed and the use of broadband services place Turkey among the top ten OECD countries with its performance in these fields and lower the costs
- Supporting logistics centers for e-commerce, distribution centers abroad, capacity building, training and payment systems
- Supporting programs to promote cloud computing and raising awareness in SMEs

## 1.2 Enhancing Management Quality in Companies

**Priority #5: Accelerating quality and innovation movement**

**Priority #6: Extending access to consultancy services**

### **Sample interventions:**

- Creating an “Operational Program for Improving the Human Resources of Companies” for projects on functional or thematic issues such as marketing, supply chain, digital transformation, managing inter-generational differences and improvement of the work environment in partnership with consultancy firms, academic institutions and companies
- Developing a program for enhancing the quality of working environments at the OIZs
- Extending working practices through similar programs in cooperation with the consultants provided within the scope of the Turquality program

## 2. Perfecting the ecosystems of enterprises with global competitiveness targets

### 2.1 Strengthening and Diversification of Financial Support Mechanisms

**Priority #8: Supporting venture capital funds**

**Priority #9: Developing project funding opportunities for innovative initiatives aimed at expanding the global scale**

**Priority #10: Planning a mission-oriented support mechanism for innovations that will meet the strategic needs of the country (Industrial Technology Reward Fund)**

#### Sample interventions:

- Making the Turkey Investment Fund operational
- The establishment of funds to specialize in areas to be determined in the Eleventh Development Plan
- Focusing on creating programs to develop long-term financing models in high-tech and innovative areas
- Efficient use of the Eximbank resources for innovative entrepreneurs on a global scale
- Creating interdisciplinary structures that can lead to the cooperation of different actors such as large companies, small-scale technology firms, research institutions, etc. who do not cooperate under normal circumstances in order to solve a defined national problem

### 2.2 Development of Marketing and Networking Competencies; Strengthening the Perception of “Turkish Technology”

**Priority #11: Development of marketing capabilities**

**Priority #12: Strengthening networks (between national and international enterprises, researchers, funders and government executives)**

**Priority #13: Boosting the perception of Turkish Technology and increasing brand value**

#### Sample interventions:

- Support mechanisms to involve the development and commercialization of products for international markets, particularly in the areas of priority technology and sectors
- Creating networks and conducting improvement activities to strengthen the ties between research labs, R&D centers, technology development zones, public institutions, and companies
- Supporting the integration of clusters around certain technologies with important technology centers abroad, particularly in the areas of technology development zones with critical mass

## 2.3 Making the Localization (and Nationalization) Agenda Productivity-Driven

### **Priority #14: Making the localization agenda productivity-driven**

#### **Sample interventions:**

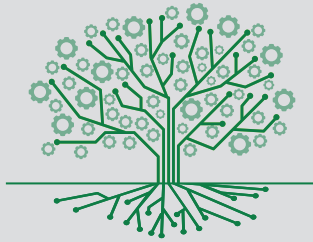
- For the products to be included in the localization program, building support projects on the basis of a global vision with an emphasis on global dynamics and demand conditions, as well as prioritizing import substitution
- Giving priority to creating demand for technologies that can be produced indigenously outside of public procurement initiatives; for example, the use of regulations for housing and development in cooperation with municipalities to increase the use of composite materials in the construction industry

### **3. The Interface Approach for the Effective Use of TFV Policies**

It is important to establish and strengthen the interface structures that play a role in implementing the policies in order to ensure effective implementation of policies aimed at increasing TFV. Interface structures will provide services that cannot be adequately provided by the market by functioning as a kind of public entity between the public sector, academia and the business world. These include tools such as information, consultancy, networking, and financing. These structures will not only support the individual companies but also the value chain and ecosystem. Interfaces will focus on increasing the efficiency and innovation performance of companies, while implementing programs in strategic areas on behalf of the public sector and will contribute to the effective use of public funds. The interface structures should be developed to take on various functions and focus on various intervention types rather than concentrating on standardization. In this setting, the basic principle should be to increase the influence and simplify the forms of intervention in selected areas without making the existing mechanisms and support programs more complex. Within this framework, it is

recommended that the new system is initiated in an experimental environment formed by exceptional arrangements where the results are carefully monitored and the effects are evaluated, and that three different interface experiments are implemented. The first two of the three experiments proposed are related to the innovation policy, while the third experiment focuses on the development of an interface for the dissemination of technology:

- The First Experiment: Research Institute offering applied research services
- The Second Experiment: Interface that provides a full range of services for technological SMEs and start-ups
- The Third Experiment: Technology diffusion interface



## **INTRODUCTION**

Why do Productivity Policies Gain Importance?



**Improvements in productivity are the basis of economic growth and improved welfare in the long term.** Increased added value due to productivity is reflected as high profitability for capitalists, high wages for workers and low prices for consumers. The steam machine and electrification in the last century and innovations in the area of digitalization in the current age, have improved productivity by transforming production methods and have become the driving force for economic growth.

**Total Factor Productivity (TFP) is one of the three main channels through which economic growth is achieved; the other two channels are an increase in employment and capital investments.** In essence, productivity is the ability to produce more output with less input. Inputs can be divided into five categories: capital (C), labor (L), energy (E), materials (M) and services (S). Concepts such as labor efficiency and energy efficiency indicate the relationship of just one of the inputs with the output (partial efficiency indicators), while the relationship of all these inputs (C+L+E+M+S) to the output indicates Total Factor Productivity. Accordingly, the TFP is the portion of the produced output that cannot be explained by the amount of input used in production. The size of TFP varies based on how effectively and intensively the inputs are used in production.

**In our country's economic growth, the contribution of TFP remains limited and fluctuates.** This poses a disadvantage in terms of the sustainability of growth. In the period following 1990, Turkey's main source of productivity gains came from the process of transition from sectors with low productivity (agriculture) to sectors with higher productivity (industry and services), i.e., structural transformation. In this period, the contribution of the increase of productivity within the sectors remained limited. In the period of 2012-2016, the contribution of TFP within the growth rate of 5.5% was 0.7%. While the contribution of TFP to the growth rate was 24% in the industrial sector, it was 13% in the overall economy. In this period, the accumulation of capital contributed most to growth (53%). When the manufacturing industry is examined in the production of 82 different sub-sectors during the period of 2003-2014, the share of labor, materials, energy and other unexplainable factors including TFP was calculated at 9%, 75-80%, 4% and 9%, respectively. The difference between productivity levels of small and large enterprises is striking. As of 2015, the labor efficiency in companies with 1-19 employees is approximately one sixth of companies with more than 250 employees.

**While the micro dynamics in the manufacturing industry are focused on in this study in order to improve the contribution of TFP to growth, the macro dimension of productivity should not be neglected.** In this context, the most critical issue is the increase in quality of human capital. If the increase in quality of human capital is not sufficient, the impact of most of the policy recommendations addressed in this White Paper will be limited. Cultivating an educated workforce who have comprehensive knowledge of advanced technologies and have the capacity to develop more advanced technologies could provide a significant contribution to the productivity to our companies that primarily compete in the international market by lowering prices. In addition, micro structural reforms to be implemented in areas such as tax, labor market and regulatory agencies will accelerate the structural transformation in the manufacturing industry and increase the contribution of productivity to growth. While productivity-oriented policies are implemented, skill transformation programs and social policies that complement those policies must also be taken into consideration. It should not be overlooked that the increase in digitalization increases the risk of workers becoming unemployed; the balance between productivity growth and employment should be analyzed and in addition to actions to be taken to improve the level of digitalization, policy recommendations that will prevent potential job losses occurring as a result of digitalization should also be put on the agenda.

**A new economic growth perspective focusing on TFP improvements must be designed in order to take action against the negative state that has been observed in our country's productivity performance in recent years.** Due to the trend of digitalization in the industry (robotics, 3D printers, smart factories, etc.), competitive strategies based on a low-quality workforce and low wages are losing validity. This White Paper aims to contribute to the policies with respect to increasing productivity in our country by presenting a policy framework for the consideration of the public in a time like this. The policy framework focuses on the manufacturing industry and aims at understanding the factors determining productivity in our country and improving policy responses by shedding light on micro dynamics in this field.

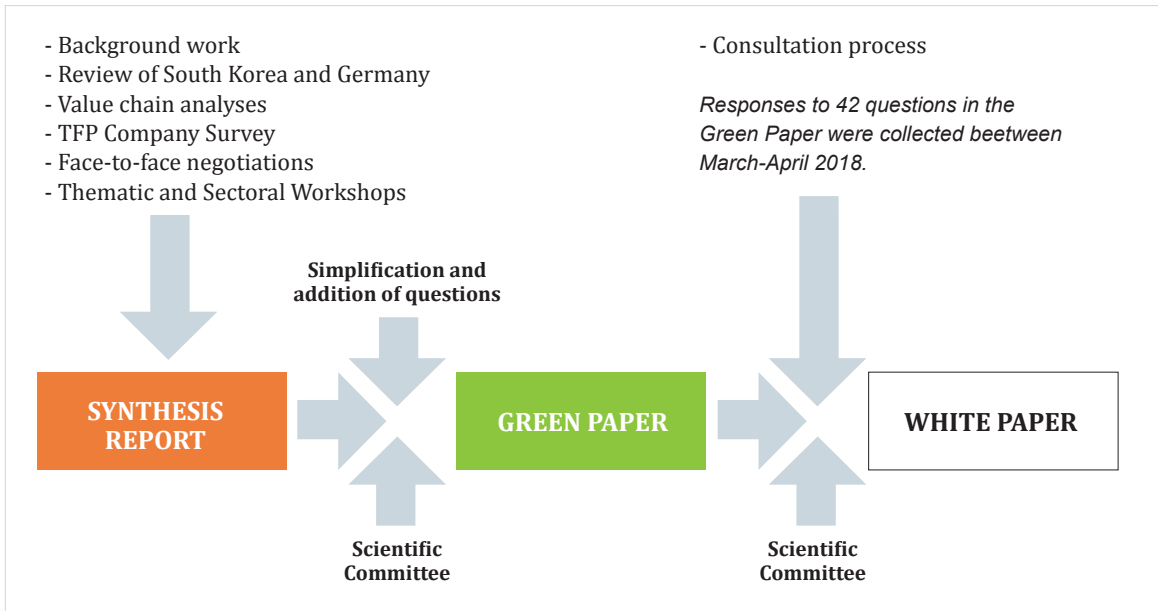
## How the White Paper was Prepared

The White Paper has been prepared as part of the Support to Development of a Policy Framework on Total Factor Productivity Project (TFP Project). The project is executed by the United Nations Development Programme, whose main beneficiary is the Presidency of Strategy and Budget of the Presidency of the Republic of Turkey and is jointly financed by the European Union and the Republic of Turkey.

This work includes situational assessment and policy recommendations to increase the contribution of Total Factor Productivity to growth in Turkey. Within the scope of the project, a consultation document (Green Paper) was written. This White Paper was prepared after the opinions of stakeholders were received.

The White Paper is intended to contribute to high-level policy documents such as the Development Plan in addition to policy documents such as the Mid-Term Economic Programme and Annual Programme.

**Figure 1:** Preparation Process for the White Paper



A research process consisting of the following seven components was carried out during the preparation process for the White Paper. (Figure 1) The preparatory work and outputs are shared on the project's website [www.tfv.org](http://www.tfv.org):

**(i) Background Studies** Analyzes performed on key data for productivity dynamics in the manufacturing industry; literature reviews on global value chains and productivity; German and South Korean benchmarking studies; and trends in selected value chains (food, textile-ready wear, electrical goods, automotive) were researched.

**(ii) TFP Company Survey** Prepared for the purpose of analyzing the productivity and innovation dynamics of companies, the survey was filled out by 2903 companies. Companies that participated in the survey were categorized and analyzed within 4 categories. The first were companies that are among the top 100 industrial enterprises in Turkey. Companies included in the other categories were selected from the companies with the largest industrial enterprises and suppliers.

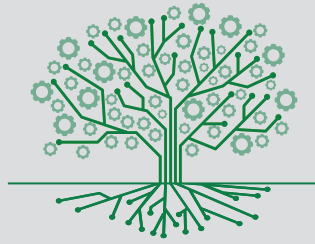
**(iii) Face-to-Face Interviews** In line with the framework determined for the survey, in-depth interviews were carried out with the large industrial companies included in the first category. Assessment and evaluation of growth, productivity and innovation from the companies' owners and managers were compiled and synthesized within a structured framework.

**(iv) Thematic and Sectoral Workshops** Eight workshops were held with the participation of 153 representatives from the private sector, civil society and public institutions within the four value chains selected based on themes determined in field studies, benchmarking studies, sector evaluations and trend analysis studies. Themes addressed at the workshops were as follows: Digitalization in value and supply chains; public policies on the investment needs during the commercialization of R&D; timely entry of high-tech materials into our country; and the involvement of SMEs in the production processes and how SMEs can develop management styles and administrative structures that are more institutional and globally competitive.

**(v) Synthesis Report** It has been prepared by compiling all quantitative and qualitative data. The report is a technical background document that consists of basic trends, basic determinants of productivity in the manufacturing industry, policy framework design rationale and policy recommendations.

**(vi) The Green Paper** The Green Paper was created from the Synthesis Report through the process of developing a consultation document and transforming the report into a policy document. The aim was to collect feedback from stakeholders on the 42 questions included in the report.

**(vii) The White Paper** The White Paper has been created through the analysis of international conferences, regional meetings, and correspondences with state organizations regarding the Green Paper and the feedback received via the website.



# Determinants of Productivity in the Turkish Manufacturing Industry

**The prerequisite to developing a consistent policy framework for Total Factor Productivity is having up-to-date and comprehensive knowledge on the dynamics determining TFP in our country.** A series of studies were conducted for this purpose in order to shed light on the elements that could affect productivity in companies within the manufacturing industry which are at the core of the TFP Project. As a result of the field research, analysis of TÜİK data, review of relevant international and national literature, and the quantitative analyses and stakeholder meetings conducted for the four selected value chains (automotive parts, white goods, apparel and food), elements that could affect the productivity of companies were categorized into two groups as internal and external factors:

- **Internal factors:** The company's organizational structure; organization of production; entrepreneurial qualities; human resources practices; learning mechanisms within the company; use and dissemination of information; quality of input; physical capital; machinery and equipment quality; R&D activities; information technology; product and process innovations; economy of scale; strategy; and forms and stages of integration in the global value chain
  
- **External factors:** Quality of the human capital; tax system; competitive environment; regulatory framework; institutional quality; flexibility in the input market; quality and competence of infrastructure; access to finances; macroeconomic and political stability; policy predictability; technology policies; demand elasticity; and production location (regional dynamics).

**Since many organizations and policy frameworks currently have an impact on the external factors, the TFP policy framework focuses on internal factors.** As a result of compiling the trends in internal factors at the company level, seven critical elements that determine TFP at a company level were identified. This section outlines the findings on these seven critical elements listed below:

1. Business models: Positioning in value chains
2. Integration into global supply chains
3. Access to information, innovation and transfer of technology
4. Intercompany collaborations and long-term customer relationships
5. Use of modern manufacturing techniques
6. Company management quality and institutionalization
7. Labor productivity and human resources practices

## Business Models: Positioning in Value Chains

In interviews held with companies in the manufacturing industry for the TFP Project, one of the key factors causing a gap in productivity compared to competing countries/firms was indicated to be the differentiation of the **business models**. The concept of a “business model” covers how and at what stage of the value chain companies are positioned and how they create value. As technological advancement decreases transaction and coordination costs, unprecedented business models can arise. In a study undertaken with large aeronautical and defense companies in the USA, it was identified that companies that are able to change their business models and adapt to the dynamics of the market raised their financial performance 7 times more than those who were not able to do so (Fischer, 2016). It is possible to say that three critical trends accelerate transformation and increase productivity in business models:

- The quality and quantity of transactions that machines can perform can be rapidly increased. As such, machines take over the basic functions performed by the labor force and force them to gain new skills.
- The number and scope of platforms that bring together the product and customer without an interface institutions (Alibaba in the retail sector, Uber in transportation services, Facebook in media, Airbnb in hospitality services, etc.) are increasing with potentially destructive effects on traditional actors.
- Crowdsourcing methods, which allow companies to benefit from the knowledge, experience and skills of people from all over the world in addition to the knowledge, experience and skills that they develop internally or with their suppliers in the value chain, are on the rise (McAfee and Brynjolfsson, 2017).

**In addition to the transformation of business models, the share of manufacturing and assembly in elements that determine the value of the product are decreasing while the share of components such as R&D, design, marketing and services offered with the product are increasing.** The level of adaptation to and utilization of technological advancements at an exponential rate in the world has a direct impact on improvements in TFP and the competitiveness of companies in the manufacturing industry. Many different economic and



technological trends such as globalization, regionalization, smart systems, advanced materials, digitalization of information and processes and 3D printers force companies in the manufacturing industry to transform their practices. As a result of these developments, companies in the manufacturing industry become sellers of “outcomes” rather than “products” and the importance of being able to provide solutions tailored to the customers’ needs increases. The key condition for preserving profit margins in the manufacturing industry is the ability to enable this transformation, i.e. the ability to manufacture products tailored to the customers’ needs. For example, what underlies Germany’s ongoing achievement of high added value in the manufacturing industry is its ability to spread the value chain to different countries (Eastern Europe, China, Korea) and its ability to perform mass customization through robotization and automation (The World Bank, World Trade Organization and OECD, 2017).

**These developments across the world also affect the Turkish manufacturing industry and companies that are able to adopt innovative business models in line with technological advancements are able to improve their competitiveness and efficiency.** In the field study performed for the TFP Project, it was found that companies that focus solely on manufacturing and product sales experience a downward trend in their profit margins, while companies that can strengthen their functions outside the manufacturing chain are able to increase their added value, profitability and international competitiveness.

**The following findings with respect to the relationship between business models and company productivity in the manufacturing industry in our country have been gathered through field studies, surveys and workshops conducted for the TFP Project:**

- Companies that want to achieve branding and a higher level of added value invest in marketing/distribution processes.
- In addition to divisions such as accounting and purchasing, information technology within standard business processes is also being relatively commonly used in areas that are closely related to productivity such as production planning, supply chain management, product and material management and design.
- Companies using information, e-commerce and material technologies are more productive and innovative.

- Successful companies have independent divisions working on production planning, procurement, human resources, quality control, productivity, supplier selection and development.
- The failure of the distribution network to operate effectively is among the problems for companies. It is stated that information and communication technologies should be used for more efficient organization of logistics.

## Integration into Global Supply Chains

**One of the key elements affecting and strengthening the relationship between export and productivity is the increase in the share of global value chains in world trade.** As the production process can be divided into different steps, global value chains are spreading to different countries. The share of global value chains in global added value has entered a period of stagnation following a steady increase up until the 2008-2009 global financial crisis. It is observed that protectionist tendencies are gaining power in developed countries. Nonetheless, 60-67% of the total world trade occurs in global value chains (The World Bank, 2017).

**One of the primary ways of raising TFP at a company level is the integration of the company into global value chains. Formal annual data collected from companies in the Japanese manufacturing industry indicate that companies which are integrated into global value chains are more productive compared to those which only operate domestically.** This difference in productivity is independent of the scale, factor intensity and industry branches (Tomiura 2007). Increases in productivity usually occur along with the trend of “progress in the value chain” (upgrading) (Gereffi, 2001; Taymaz, 2016c). Such progress occurs on four different dimensions:

1. By using their resources more effectively and efficiently, companies transition from workshop production to mass production and from mass production to lean and stockless production. While companies that only focus on the domestic market do not consider transition to productivity enhancing practices such as automation

to be profitable, those companies that are able to expand their market thanks to their integration into global supply chains are able to focus on productivity enhancing investments (Gereffi, 2014).

2. Rather than manufacturing ordinary products, companies transition to manufacturing more “sophisticated” products demanded by global buyers. Such products are more complicated and require a high level of skill, better quality inputs and effective quality management systems. The sophistication level of these products can be measured by the unit value, labor efficiency or the content of the required skills (roles).

3. Companies undertake different functions with higher added values in the value chain (design, R&D, branding, marketing and distribution channels, etc.) including the transformation of business models which was addressed in the previous sub-section.

4. Companies begin to use the skills they developed in one value chain for the value chain of another sector. Companies that transition from the automotive to the defense industry, as recently observed in our country, are examples of this trend (Beltramello, De Backer, and Moussiégt, 2012).

**The effect of integration into global value chains at the companies’ productivity level are also related to the governance structure of the value chain.** The governance of the value chain determines how profits and risks are distributed in the overall value chain. The profitability of a company is directly related to the strength of the leading companies in the value chain that the company is in (Gereffi, 2014). A significant portion of the power affecting the value chains driven by the manufacturers is concentrated in the companies that produce the final product. These value chains usually involve industries related to capital, technology and information. A high level of obstacles are encountered in entering these sectors due to economies of scale. In value chains guided by purchasing companies, a significant portion of the power lies with retailers and marketers as they are able to shape mass demand. The position of the company

in the value chain depends on the supplier selection of the primary company and this selection depends on the structure of the market. In markets where the main companies produce more revenue (where demand is flexible), there is an effect of strengthening and transforming the subcontractors in the value chain, while the opposite is observed in the markets where demand is not flexible (Antràs and Chor 2013). Finally, it should be taken into account that some factors (price, quality, early delivery pressures, etc) that may be considered as a problem for small firms may be the result of large companies' pursuit of productivity and the policy response and the impact analysis must be designed for the overall value chain.

**It is possible for companies to be integrated into the global value chain in different intensities based on their attributes, capacities, goals and the features of their business environment.** Increasing the productivity levels of companies depends on the improvement of their competencies. In today's global value chains, non-price factors such as quality, demand compliance and delivery times become more important than competitive prices (Taglioni and Winkler, 2016). The following table shows the skills required for integration into global value chains, the stages of integration, the purchasing side and the sales parties. It can be stated that there is diversity of companies in the structure of the private sector in Turkey, that range from the lowest to the highest level. It would be useful to construct the TFP policy framework by taking into consideration the stages and capability requirements in this context. In particular, organizations play a central role in developing high value-added competencies such as research and development.

**Table 1: Stages and Required Capabilities in Value Chain Integration**

<b>Stage of integration into the value chain</b>	<b>Purchasing party</b>	<b>Selling party</b>
<b>Level of matured interaction</b>	<ul style="list-style-type: none"> <li>• Purchasing processes between the primary company and the supplier becoming compatible</li> <li>• Strong and systematic relationships with suppliers</li> <li>• Strong and systematic relationships with technology / R&amp;D organizations</li> </ul>	<ul style="list-style-type: none"> <li>• Corporate capital becoming the most fundamental capability</li> <li>• Becoming a leader in research and development</li> <li>• Becoming a brand with global recognition</li> <li>• Functional development, the ability to leap into other sectors</li> </ul>
<b>Progressing in the value chain (upgrading)</b>	<ul style="list-style-type: none"> <li>• Quality of inputs</li> <li>• Improvement of the capital intensity</li> <li>• Research and development for implementation / customization (for the use of inputs in the product)</li> </ul>	<ul style="list-style-type: none"> <li>• Gaining intangible capital capabilities</li> <li>• Company management and organizational skills</li> <li>• Learning the conditions of demand</li> <li>• R&amp;D for implementation, product and process development</li> </ul>
<b>Connecting to the global value chain, first contact</b>	<ul style="list-style-type: none"> <li>• Ensuring consistent access to inputs</li> <li>• Development of investment capabilities</li> </ul>	<ul style="list-style-type: none"> <li>• Effective use of agents and interfaces</li> <li>• Learning by imitation</li> </ul>
<b>The stage before the connection to the global value chain</b>	<ul style="list-style-type: none"> <li>• Overcoming obstacles to importing and purchasing</li> </ul>	<ul style="list-style-type: none"> <li>• Overcoming obstacles to exporting and international sales</li> </ul>

Source: Mariscal and Taglioni, 2017.

**The core trends that are outlined above enabled the creation of a series of hypotheses in the TFP Project, which have been tested through the TFP Survey, face-to-face interviews and thematic workshops. Findings resulting from these studies are outlined below:**

- Companies supplying global firms make significant headway in technological development. In interviews held as part of the project, it was observed that a company's level of internalization of the elements that are critical for the performance of productivity such as lean production, quality processes, cost accounting and a work environment that drives motivation depends on the depth of the company's interaction with the global firms. On the other hand, it is also easier for companies that have passed the certification processes of global companies to reach other networks and markets. Companies inspect their suppliers in line with the demands from customers and accordingly, the quality of production processes increases.
- Today, primary companies/customers/buyers adopt a more systematic approach to the organization and management of the supply chains of companies so that the required quality and rate of production can be maintained. There is a systematic structure within the scope of both supplier selection and monitoring of suppliers' performance and development of suppliers, especially in the automotive and white goods sectors. Supplier selection in the clothing industry has displayed a significant improvement led by foreign purchasing companies. There is vertical integration and an associated supplier development in the automotive and white goods sectors, while there is contract manufacturer development and the supervision of contract manufacturers in the clothing and food industries, respectively.
- Consolidation tendency is prevalent in the management of the supply chain. In general, 2-3 alternative suppliers have been identified in order to ensure supply security in the examined sectors. In company interviews, there were predictions that there would be a reduction in the number of suppliers in the automotive and white goods sectors in coming years.
- More than half of the companies that participated in the TFP Survey intend to maintain customer relations as they have in the past, while 26% indicated that

they would pursue new domestic customers. In this context, the second most stated plan (9%) was the diversification of the goods that are sold to customers. Approximately 10% of the companies stated that the target market of the company would change (focus on exports, deal with large-scale customers, etc.).

- Of all the companies that participated in the TFP Survey, the ratio of those with international connections aside from import and export activities was 21%. For companies in the automotive and electrical appliance industries that have a direct position in the supply chain of global companies (OEMs), this ratio was over 60%.
- Based on econometric analyses, large companies with international connections that were engaged in R&D activities tended to have higher productivity and stronger technology innovation.
- There was a strong positive correlation between entering international markets, the availability of foreign capital in the ownership structure of the firm and productivity performance.
- One of the methods preferred by the companies to improve their international connections was to buy a foreign brand. There was a tendency in the clothing and white goods industries, as well as a number of automotive companies, towards branding by acquiring available foreign brands.

## **Access to information, R&D, Innovation and Technology Transfer**

**A company's access to information and its ability to use information and process and improve it for its production directly affects the productivity of that company.** While information and technology are considered to be external factors in neoclassical growth theory (Solow, 1957); in today's growth models, information is now assessed to be an internal factor (Romer, 1990). It is difficult to collect information in this area. Therefore, the required estimates are usually acquired through information channels such as R&D, patents, use of information technologies and personnel training. Furthermore, direct foreign investments are now also considered as a channel of information transfer. In all these models, a

special role is attributed to innovation for maintaining technological advancement, new products, production processes and the emergence of organizational changes underline the impact of accelerating TFP (UNIDO, 2007). On the other hand, companies' access to information through infrastructure that provides speed is necessary for their access to labor and raw material markets, acceleration of their business processes, and the development of new consumer practices and services. Businesses' rapid access to the internet through broadband improves factor productivity and contributes to growth (ITU, 2012)<sup>1</sup>. Turkey is low on the list of OECD countries<sup>2</sup> in broadband internet access (OECD, 2017).

The following findings were obtained from the field studies, surveys and workshops carried out within the scope of the TFV Project, on the relationship between accessibility and innovation dynamics and productivity of companies in the manufacturing industry in Turkey:

- **Key information sources.** Key information sources of companies vary significantly depending on the sectors of the companies. In all sectors, feedback from users/customers, open sources of information and trade fairs / overseas trips appear to be the most common information sources. The main sources of information for companies at the top of the supply chains of automotive and electrical appliance industries were internal and intercompany R&D activities. Information sources in the leading automotive and white goods companies were R&D activities and foreign partners; design activities, global buyer companies and personnel transfer in the clothing industry; and machinery producers, suppliers of raw materials and preservatives and personnel transfer in the food sector. Significant factors that could lead to a productivity gap between competitor countries/firms include the higher scale of production of foreign competitors, their higher levels of mechanization/automation, and their higher level of skills in information and communication technologies.

- **Innovation trends.** More than half of the companies that participated in the TFP Survey have had their trademarks registered, while 1/3 of them performed

<sup>1</sup> *The relationship between productivity and the companies' broadband internet access, their website and use of social networks was found to be inversely related in the TFP Survey. It is believed that this finding which contradicts the mainstream findings in this area should be researched in more detail through other studies.*

<sup>2</sup> *In the companies' access to broadband internet, Turkey ranks 31st out of 35 countries and 29th out of 34 countries in the use of cloud technology services.*



product innovation. Nearly 1/5 of them have industrial design registrations and patent applications. In a significant portion of the companies that renewed their products, innovation covers only their own markets (72%), while it covers only the company's practices in a higher portion of companies (85%). Income generated from new products created for the companies' own markets corresponds to approximately 1/4 of the total turnover, while income generated from products which are new only for the companies themselves corresponds to approximately 1/5 of the total turnover<sup>3</sup>.

- **Process innovation.** Of companies which performed process innovation, approximately 1/3 applied new or improved manufacturing methods while 1/5 supported logistics, delivery and distribution methods.

- **Reasons for not innovating.** A majority the companies (83%) do not innovate because there are no factors forcing them to innovate and the remaining companies (17%) do not innovate because they encounter factors that prevent the innovation action. The most cited reason for not innovating is the low demand in the market for innovation.

- **The relationship between productivity and innovation.** The relationship between productivity and innovation has been estimated in line with the model created by the survey data. When only the variable of innovation is addressed, the relationship between productivity and innovation is positive and statistically significant. When the variables of layer and industry, in which the company is involved, are also incorporated into the model, the correlation between productivity and innovation shows no change. R&D activities have a strong impact on innovation and productivity.

- **The relationship between R&D and productivity.** R&D activities appear to greatly contribute to productivity and the tendency for technological innovation in line with the model created by the survey data.

<sup>3</sup> While questions related to innovation in the World Bank Business Survey for the Assessment Study on Regional Investment Climate and the Total Factor Productivity surveys are conceptually based on similar hypotheses such as product and process innovation and innovation in terms of the market, they differ from each other. Apart from asking if there is innovation, The World Bank survey requires the innovation to be explained in an open-ended manner and the responses are filtered based on the content of these explanations.

- **Methods of technology transfer.** Firms do not produce the information that are required for investment, production and innovation activities by themselves, instead they try to obtain this information from various channels. When technological information sources that firms benefit from such as design and product development are examined, it is seen that technology transfer significantly increases the productivity. It is concluded that companies that transfer know-how and technology through channels such as “qualified senior executive/technical personnel transfer”, “knowledge transfer from the primary company” and “technology transfer via patent and license” are more productive. The use of open information sources also provides a partially positive contribution to productivity. The companies transferring know-how and technology through the employment of qualified personnel and license agreements or directly from the primary company are more productive, but this source of information fails to make companies more innovative.

- **Use of technology and productivity.** Variables of technology use (embedded software, cloud computing, the internet of things, large data, flexible automation, smart robots, e-commerce, international digital payment, radio frequency identification [RFID], new materials, three dimensional printers, etc.) have a positive impact on productivity. The effect of “Broadband internet access” and “Website/social networks” appears to be negative. It was found that companies using information, material and e-commerce technologies are more innovative, while those using MIS and the web (social networks) are less innovative.

- **Reverse engineering.** Companies obtaining knowledge and technology by reverse engineering are less innovative. Companies pursuing a passive imitation strategy fail to be technologically innovation. However,, for companies with low capacity, passive imitation practices are a natural stage of development. active policies, such as R&D and technology transfer, should be pursued by companies for technological innovationat later stages.

**In the thematic workshops held as part of the TFP Project, critical findings on how the effectiveness of R&D expenses can be improved and particularly on how commercialization processes can be accelerated were compiled.** It is mentioned that there are significant setbacks in commercialization and the effective use of funds in our country, despite the recent rapid increase in R&D spending. One of the main shortcomings in commercialization is not being able to sufficiently identify/analyze market needs. Prioritization of capacity building for R&D in the private sector from a productivity point of view is important. For this

purpose, elements such as the promotion of the key industry and sub-industry for working on R&D and design, together with providing flexible conditions for the setup of R&D centers and capacity development to calculate the effect of intellectual capital on the assets of companies have been emphasized.

## **Intercompany Collaborations and Long-Term Customer Relations**

**As much as a company's ability to maintain its position in the supply chain depends on factors such as quality, speed and cost it is also related to its ability to develop trust-based relationships with its customers.** The healthy development of relationships and collaborations with customers contributes to the development of the company's capacity in information management, better acquisition of knowledge on demand dynamics and the customization of the support functions of production and after-sales based on the specific needs of the customers. The positive effects of the collaboration between the key industry and sub-industry in areas such as product design and R&D on productivity and innovation are known, particularly at the stage before a new product is launched (OECD, 2015; Barajas et al. 2011).

**As a result of the TFP Survey, company interviews and thematic workshops, significant findings on the identification of the status of long-term customer (LTC) relations in the manufacturing industry in our country and how it effects productivity were obtained.** These findings primarily focus on the identification of the current state. In addition, key problems that limit the strengthening of collaborations between companies, the effects on productivity and solutions to improve them were also compiled. Key findings that shed light on the current situation are outlined below:

- **Weight of LTCs.** LTCs have an average share of approximately 66% in the turnover of companies. The sector with the highest share of income generated from LTCs is the chemicals industry in the second category<sup>4</sup>, with 78% of its turnover generated from LTCs. Out of the companies in the third category, those in the mineral/metal industry have the highest turnover share generated from LTCs with a share of 71%.

<sup>4</sup> While the companies within the top 100 industrial organizations in Turkey in the relevant sector are included in the first category in the TFP Company Survey, companies in other categories are classified based on their supply chain relationships.

• **Intercompany collaborations and areas of support.** Approximately 81% of companies do not receive any support from their customers. 7% of the companies receive support from their clients on transportation/shipment, while approximately 5% receive know-how support on financing, compliance with environmental standards, mutual input procurement, and market/demand conditions. A very small portion of the companies receive support from their customers and these supports can help to reduce costs. The most significant support providing these benefits is mutual input financing. 29% of those who receive this support and 22% of those who receive financing support gain cost benefits. Those who receive transportation support are able to lower their costs by 20%.

• **Intersectoral differences.** The number of long-term (2 years or more) customers asked for the purpose of identifying the companies in the supply chain is 95%. Food industry companies in the second category have the highest number of long-term customers with 242 customers. Mineral/metal industry companies in the same category ranks second with 236 long-term customers on average, while the wood products industry ranks third with 166 customers. Of the companies in third place in the value chain, the industry with the highest number of long-term customers is the food industry with 113 customers. The lowest number of long-term customers was found to be in the machine industry in the third category with 75 long-term customers.

• **Domestic and international distribution of LTCs.** It has been observed that the average number of long-term customers that the companies have in Turkey constitutes 81% of all customers. It has been observed that the companies in the second category of the value chain serve domestic customers to a greater extent usually with a rate of over 90%. Turkish customer rates for companies in the third category are lower. For example, in the food industry this rate can be as low as 72%.

**Significant findings on the effects of the practices and trends in this area have been compiled:**

• Being part of a value chain has a positive impact on productivity and innovation. In this context, the share of LTCs in turnover increases the productivity of companies, however its effect on technological innovation is not positive nor

significant. Companies with an increasing number of LTCs in the last five years are more productive than those with an unchanged number of LTCs and the latter are more productive than those with a decreasing number of LTCs. The innovation tendency of companies with an increasing number of LTCs is higher than those in other groups, but the innovation tendency of companies with an unchanged number of LTCs are lower than those with a decreasing number of LTCs.

- Companies with joint R&D and design activities with their customers have higher productivity, and this effect remains to be valid in all models. Engaging in joint R&D designs with customers has a positive impact on the tendency for technological innovation, however it is ineffective in the model where all variables are included.
- The support provided by customers has a positive, but insignificant effect on productivity. The effect on technological innovation is positive and statistically significant, but this effect is lost when the variables of technologies, personnel management and organizational structure are added to the innovation model.
- Joint projects executed with machinery manufacturers reflect positively on the productivity of companies. It is observed that successful companies in the food industry, in particular, carry out joint productivity projects with domestic and/or foreign companies manufacturing machinery equipment.

**Finally, key problems and future expectations in this area are outlined below under four headings:**

- **Key problems.** One of the most frequently mentioned problems with customers is the irregularity of payments. Around 71% of companies complained about this issue. There are no significant differences between industries on this matter. The second problem that companies face most frequently with their customers is the pressure on prices from customers, with an rate of 51%. The third most common problem with customers are the time challenges caused by the orders. The companies that stated that their productivity is high compared to their global competitors, responded only to the problem areas (33%) over the percentage of all firms (39%). 32% of the companies indicated receiving orders in very small batches as the fourth biggest problem. The fifth most significant problem experienced with customers (28%) were the disruptions in the information flow.

Table 2: Problems Encountered with Long-Term Customers (percentage of the companies experiencing problems)	Productivity by global competitors			Total
	Lower	Nearly similar	Higher	
Irregularity of payments	81.4	70.4	56.3	70.7
Suppression of prices	46.4	55.2	50.9	51.3
Shortage of time for ordered goods	30.1	33.0	39.1	32.8
Very small lots of ordered goods	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
Failure to support supplier development	26.3	20.6	18.2	20.8
Frequent change of product specs	12.5	24.2	16.1	18.5
Failure to communicate manufacturing schedule in time	19.4	27.6	21.7	18.2
Failure to provide financial support	17.3	22.9	12.5	18.2
Lack of production capacity to meet customer demand	3.6	10.7	9.0	7.9
Conflict in quality	5.2	9.8	5.6	7.1

*NOTE: The companies who have not responded to the productivity.*

• **Becoming transparent.** Enabling transparency for the improvement of trust between companies is emphasized. While the most important problems faced in the development of intercompany relationships used to be related to logistics and infrastructure, today, the most significant problem was identified to be transparency. An open line of communication between suppliers, logistics companies and the primary company and software including effective Enterprise Resource Planning (ERP) systems and end-to-end solutions have gained importance. On the other hand, processes with respect to the adoption of transparency can create concerns with SMEs and businesses can have reservations on the openness of their internal processes. It is emphasized that the key role that the main industry will play in this ecosystem is to create an environment where the main industry and sub-industry can act together. At this point, the regulatory role of the state for the sharing and protection of commercial/financial secrets is important.

- **Turnover rate.** The total customer turnover rate of the companies that participated in the study is 44%. This indicates that an unstable relationship has been built with customers. This rate reaches up to 60% for mineral/metal industry companies in the second category, which is the highest rate in the table. The lowest customer turnover rate is found to be 18%, which is in the chemicals industry. For companies the third category of the value chain, the outlook of customer relations is generally even more unstable.

- **Future expectations.** Companies mostly state that they will not change their relationships with their suppliers in the future. The most prominent plan for the future is that they will only work with new supplies that are better than their existing ones. The second most frequently stated plan is the elimination of unsatisfying suppliers and a reduction in the number of suppliers. The third plan is the willingness of companies to give more importance to the development of their institutional / organizational skills.

## **Use of Modern Manufacturing Techniques**

**The studies conducted to measure the productivity of the domestic manufacturing industry reveal that the production methods adopted by companies significantly affect corporate productivity.** It is seen that companies with higher productivity scores have developed lean production methods, improved their employees multi-tasking duties and they often optimize corporate workflows and production platforms as well as applying specific procedures to evaluate the performance of employees (McKinsey, 2003). Although public policies play a minor role in the adaptation of these methods, facilitating integration into global supply and value chains and thus contributing to the adoption of these aforementioned practices would significantly impact the effectiveness.

**Findings from the TFP Survey, company interviews and thematic workshops about the use of modern production methods and their impact on effectiveness are summarized below:**

- **Standard operating procedures (SOP).** The rate of companies that apply SOP is 55%. This rate is far above the average in Tier 1 and Tier 2<sup>5</sup> companies but quite below-average in Tier 3 companies. Almost half of the companies apply SOP for frequently repeated out-of-production activities. The majority of Tier 3 companies do not apply SOP. Almost all of the companies that apply SOP organize specific training programs for their employees before initiating new assignments.

- **Setting total equipment effectiveness targets (OEE).** The number of companies that have specific targets for OEE is almost half of the sample group. This indicator shows a similarity with that of SOP practices in terms of both sectoral practices and multi-tier company classification. In other words, it can be said that companies that implement the SOP have also set targets for equipment efficiency. The rate of companies that carry out separate OEE monitoring processes for each equipment is almost half of all companies. This means that around half of the companies take necessary measures to improve OEE.

- **Quality processes.** Quality control processes are at most implemented for each phase of the quality assurance process or each lot of production. When the companies are evaluated according to their position in the sector, it is seen that the quality processes are relatively effective in Tier 1 and Tier 2 companies, but there are significant shortcomings in almost all of the sectors covered. During the thematic workshops, it was stated that some companies obtain quality certificates at low prices for only fulfilling requirements and thus, these certifications do not reflect effectiveness.

- **Kaizen system.** It is seen that some companies, particularly those in the automotive sector, integrate “Kaizen Value Systems” to corporate activities in order to improve the production processes. Some companies take suggestions of blue-collar employees into consideration and adopt specific strategies to structure the production activities, while most of them apply traditional methods.

- **Benchmarking and key performance indicators.** Almost half of the companies identify key performance indicators (KPI) for different stages of production

<sup>5</sup> While the largest 100 industrial organizations in Turkey in the relevant sector are included in the TFP Company Survey as Tier 1 companies, companies in other categories are classified based on their relationships with the supply chain.



processes. This rate is significantly higher for Tier 1 and Tier 2 companies than Tier 3 organizations. Only a limited number of countries have “benchmark” values related to productivity. These values are obtained through the major companies, business customers/clients, staff transfers, “inventory values” in machine-equipment installation, sector-based organizations and consulting firms. Cost structure of production, partial productivity indicators, changeover time, turnover rates and inventory costs are significant performance indicators monitored by companies. On the other hand, raw material costs, compensation of employees and energy costs are intensely monitored; while the production per employee, capacity utilization rate, production per energy consumption, factory productivity and production line productivity values are often used as partial productivity indicators.

- **Productivity measurement trends.** Measurement and evaluation activities related to productivity levels and growth in productivity have gained wide currency among companies. The leading companies, particularly those in the automotive and white goods sectors, have developed productivity measurement systems and necessary policies, and ensured significant improvement in productivity through post-measurement precautions. It is also seen that the productivity measurement and evaluation activities have been initiated based on the demands of major companies or global business customers and affiliations of large-sized holding companies often perform more intense and comprehensive productivity studies. On the other hand, especially in the food and clothing sectors, we see large-scale and branded production but efforts and intentions to perform productivity studies are still in its early stages.

- **Consulting for studies.** Companies receiving consulting services for productivity studies are increasing day by day. Particularly the major companies in the automotive and white goods sectors often try to improve productivity levels through corporate activities carried out by their own employees and only temporarily contracting external consulting services. However, the productivity studies in the clothing and food sectors are generally conducted with external support.

- **Basic skills.** Companies that have already overcome deficiencies in terms of basic production skills often focus on innovation. That is to say that a company with high turnover rates does not intend to take innovation a priority. Low levels of innovation show significant ongoing deficiencies in basic production capabilities.

## Company Management Quality and Institutionalization

**Studies using microdata collected at the company level reveal that management quality is a significant actor in explaining in-country and intercountry differences of productivity.** Company management practices include how they monitor internal issues; how they achieve the best performance from employees; and to what extent they can evaluate and turn results into measures. These tools, processes and systems integrates new information containing the company's optimal methods and technologies with the capabilities of human resource management, ultimately contributing to the company's productivity.

In the World Management Survey that questions basic management practices, situation of Turkey can be reviewed in comparison to other countries. During the period of 2013-2014,

- Turkey ranked 21st out of 35 countries in terms of quality of management practices. A management quality score of 2.7 on a five-point scale obtained by manufacturing companies in our country indicates a mediocre performance.
- As a method of surveying, this study makes comparisons between the actual values and those provided by managers and thus evaluates "overconfidence" levels of managers. Deviation from actual values may lead managers to be resistant to innovation and incompetent in the pursuit of improvement (Del Carpio and Taşkın, 2016).
- There is a positive and statistically significant relationship between the added value based on labor time and the quality of management in manufacturing sub-sectors (ibid).
- Transnational companies have a higher quality of management than local organizations and family-owned or private companies are superior to other types of companies in these term. Managers of companies that are better managed

often have more authority in significant processes such as recruitment, sales and production and employees (managers or non-managers) often have higher levels of education (ibid).

**Findings obtained through the TFP Survey, corporate interviews and thematic workshops are summarized below:**

- **Holding affiliates.** Within the scope of the TFP survey, 25% of the firms in the sample are affiliates of the holding. This rate is observed to be quite high in Tier 1<sup>6</sup> companies in the relevant value chain and decreases in lower tiers. The highest rate of holding affiliates belongs to the homeware sector with 86% among Tier 1 companies. On the other hand, holding affiliates among Tier 3 companies in the machine industry have the lowest rate with 21%. It is observed that in cases where holdings have affiliates in multiple sector companies inter-sectoral training and knowledge and information transfer is undertaken. For instance; a successful practice in the automotive sector can be adapted to electronics. Being a part of a holding has a positive impact on every model in terms of productivity and technological innovation. However; as new variables are added to the measurement processes, this impact weakens and loses its significance.

- **Institutionalization.** Around 20% of family-owned companies have entered into the process of institutionalization. Moreover, the rate of companies which have developed internal organization units is 19%. There are also companies that have performed minor, mainly geographical changes and structural modifications. As another indicator of institutionalization, the rate of companies which have appointed owners' relatives in executive positions is around 32%. In this context, the lowest rates (8% and 13%) belong to companies in the automotive and homeware sectors, respectively. However, for main industrial food (39%), textile and ready-made clothing (57%) companies, this rate is much higher. For almost all Tier 2 companies, this rate is far above the average.

- **Family businesses.** It is observed that the rate of family-owned businesses is higher among Tier 1 and Tier 2 companies. The general rate of family businesses was calculated to be approximately 29% of the sample. Among them, the highest rates of family businesses belong to food and textile and ready-made clothing

<sup>6</sup> While the largest 100 industrial organizations in Turkey in the relevant sector are included in the TFP Company Survey as Tier 1 companies, companies in other categories are classified based on their relationships with the supply chain.

industries. The lowest family business rate, however, is observed in Tier 3 companies of the wood product industry.

- **Transition to the second generation.** In a significant number of sectors and regions, industrial companies are in a transition process to the second generation. It has been observed that the companies that successfully manage this transformation process have also experienced a change in their business models, moving towards the higher levels or areas of added value in relevant value chains. Managers of the second generation are more inclined to implement mentoring, coaching, clustering and similar other services compared to older generation. The positive impacts of the transition process to the second generation is substantially associated with the skills of this new generation. Monitoring and support activities toward this transition in family businesses, which have a significant place among SMEs, would be beneficial. It is also thought that facilitating this transition process with effective tools such as coaching, mentoring and consulting would contribute to national competitiveness.

- **Strategic planning.** Around 65% of the companies perform regular strategic planning activities. Strategic plans are generally drawn up with the participation of employees and the implementation process is monitored and evaluated.

- **Advantages of family businesses.** In comparison with companies managed by a completely professional team, family businesses have certain advantages. For instance, when family businesses go through difficult times, family members may sacrifice their own assets to improve the situation. However; this cannot be expected even from the CEO of a corporate organization. The spirit of a company's foundation process should be preserved during the transfer of the business to the second generation and the "clawing our way to the top" story should be well communicated. In addition to this, it is often mentioned that managers from the new generation are more inclined to set corporate rules, although they are not as challenging as the founding generation. Therefore, it is important to facilitate this transition process with "coaching" services.

- **Institutionalization and resilience.** Most institutionalization instruments aim at stabilization and standardization of processes. On the other hand, we witness significant changes in these processes due to technological advances. During this

transition period, companies, particularly family business, have to be resilient and prevent transforming into “bureaucratic kingdoms”.

- **Impact of different practices on productivity.** Productivity of companies that have changed their organizational structures and established performance management systems is relatively high, but this effect is weak. Productivity of companies implementing flexible labor policies, performance based reward systems and Key Performance Indicators (KPI) is found to be lower compared to the others. The tendency of companies that have established quality control and performance systems, changed their organizational structures and implement KPIs into technological innovation is relatively high. Flexible labor policies also have a negative effect on technological innovation as well as on productivity. Companies that have Management Information Systems are found to be more productive but less innovative.

- **Digitalization.** Information technologies affect all operations, behaviors, workflows and processes in a company, including relations (i) inside the institution, (ii) with suppliers and (iii) with customers. Significant IT breakthroughs must be supported by organizational change. Information technologies, on one hand require technological maintenance for machines and software programs together with a change in culture among individuals who use this machinery and software. Accordingly, it is necessary to organize regular training programs, use the systems efficiently and evaluate the data obtained through these systems. However, the human factor is always a determinant in the process regardless of the extent of the digital transformation and advancement in artificial intelligence applications. Information tools and systems can only ensure an increase in productivity when considered alongside corporate transformation and the quality of management and human resources.

## **Labor Productivity and Human Resources Practices**

**The quality of people is a significant factor in corporate functioning such as the operation of production tools, corporate decision-making processes, innovation and the delivery of goods and services to end users.** A study that compares findings of a research about work and education experiences of citizens of Denmark between 1980 and 2001 and the data obtained by another

study examining added values at the corporate level for the 1992-2001 period, proves that human capital inputs have a significantly positive impact on corporate outcomes (Fox and Smeets, 2011). In another study examining labor data of 26 different sectors in 5 countries between 1979 and 2000, it is suggested that besides the certified education levels (high school, graduate degree etc.), in-service training programs and practical experience (human capital) also have a significantly positive impact on corporate outcomes (Mason and Vecchi, 2012).

**Findings obtained through the TFP Survey, corporate interviews and thematic workshops are summarized below:**

- **Rate of white-collar employees and their productivity levels.** The rate of white collar employees, which is an indicator of quality concentration, is 20%. The highest rate in number of white-collar employees belong to the automotive industry with 36%, which is considered as a Tier 1<sup>7</sup> sector. In the main food industry and among Tier 2 companies, the rate of white-collar employees is around 32%. It is followed by the wood products industry with 30%. Companies with higher rates of white-collar employees often have higher averages of productivity. The worker to white-collar worker ratio within a company has a positive impact on productivity. However, the rate of white-collar workers has limited effect on technological innovations when R&D activities are excluded.

- **Labor turnover rate.** High labor turnover rates pose a significant issue for companies. Only a limited number of companies among the interviewed organizations have turnover rates around 2-2.5%. This rate is around 60% in a large number of companies, which is far above the acceptable threshold. The labor turnover rate is rather low in the automotive and white goods sectors, but high in clothing and food industries. This rate is 30.6% for white-collar employees and 34.6% for blue-collar employees. On the other hand, the labor turnover rate of white-collar employees is relatively high in the food industry. This rate is also higher in Tier 3 companies. It is noteworthy that the labor turnover rate in blue-collar workers is higher in the wood product and textiles / ready-made clothing sectors.

- **Number of shifts.** The average number of shifts the companies are running is 1.6. The highest number of shifts is being run in main industrial food companies with an average of 2.7, while the number of shifts in main industrial textiles

<sup>7</sup> While the largest 100 industrial organizations in Turkey in the relevant sector are included in the TFP Company Survey as Tier 1 companies, companies in other categories are classified based on their relationships with the supply chain.

and ready-made clothing companies with 1.7. Moreover, the number of shifts is measured as 2.1 in electrical household appliances and motor vehicles industries. In Tier 2 companies, the average number of shifts in most of the industries is 1.8. On the other hand, the lowest number of shifts is seen in Tier 3 companies of wood products and machinery industries with an average of 1.3.

• **Human capital policies and labor productivity.** Corporate and professional organizations often perform well in human resources practices, such as career opportunities and performance-based promotions. Many companies that fall behind in terms of institutionalization also lack in consistent systematic human capital policies. A majority of companies monitor performance levels of employees. The most frequently used strategies by companies to increase labor productivity are regular payment of wages, in-house training programs, non-wage social benefits and similar others. The aforementioned first two strategies stand out among others in all tiers of sectors and companies. The effect of personnel management and organizational structure on productivity and technological innovation activities is rather complicated. The companies prioritizing labor flexibility are often the non-productive and less innovative ones. The companies employing quality control, KPI and performance systems with transformed organizational structures are more innovative. The productiveness of companies adopting rewarding and analogous practices for KPI and personnel management is found to be lower on average. In these companies, confidence precludes qualification in recruitment processes. The productivity of companies, which adopts performance-based promotion and rewarding practices in order to increase productivity of employees, is found to be lower in average. This finding pointing to the contrary of the expectation may result in inefficiency due to the fact that the personnel management systems create excessive bureaucracy against the cost of implementation and reduce the motivation as a result of its strict application. Another reason may be that the classical methods have become invalid in today's world, which is shaped by the transformations that technological advances have forced.

• **Labor perceptions of businesses.** The companies that participated into the survey rated their employees 3.5 (medium-high) on a 5-point scale, in terms of their knowledge / skills and motivation levels. Levels of knowledge / skills and motivation of white-collar employees in all sectors were found to be slightly (on a limited level) more positive compared to blue-collar workers. Satisfaction with employees' level of knowledge / skills and motivation is higher in companies within the automotive sector than the other companies.



## **TFP Policy Framework**



Studies conducted in different periods, different countries, and for different purposes all indicate a number of factors that play significant roles in Total Factor Productivity (TFP)<sup>8</sup>. Use of technology, labor skills, management quality of companies, investment environment, incentives that support innovation and entrepreneurship, and ease of access to financing are among many different policy areas that may play a role in increasing TFP levels. At the macro level, regulations about both the factors that shape the macroeconomic conditions (policy predictability, price stability, factor prices) and the regulations that affect the markets in general (output markets, capital markets, labor markets, deregulation of professional services) and horizontal policy areas such as human capital and investment environment may significantly affect TFP trends. At the micro level, on the other hand, we see a gap that can also be called a “black box” as both domestic and international studies that examine corporate dynamics in terms of public policies and responses are inadequate in their scope and frequency. The micro level can be divided into three main elements:

- Production issues: Scale, capital intensity, production technology, machinery and quality of equipment, quality of labor, level of capacity utilization
- Issues regarding the quality of management: Organizational structure, human resources and performance management, cost accounting, cash flow management, simple production techniques, quality standards, collaboration with suppliers
- Issues regarding business models, product and service innovation: Diversification of products and services, marketing, design skills, R&D and product development competence, entrepreneurship and innovation

In order to respond to micro-level issues, countries generally have four main policy areas:

- Improving the business environment: Infrastructure and improvement, higher education system, vocational education system and development of labor skills, free trade agreements, applicability of agreements
- Increasing the demand: Tax incentives, public procurement and naturalization, regulations, consumer financing, branding
- Encouraging production: Transfer and dissemination of technology, direct foreign investments, capital support, supply ecosystem, import regulations, development of industrial and technological areas
- Supporting innovation: R&D supports, university-industry cooperation, facilitating dissemination of new technologies among companies, financial incentives for support innovation, incentives for clustering activities

<sup>8</sup> For a detailed literature review, please 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 Organization.*

**Which of the aforementioned main policy areas should be chosen as a priority for the Eleventh Development Plan (2019-2023)?** In order to answer this question, a new policy framework has been created after synthesizing the data obtained through the business survey developed within the scope of the project; relevant literature review and analysis of foreign good practices; thematic workshops and studies with value chains; and face-to-face interviews with decision makers and stakeholders.

According to the results of the business survey, companies consider external factors such as financing problems, unexpected downsizes/fluctuations in foreign markets and labor quality, as the most significant factors hindering the growth of productivity, followed by machinery-equipment quality and supplier incompetency. Considering these results as a whole, a considerable portion of Turkish companies appear to attempt to gain competitiveness through cost reducing passive strategies such as labor flexibility, supplier price repression, etc. On the other hand, more productive companies pursue active strategies such as building long-term relationships, utilizing collaborative R&D and design activities and implementing technological innovation. These findings indicate that there is a need for enforced regulations and incentive mechanisms regarding companies' adoption of active strategies in order to increase the productivity in manufacturing industry.

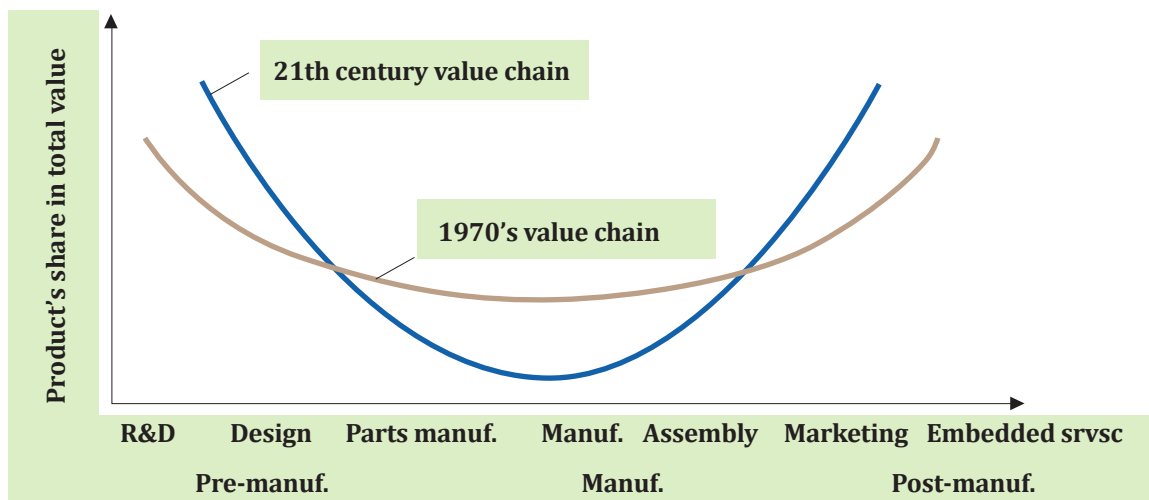
Synthesis of non-survey studies reveals a set of critical implications that may shape the policy framework design:

- According to the Germany and South Korea cases that were examined in terms of background research, it is seen that practices in Turkey do not suffice to increase TFP. Furthermore, compared to these two countries, three main deficiencies can be emphasized regarding public policies in Turkey: (i) a perspective to assess companies in terms of their productivity performance; (ii) an effective implementation capacity to selectively choose between better and worse firms, innovative and not innovative entrepreneurs; (iii) and the willingness to assess the effects of policy implementations on companies (Çağlar, 2017).
- The main reason for the productivity gap in comparison to competitor countries/ companies can be explained as differences in product ranges and business models. Today, companies with new business models that integrate new technologies

increase their competitiveness through platform revolution, industry-service integration, selling outcomes rather than products and other similar methods. According to the companies' statements, competitive foreign organizations with higher productivity performances have (i) higher production scales, (ii) higher mechanization/automation levels, (iii) better skills in information and communication technologies, (iv) better capacity to employ more innovative employees and (v) different business models.

- Supporting companies' integration into global value chains is one of the main methods to increase productivity and to reduce the gap between large and small points. On the other hand, manufacturing/assembly operations become the lowest value-added stages in value chains while some other issues such as identifying unsatisfied global needs; developing concepts regarding these needs, performing laboratory experiments; creating prototypes; performing international market research and studies; improving concepts in line with the results from feedback studies; creating, testing and developing functional products/prototypes' performing engineering processes; investing in and promoting small-scale production activities and ensuring their place in the market; establishing distribution networks; and providing supplementary services stand out as important higher value-added stages in the value chain (Figure 2).

**Figure 2:** Stages of Value Chain and Distribution of Added Value, Manufacturing Industry in the 1970s and 21st Century



Source: The 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 aforementioned findings and synthesis, a new policy framework consisting of three main components, which are based on the approach that aims to increase Turkey's high-value-added industrial product exports, are offered for the Eleventh Plan (2019-2023) with a view to increasing TFP's contribution to the economic growth:

(i) The first policy level consists of horizontal policies and includes an approach that aims to increase productivity regardless of technology, sector and region. Policies at this level mainly focus on companies that are far from the borders of technology.

(ii) The second policy level is composed of vertical policies and includes interventions that require selectiveness and focus on specific sectors, technologies and regions. Policies at this level mainly focus on companies that are essentially close to the global borders of technology.

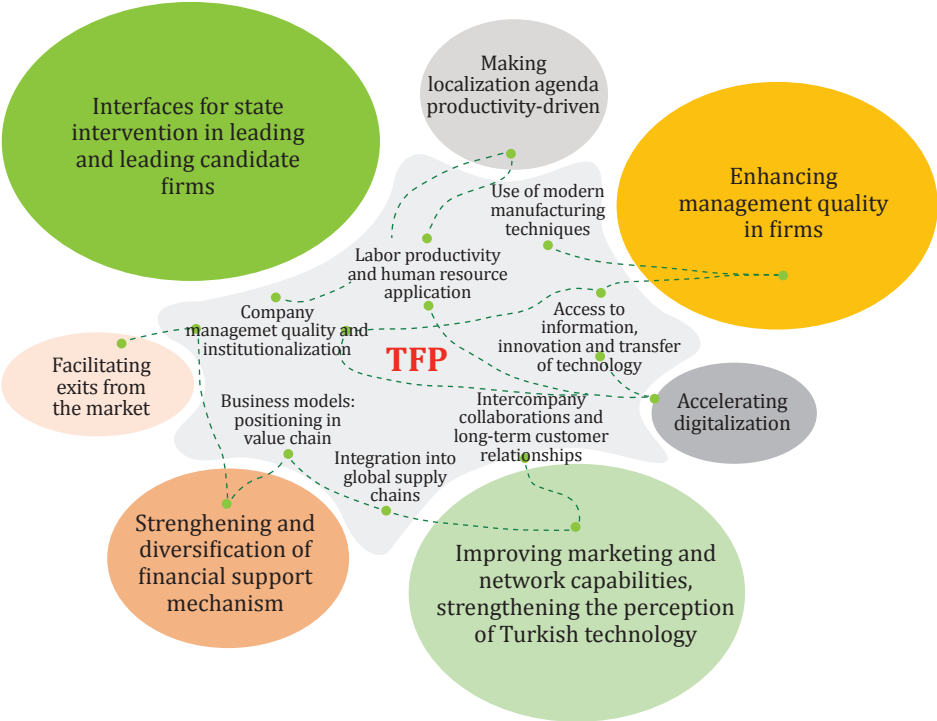
(iii) The third plane includes the outline and principles of a new implementation approach to the implementation of policies towards TFV.

The proposed policy framework includes recommendations that aim to ensure the facilitation of interventions to public authorities and focusing the issues that are identified as effective for TFP at a micro level and discussed in the second part of this report. The factors which are expected to explain TFP differences among companies may vary based on the period and perspective of analyses. However, it is possible to say that seven main issues, which are discussed in the first part of the report and mentioned as Determinants of Productivity in the Turkish Manufacturing Industry, stand out among others within the conditions under which the domestic manufacturing industry operates:

- Business models: Positioning in value chains
- Integration into global supply chains
- Access to information, innovation and transfer of technology
- Intercompany collaborations and long-term customer relationships
- Use of modern manufacturing techniques
- Company management quality and institutionalization
- Labor productivity and human resources practices

The seven fundamental policy titles mentioned in this part of the report are expected to systematically accelerate the transformation of these TFP elements. Each of these seven titles should be implemented in such a way that they are not only accelerating a single factor, but multiple factors. As presented in the figure below (Figure 3), each policy response has the potential to transform the relevant components, either directly or indirectly.

**Figure 3:** Relationship Between Determinants of Policy Priorities and Total Factor Productivity



Due to the aforementioned holistic and systematic approach, it is inevitable that the proposed framework will create a more comprehensive set of policies toward economic development. This is because, increases in TFP is the most fundamental variable that can explain the differences in economic development between countries that occur within the long term.

It is suggested that the policy bundles that consist of different tools included in this tripartite framework be built upon value changes and specific technologies and regions.

The scope of the policy framework proposed by this document is determined by the following:

- The policy framework essentially focuses on the manufacturing industry and includes software, design, marketing, e-commerce issues that are closely associated with the performance of the sector.
- However, a number of issues that are actually critical for TFP have been excluded so as to preserve the focus point and priorities of the document. These include energy efficiency, labor productivity, productivity of the public sector, and effectiveness of market regulations. There are comprehensive strategies and action plans regarding most of these issues.
- The proposed TFP policy framework is targeted at all companies but provides a special sub-framework for those that have a potential of growth and make efforts toward growing, regardless of the scale of organization. The suggested policies should be considered according to the extent organizations can benefit them not the definitions of SMEs or large-scale companies determined by legislations based on number of employees and financial turnover. In this regard, it is important to support companies that can progress toward productivity and perform necessary activities to achieve it.

**Box 1: TFP Policy Framework: Germany and South Korea Cases**

Germany and South Korea cases were examined within the scope of the TFP project. According to this, at the macro level, the policy frameworks of these countries are summarized below.

**Germany's approach:** To indirectly support global leaders by creating a competitive environment

**Germany's TFP framework:**

- i. Government subsidies that aim to increase innovation capacities
- ii. Regulations toward the labor market
- iii. A vocational education system

**Korea's approach:** Enhancing national technological capacities to ensure a rapid convergence; strengthening large companies and technology entrepreneurs through efficient public responses

**Korea's TFP framework:**

- i. Policies that aim to improve the technology ecosystem
- ii. Incentives to strengthen innovative entrepreneurship and SMEs
- iii. Human resource development and vocational education
- iv. Increasing competitiveness and integration into global economic environment

*Source: Çağlar (2017)*

## 1. Policies That Accelerate TFP

Three horizontal policies that are critical in the near future for the performance of the manufacturing industry to come into prominence as a result of the synthesis of all tasks carried out within the scope of the project that aim to increase TFP levels:

- (i) Digitalization: E-commerce, cloud computing, infrastructures, development of software sector for manufacturing industry
- (ii) Institutionalization: Quality of management, organizational problems, production quality processes
- (iii) Effectiveness of regulations about exit from markets: Prevention of resource allocation to companies that do not perform well to increase productivity and acceleration of exits from relevant markets while at the same time strengthening necessary social support programs

Within the scope of this policy area, it is recommended to implement programs to attract firms, sectors and regions that are left behind in terms of productivity. It is also significant to develop certain approaches to create, improve and coordinate strategic public responses within these programs that may directly affect increases in TFP. Moreover, current company support mechanisms in these areas should be reviewed from a productivity-based perspective and enhanced in terms of productivity.

### Accelerating Digitalization

It can be suggested that the role of digitalization in the future of industrial productivity is going to be same as that of certain factors, such as energy and transportation, in the past. It is also expected from new areas that integrate the Internet of things, artificial intelligence, additive manufacturing and software and data sciences like cloud computing to have a significant impact on productivity in addition to providing benefits such as speed, quality and flexibility. Today, a majority of countries in the world allocate resources to manufacturing projects and apply research within the scope of “Industry 4.0” or “industrial digitalization” giving priority to capacity building for SMEs actively involved in this field of activity.

According to the World Bank’s World Development Report 2016, Turkey ranks 28th among 173 countries in terms of digitalization level for the public. On the other hand, Turkey ranks 51st according to the digitalization level of companies.

The World Economic Forum (WEF) forecasts that by 2025, machines will perform more work tasks than humans, compared to 71% being performed by humans today (WEF, 2018). On the other hand, the awareness of corporate digitalization is increasing and both public and private sectors at the national level are preparing to set a course towards digitalization. Digitalization is expected to be a significant indicator of growth within the scope of the Eleventh Development Plan. Therefore, looking through the TFP perspective, digitalization comes first among the most critical horizontal policy areas.

Today, the Internet facilitates access to global markets for local companies and allows dissemination of value chains to different countries. In the near future, by 2020, the amount of e-commerce (B2B) within the global economy is expected to reach 6.7 trillion USD (Frost and Sullivan, 2015). E-export systems solve problems of a lack of knowledge and confidence in traditional methods and significant advances emerge in terms of rating, feedback, conflict resolution and payment systems. E-commerce serves as a significant opportunity to ensure access to overseas markets; improve competences by creating new marketing channels between products and customers; provide access to markets through the use of internet technologies by design and information intensive products and thus encourage online and open innovation platforms. To realize the potential of this opportunity, policy makers need to proactively support e-commerce activities and remove the obstacles that are encountered.

Increasing companies' access to information optimizes management of supply chains and customer relations and therefore directly affects capital efficiency and labor productivity. All these advances in the field of digitalization lead to a decrease in operation costs in terms of the economy in general and have a potential to contribute to the growth of TFP. However, in order to fulfill this potential and manage the risks / negative aspects, labor skill levels should be increased, unfair competition should be prevented through competition policies and individual rights should be secured by ensuring accountability.

The agenda of digitalization can be divided into two sub-divisions. The first one is to facilitate the dissemination of new technologies among companies. To ensure this, necessary measures should be taken to increase the level of digitalization, such

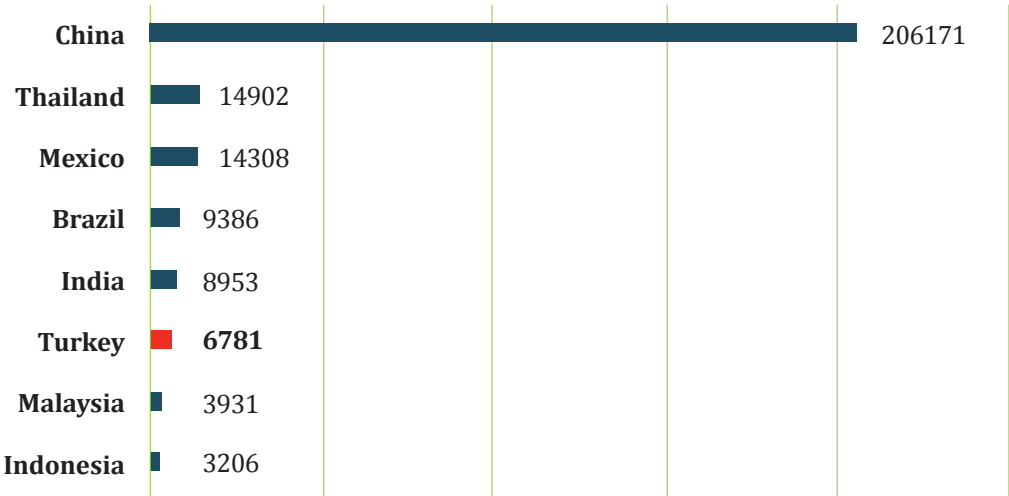


as decreasing the cost, particularly of infrastructure services, while increasing the quality. Another way to reduce the productivity gap between large and small-sized companies is to decrease the digital gap between them. Secondly, it is important to enhance capacity required for the production of new technologies. As for this priority, the vertical policy measures, which were discussed in the second part, can be taken.

According to the data from 2017, the Internet connection speed in Turkey is 7.6 mbps in general and with this value, the country ranks last among European countries and 75th among 143 countries in the world (Akamai, 2017). The low connection speed obstructs local cloud services and decreases the possibility that the country will become a significant actor in global Internet trends.

On the other hand, according to the data of the International Federation of Robotic, Turkey is at a level close to that of medium technology intensive countries with about 7.000 robots as of October 2016. (Figure 4) However, in 2016, the numbers of industrial robots put into use by South Korea and Germany was 38,000 and 20,000, respectively (IFR, 2017).

**Figure 4:** Number of Industrial Robots in Operation, October 2016



Source: International Federation of Robotics

Currently, there is only a limited amount of information and industry actors in Turkey to accelerate the digital transformation of companies. Even in the automotive sector, where the level of digitalization is rather high, the major actors can only partially affect the suppliers' levels of digitalization. In order to perform fundamental plans, market research, as well as demand and technology forecasting, suppliers should make more effective use of the digitalization process. The number of leading players in the industries, which can drive and accelerate digital evolution is limited because the development of most sectors is depend on SMEs. The insufficiency of internal dynamics imposes Public Sector an accelerating and transformer role in digitalization.

Public institutions need to implement multiple areas horizontally, undertake an accelerating and facilitating role, ensure coordination among stakeholders and use the current tools for these purposes, instead of focusing on a specific sector or technology to improve dissemination of the digitalization movement, which is a newly-emerging field. The alternative of facilitating companies through tax incentives should be to provide the necessary infrastructure to help them reach more customers. Accordingly, in addition to the corporate digitalization efforts, synergies arising from the digital interaction between suppliers, customers, banks and investors including the public sector should be used in an efficient way.

### **Priority #1: Increasing digital skills of companies and improving the software sector**

In order to decrease the digital gap between companies, they should be encouraged to use digital activities and public resources should be increase to improve the digitalization skills of companies. Within this scope, capacity building processes for information and content management (ERP, MRP), customer relations management (CRM), communication and interaction, operational feasibility (public sector, finance, e-commerce), problem solving with digital instruments, and the creation of content that will increase customer/employee satisfaction should be supported.

A new incentive tool should be developed to provide financial support for digitalization and automation investments of companies and the emphasis should be placed upon building tripartite project structures that assemble funding, plaintiff and solution provider companies under the same roof. The projects should not only focus on selling technologies but include other different factors such as services to be used permanently for operation and maintenance activities. In this regard, relatively long-term engagements should be supported and solution

provider companies, particularly those in the software industry, should be allowed in terms of development.

Necessary incentives should be increased to encourage companies to engage in online activities and the cooperation between chambers, development agencies, municipalities, non-governmental organizations and large-scale technology companies should be enhanced by increasing the number of effective local initiatives.

Capacity building training programs should be organized to increase digital skills and quality and quantity of the technical labor force who can utilize the opportunities provided by digital economies. It is also important to increase basic information literacy and concentrate on information-related topics in life-long learning programs.

Active investment promotions should be made to attract global actors of the information technologies sector in Turkey so as to take a share of high-value added global value chains and technology development areas and organized industrial zones should be authorized for this purpose.

## **Priority #2: Improving digital infrastructure**

In line with the planned cost-benefit analyses, the aim should be to increase broadband Internet access and speed and the use of broadband services should be extended. Moreover, it should be aimed to place Turkey<sup>9</sup> among the top ten OECD countries with its performance in relevant fields and a robust policy target should be adopted to decrease the costs.

The national broadband strategy should be implemented to extend necessary infrastructure; competitiveness in new generation and large-scale broadband infrastructure investments should be increased; and the private sector should be encouraged in this regard through taxation regulations that stimulate the demand. Each company in selected organized industrial zones should be provided with access to fiber Internet services (in accordance with the top values in the OECD ranking) and pilot areas should be determined to monitor and document the impact of high-speed Internet access on competitiveness. In addition to the results of the pilot project, necessary decisions should be made in line with the relevant cost-benefit analysis.

<sup>9</sup> For OECD statistics about broadband Internet speeds, companies' access to and use of Internet services, please see: <http://bit.ly/2p6UY7p>

### **Priority #3: Improvement in e-commerce capacity**

To achieve the target to make Turkey both a hub of production and e-commerce in the region, the e-commerce strategy should be put into effect and the overseas expansion of Turkish products and services should be accelerated through e-commerce initiatives. In order to increase the access of SMEs to foreign markets via e-commerce, the current support framework should be enhanced and the capacity to develop customer, logistics and payment systems should be increased, particularly for B2C businesses.

A program should be developed to meet the costs of logistics centers, which is particularly common infrastructure, and to cover part of the logistics costs in international e-commerce shipments while not breaching the World Trade Organization rules.

By giving the companies that export via e-commerce a certain status, facilitating regulations in the customs and logistics processes of B2C sales of these enterprises. Programs need to be developed to provide entrepreneurs with knowledge in this field through e-export training and support programs at universities, chambers of commerce and KOSGEB.

For e-commerce stores, training programs should be prepared to enable companies that decide to start e-commerce or want to become members of existing external platforms such as Amazon, eBay, Alibaba, should be organized in order to increase their capacity to use software and to organize in these networks. Support should be given to companies that wish to establish new e-commerce platforms as well as those operating existing platforms to assist with design, software, marketing, translations into the languages of countries where sales will be made and compliance to payment systems, etc.

Support should be given also to the offices and information centers as well as distribution centers being established abroad by the companies, and logistics possibilities of e-exporters should be enhanced.

Platforms and programs supporting e-export should be created to gather all departments within the sector, such as logistics, payment systems, location and content providers in addition to individual e-commerce players, under the

same roof. E-commerce collaborations should be therefore encouraged, and a progress should be made in a manner to compete with international networks of competitors by improving economies of scale and learning between stakeholders.

**Priority #4: Extending cloud computing**

The target of “making Turkey the regional data center and extending cloud computing” stipulated in the Information Society Strategy should be prioritized.

Companies should increase their use of cloud computing. This should be aimed at enhancing the quantity and quality of enterprises that develop original practices in this area. Specific support should be given to accelerator programs to enhance cloud computing enterprises within the scope of incubation support programs.

A campaign on the advantages of cloud computing should be organized under the control of SMEs.

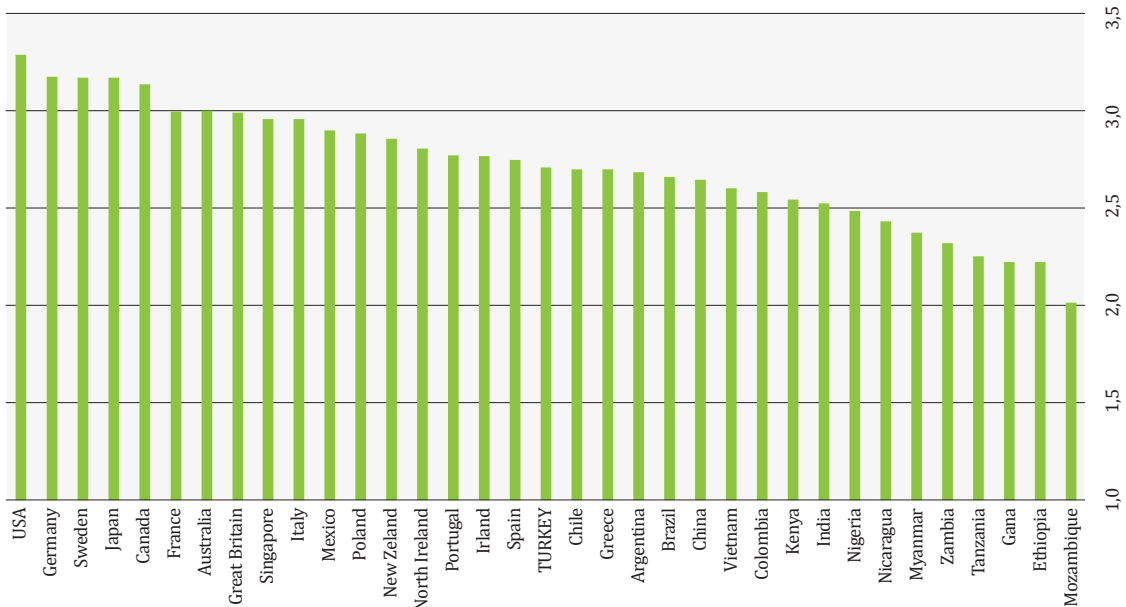
In order to eliminate companies’ concerns regarding cyber security, legal measures should be taken where needed by cloud computing service providers for data safety in line with European Union legislation.

## Enhancing Management Quality in Firms

**Studies using microdata collected at a company level reveal that management quality is a significant actor in explaining in-country and intercountry differences of productivity.** Company management practices include how they monitor internal issues; how they achieve the best performance from employees; and to what extent they can evaluate and turn results into measures. These tools, processes and systems integrates new information containing the company's optimal methods and technologies with the capabilities of human resource management, ultimately contributing to the company's productivity. Adoption of examples of successful management practices by companies lowers the productivity difference between them and global leaders within their industries and contributes to enhancing productivity in the overall economy (OECD, 2015).

**In the World Management Survey that questions basic management practices, situation of Turkey can be reviewed in comparison to other countries.** During the period of 2013-2014, Turkey ranked 21st out of 35 countries in terms of quality of management practices. A management quality score of 2.7 on a five-point scale obtained by manufacturing companies in our country indicates a mediocre performance.

**Figure 5:** Average Management Quality Scores for Manufacturing Firms (on a scale from 1 to 5), 2014



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

**Considering the history of the last 30 years of industry growth in Turkey, a generational change can be observed in the management of the industrial companies that contributed to this growth.** In order to ensure this generational transition has a positive influence on companies and to guarantee sustainability of the companies, an institutional transformation is required. It has been observed that the companies that successfully manage this transformation process have also experienced a change in their business models, moving towards the higher levels or areas of added value in relevant value chains. It is seen that the second generation of managers are more inclined to utilize new technology and applications. In this respect, it is important to support the transition to the second generation or even to the third generation with correct mechanisms.

Looking at sources of technological information that companies benefit from, including design and product development, the transfer of knowledge, through the relationships they establish with the main companies who they supply within the value chain, increases productivity. Companies using methods such as transfer of qualified senior manager / technical staff, transfer of information from the parent company for ensuring manufacturing standards, transfer of information via patents and licenses make positive contributions to their productivities.

It is important for companies to attract qualified human capital and to contribute to the company's performance with correct policies to enable input and dissemination of new information within the company. The companies should be able to access qualified consultancy services so that information on corporate approaches and systems to help develop and manage the skills of human capital is obtained.

Management quality is pertinent to the management of manufacturing processes as well as pre- and post-manufacturing phases of value chain such as R&D, design and marketing. It is important and necessary to establish minimum bureaucratic processes such as operating management systems and defining processes and roles. However, there are two critical aspects regarding R&D, design and marketing phases which have a particularly higher added value in the value chain. The first is the social aspect of institutionalization. Social/behavioral management practices increasing the transfer of information and creativity should be improved both between units/employees within the company and between companies. The second aspect is the risk-taking ability in line with medium to long-term visions. Companies should be aware of technological transformation that impacts business models in a destructive manner and develop their medium to long-term visions to take advantage of opportunities arising from this transformation. Moreover, they require a business environment where they will not hesitate to take risks to invest in such visions.

### **Priority #5: Accelerating Quality and Innovation Movement**

Beginning as a private sector initiative in our country, the quality movement raised awareness about understanding the importance of quality required for the companies to compete in the European market during the early years after Turkey signed the Customs Union Agreement. The quality movement should be accelerated and this acceleration should be reinforced with an innovation movement that takes the potential structural transformation within the industry into account and is aimed at increasing global competitive advantages.

The quality and innovation movement should aim not only to increase companies' motivation to export by improving their management practices and innovation skills, but also to raise public awareness about the manufacturing industry and create pride for Turkish goods and Turkish technology.

The main performance indicators of the quality and innovation movement are prevalence, inclusiveness and appropriation of the movement. Within this scope, firstly the government, and then employers and employees, universities and scientific institutions, relevant civil society organizations, professional organizations, formal and informal educational institutions, and the media/press should be actively involved in this movement. The main factor ensuring the sustainability of the quality and innovation movement is the fair distribution of the gains and rewards among all stakeholders. The following horizontal elements to improve the ecosystem, such as improving the quality of the working environment, may be considered within the scope of a quality and innovation movement:

- Strengthening institutionalization
- Improving management skills
- Enhancing the understanding of strategic management and planning
- Extending the understanding of management in processes among manufacturing industry enterprises in particular
- Promoting creativity by boosting employee motivation and participation
- Improving the business and investment environment
- Building the capacity of companies in terms of renewing their business models
- Raising awareness of problems and needs

A program should be developed for enhancing the quality of working environments



at the OIZs. Within this scope, creative arrangements should be implemented to meet the expectations of white and blue-collar employees employed in organized industrial zones in order to find solutions to employees' transportation problems and increasing the quality of employee benefits such as nurseries. In particular, the efforts to understand and fulfill the expectations of the new generation who were born in the 1990s and who grew up with the internet should particularly be prioritized.

Programs should be prepared to bring the global knowledge into Turkey in addition to activities such as rewarding the companies' performance, sharing good practices, etc. For instance, programs might be developed by collaborating with universities to attract the international experts in technology towards Turkey for 6 to 12 months. Priority #6: Extending access to consultancy services.

#### **Priority #6: Extending access to consultancy services**

As part of government subsidies, expenses to be supported include those for consultancy services. A detailed analysis of the current situation of the company is carried out in cooperation with authorized consultancy firms as part of the Turquality Program carried out by the Ministry of Trade, and road maps and improvement projects are designed for brand development. The companies and enterprises within the industry express that the scheme contributes to increasing the export vision and capabilities of the company. "Experience of working with consultants" obtained through such a scheme should be expanded.

Access of SMEs, operating in the manufacturing industry, to positive examples and benchmarking mechanisms should be facilitated. Awareness of particularly small business managers should be increased regarding technical efficiency gains in the decisions of SMEs on manufacturing processes and markets. Moreover, expanding good practices and outcomes across the industry should be accelerated through a benchmark system to be offered to SMEs. It is an important requirement in this regard that SMEs are provided with international and national databases as well as benchmark indicators by public administration, universities and professional organizations.

Manager development programs are also another activity conducted under Turquality. Through trainings in collaboration with prominent universities for the managers of companies receiving support, it is aimed that the companies stay

abreast of the latest developments and combine academic knowledge obtained with business practices. The scale of manager development programs should be extended beyond the Turquality Scheme to ensure cooperation with interested companies.

A Human Capital Development Program should be created in the companies. Through this program, projects to be prepared in partnership with consulting firms, academic institutions and companies should be accepted. The program should provide co-financing on capacity issues to be identified (e.g. in line with functional or thematic issues such as marketing, supply chain management, human resources management, teamwork, digital transformation, managing intergenerational differences, improving working environments, etc.).

It should be ensured that academic staff in universities can provide consultancy services without employment under temporary or flexible working conditions or revolving fund contributions.

Another way for SMEs to access consultancy services is supplier development programs conducted by large-scale enterprises. Through these programs, large enterprises are develop the capacity of SMEs in line with their own manufacturing goals, and provide the basic skills needed to integrate into global supply chains. On the other hand, the TFP firm survey shows that the share of long-term customers in turnover of enterprises increases productivity, yet their impact on technological innovation is not positive or significant. This situation is considered to indicate the problem of learning and information transfer from long term customers. In this respect, there is a public interest in supporting supplier development programs. In this framework, the general aim is to lower the cost of transformation required for the SMEs to be able to integrate into global supply chains and specific objective is to design a support program which is based on consultancy services to develop quality of management and information transfer. It should be ensured that large-scale enterprises apply to this program to be conducted by KOSGEB; however, the beneficiaries of the program should be SMEs within supply chains of large enterprises.

### **Facilitating Exits from the Market**

**While one way of increasing TFP is strengthening the dynamics within the company (new technologies, operational efficiency, etc.), another way is to improve the functioning of redistribution dynamics in the market. In**

other words, separating inefficient companies from the market and allocating the resources (capital, employment) to more productive companies, positively contributes to TFP. One aspect of this process is what we call structural transformation, i.e. increasing the share of high value-added industries and activities while decreasing the share of relatively low value-added activities within the economy. With the acceleration of urbanization especially in the last 50 years, the decrease in the weight of the agricultural sector in our country and the increase in the share of the services and industrial sectors constitutes a significant achievement of structural transformation. Another dimension of this process is decreasing the share of relatively less productive companies and allocating resources to more productive ones in every sector.

**Easy exit from the market will increase productivity by accelerating the creative destruction in the manufacturing industry.** How a small number of barriers to exit contributes to productivity in Asian countries is striking: When companies that were unable to survive left the market in the 1990s, it positively contributed to productivity by 19% in Taiwan, 23% in Korea and 39% in Indonesia. In Turkey, market exits contributed to total productivity by 1.5% annually on average between 1993-2000<sup>10</sup>. The contribution of net market penetration dynamics on increased productivity was near-zero from 2004 to 2007 and 2% between 2008 and 2011 on the contrary to a negative contribution of -2% in the period 2012-2014<sup>11</sup>. Thus, policies that facilitate closing a firm / bankruptcy should be followed to increase productivity in the manufacturing industry.

**Factors such as withdrawal of direct foreign investments and supporting innovative entrepreneurship ensure that high-efficiency companies enter the market.** The implementation of the processes that prevent the enforcement of the bankruptcy system and the allocation of public supports to companies with low productivity accelerate the exit process of non-productive firms from the market. Turkey ranked 69th in the World Bank's Ease of Doing Business Index in 2017, and 126th under the topic of "Resolving Insolvency". Ranking so low in this area indicates that a series of steps to facilitate the processes exiting from the market would have a positively impact on the increase in TFP.

<sup>10</sup> *The Ninth Development Plan, Industrial Policy Special Commission Report*

<sup>11</sup> *World Bank Fact Sheet*

**Although bureaucratic obstacles in starting a business have decreased through reforms in 2003, the reduction in the barriers to market exit remains insufficient.** Closing down a company still takes much longer in Turkey compared to many other countries. Looking at the indicators under the topic of “Resolving Insolvency” in the World Bank’s Ease of Doing Business Index, the recovery rate is 38 cents in the European and Central Asian Region and only 18.5 cents in Turkey, while it is 73 cents to the dollar in OECD countries. As for bankruptcy periods, the OECD average is 1.7 years compared to 2.2 years in the European and Central Asian Region and 4.5 years in our country. Due to difficult bankruptcy proceedings, many unproductive companies in the industry continue to survive instead of pulling out of the market to give way to more productive companies. This implies that a series of steps regarding the speed and cost of bankruptcy processes could be evaluated within the framework of the TFV policy framework.

In this context, some changes made to the Enforcement and Bankruptcy Law and Turkish Commercial Code in early 2018 are critical to simplify and accelerate the liquidation processes.

Increasing the role of interface structures in the implementation of government supports, which is the approach suggested as the third axis of the policy framework, will contribute to making exit dynamics healthier through the allocation of less public resources to companies that have limited / unaffected performance.

#### **Priority #7: Facilitating exits from the market**

It is important to make necessary legislative changes in order to solve the problems arising from the “suspension of bankruptcy” system and to ensure criminal and civil liability to those exploiting this system.

Work to identify, develop and implement the standards for the audit procedures of the enforcement offices should be finalized by increasing the capacity of “Department of Execution and Bankruptcy Services” established in 2013 within the Ministry of Justice.

In addition, regarding the facilitation of market exits, it is of great importance to increase the number of judges and justice personnel; regulate the ethical

principles of the members of the judiciary with respect to the universal criteria; accelerate the judicial process, increase accessibility to the judiciary; improve the mechanism of enforcement offices and referral services; and increase the quality of legal education and training.

## **2. Perfecting the ecosystems of enterprises with global competitiveness targets**

The manufacturing industry has transformed from a low-technology structure to a mid-technology one, and the acceleration of its transformation into a high-technology structure will speed up productivity gains. Increasing the share of highly productive companies within the industry structure depends on making technology and innovation ecosystems favorable for such transformation. Important steps have been taken accordingly in recent years; in particular, the share of R&D activities in the national income exceeded 1% and the number of R&D staff exceeded 122 thousand. The share of the private sector, of which R&D expenditures corresponded to only 20% in the 1990s, has reached 50%. Recently, critical changes have also been made to incentive systems. Some of our steps in this regard are: realizing the concept of “Strategic Investment”, which has integrated the objective of high added value as a “measured criterion” into our country’s investment incentive system for the first time; clearing the way for fields of high-technology identified by the OECD to be listed under priority investments and benefit from 5th Region investment supports and for fields of Medium-High technology investments (machine equipment, chemicals, motor vehicles) from 4th Region investment supports; and introducing the “Project Based Incentive System”, which was designed to materialize investments in the areas of the national economy where they are much needed and which constitute a milestone for our investment incentive policies.

Despite such efforts, there are still a limited number of success stories that are based on innovation and/or high technology in our production structure and exports. The rate of high technology exports in OECD countries is 20% whereas it is 2% in Turkey<sup>12</sup>. In terms of efficiency levels, our leaders and leading companies need to (i) increase their scale, (ii) increase their market share in global competition

<sup>12</sup> Data source: The World Bank’s World Development Indicators;  
<https://data.worldbank.org/indicator/TX.VAL.TECH.MFZS?locations=TR-OE>

and, (iii) open up new markets. It is important that the number of such companies increases and their value/supply chains are reinforced. In line with this target, a perspective and set of policies are needed to perfect the elements of ecosystem that contain the companies with growth potential and intention to grow.

The common feature of the policies to be implemented in this area should be selectivity. Resources to be allocated within the scope of these policies should not be distributed equally across the private sector but should be directed towards the areas with objective/mission oriented and with the highest potential of increasing their productivity and having a positive influence on the overall economy. Priority areas to be selected should be clarified as a result of the Eleventh Development Plan preparations. The following should be taken into consideration during the selection phase:

- **Public procurement.** Areas where public procurement can be utilized and which are open for improvement within the world economy could be prioritized. The starting point may be areas such as health, energy and transportation that are mentioned in the Tenth Development Plan. These areas can be elaborated on by means of analyses, and long-term roadmaps can be prepared by taking into account the perspective of productivity increase. It is important that local competencies and demand remain at a certain level in the areas to be selected; however, the perspective of global competitiveness must be a joint precondition. Targeting global competitiveness is essential to ensure sustainability of productivity increases.

- **Horizontal areas.** Horizontal areas that might accelerate increases in productivity in many sectors should be prioritized. Acceleration of competency acquisition in general purpose technology areas such as material technologies, informatics and robotics will have a positive impact on the overall increase in TFV in the economy.

- **Intersection and implementation areas.** Intersection areas of the sectors and value chains should be prioritized. For instance, significant interactions may take place between defense and medical, automotive and electronics, ready-made clothing and furniture, and creative business models may be revealed as a result of these interactions. By focusing on multidisciplinary and interdisciplinary approaches, focusing on the high potential areas of specific technologies in our country can accelerate the increase in TFV. Important areas of opportunity may be defined that could influence the manufacturing industry with regards to smart cities, education, agriculture, health, etc.

Within the scope of this policy area, it is discussed how implement a strategic approach to improve ecosystems in critical technologies and sectors outlined above. Recommendations are put forward for policy tools and priorities that may be used accordingly.

During the implementation of said policies, it is foreseen that the interface structures, which will be discussed in the last section, will assume important tasks in the process leading from the field selection to the selection of companies.

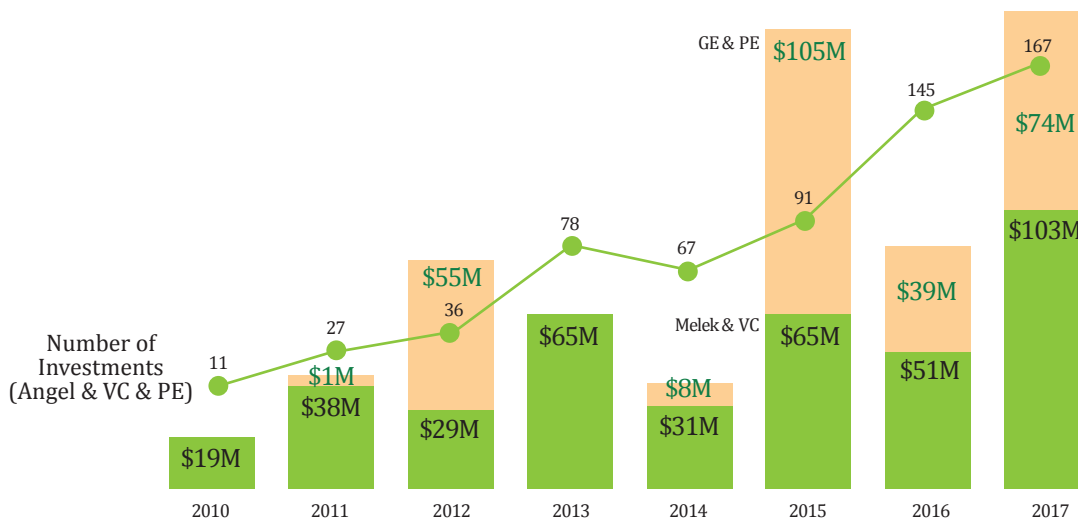
## **Strengthening and Diversification of Financial Support Mechanisms**

While manufacturing companies in Turkey do not have significant difficulties in accessing business capital, it is observed that there are significant restrictions in accessing investment capital. The underlying reason are due to structural problems such as the low level of domestic savings and dependency on external funding. In particular, current commercial banking services are insufficient for the long-term and high-risk financing needs of innovative business models and initiatives with high-tech enterprises. While many countries have the opportunity of publicly supported venture capital funds for early-stage ventures and development banking for growth ventures, such tools are limited in Turkey.

Early-stage venture capital is the most important element to support fast-growing technology companies in a country. Early-stage investments can be classified as follows: (i) Seed stage: Companies that have a product and business idea with the potential to create high value despite not yet having a commercialized product; (ii) Early stage: Companies with final products that have passed the prototype phase but without positive endorsement in sales; (iii) Early growth stage: Companies that have fixed a strong product/service position in the market and need additional financing to grow.

Having ranked 73rd in the sub-index of venture capital in the 2013 Global Competitiveness Index, Turkey's rank dropped back to 93rd in 2016. Even though it was established in February 2016, the Turkish Investment Fund has not yet become operational. In 2016, the number of enterprises receiving early phase investment was 145 and the amount of investment was USD \$70 million. In 2017, 167 enterprises received an investment of USD \$ 177 million (Figure 6) Again in 2017, venture capital investment was \$8.2 billion in the UK, USD \$3.6 billion in Germany and USD \$3.1 billion in France.

**Figure 6: Early-Stage Venture Capital Investments in Turkey, 2010-2017**



Source: startups.watch

On the other hand, Korea Venture Investment Corporation (KVIC) was established in 2005 as a fund and fund matching mechanism, and has so far supported 4,300 enterprises investing USD \$14 billion. 70% of these funds were directed towards the manufacturing sector and 20% towards the software sector (Çağlar, 2017).

Similarly, while the Korea Development Bank's total assets were USD \$191 billion in 2016, the total assets of the Development Bank of Turkey was USD \$2.1 billion. The total assets of all development banks in Turkey (Eximbank, the Bank of Provinces, Development Bank, Industrial Development Bank) does not exceed 5% of the financial system (Çağlar, 2017). While the German Development Bank (KfW), established in the 1950s, focused on financing the needs of large companies during the first period of its establishment, the bank concentrated on investment and project financing of SMEs in later periods (UNCTAD, 2016).

Beyond various government supports for innovative and high-technology investments, it is recommended to focus on venture capital and project funding in the upcoming period. It is critical to take relevant steps in coordination with other policy priorities and national technological targets.



### **Priority #8: Supporting venture capital funds**

In the Medium-Term Program (2018-2020) the objective is to “develop specific public support, loan guarantee and venture capital systems in order to contribute to the commercialization of R&D activities and financing innovation”. In this context, the Turkish Investment Fund, of which legal infrastructure was prepared in 2016, should be implemented and the fund should function as a platform for developing a national ecosystem.

By implementing a flexible and innovative strategy, the Turkish Investment Fund should take a pioneering role in the ecosystem beyond being an investment platform. The fund should not only be confined to fund managers but should attract fund managers with the highest investment performance globally towards Turkey and encourage them to set up funds with local partners in Turkey. Moreover, it should attract both global and local institutional investors as well as wealthy families for venture capital.

In order to increase the number of beneficiaries (deal flow) of venture capital fund, approaches should be developed to solve the problems of ventures particularly in the leap phase from Series A to Series B and C (see Box 2). Priority should be given to measures such as fulfilling necessary legislative amendments particularly in the Capital Markets Law and the Commercial Code; facilitating the process of market exits; eliminating uncertainties in the regulations that affect business plans of enterprises; and improving the perceptions of local technological products.

The establishment of funds to be specialized in areas to be determined in the Eleventh Development Plan should be encouraged. Initially, in the case that deal flow does not occur, incentivized funds might be encouraged for specific areas to enable the development of portfolios suitable for such specialized areas. In the future, only specialized funds in these areas might be supported.

## **Box 2: Venture Capital Funds and Stages of Investment**

New entrepreneurs grow with the funds raised by venture capital investors at different stages. Funding usually takes place as a partner to a certain part of the enterprise established by the entrepreneur. Funding stages are divided according to the maturity level of ventures. Funding starts with seed capital and continues with series A, B and C.

At the seed stage, the business idea is adapted to the prototype/product and the market. By becoming partners in the venture to sprout the “seed” at the Series A stage, venture capital investors finance the employees, market research and product/service development processes and help develop a business plan to scale the product or service according to various markets in order to generate long-term profit.

The Series B stage aims to ensure that the investments have a share in the market among the competitors and generate net profit. To that end, business development, sales, marketing and similar structures are developed within the company’s organization.

At the Series C stage, beyond making a successful investment, capital investments are made to generate significantly more income. These funds may be intended to introduce the initiative into new markets and merge with another company through acquisition. As the risk level of company operations decreases, hedge funds, investment banks and private equity firms may become involved in funding.

*Source: Investopedia*

### **Priority #9: Developing project financing opportunities for innovative initiatives aimed at expanding the global scale**

Implementation of the following policy set out in the Medium-Term Program (2018-2020) should be prioritized: “The Development Bank will be restructured to provide long-term funding for innovative and high value-added production investments in strategic industrial sectors”.

The development banking reform should focus on creating programs to develop long-term financing models in high-tech and innovative areas. The scope of these programs should encompass enterprises which have been able to develop a prototype for an unmet or insufficiently met global need, validate the innovative business model and reach a certain level of maturity. The primary focus of these programs should be creating a support network for the enterprise’s functional product, real prototype, small-scale production, market test, middle- and large-scale production, marketing, distribution, and sales and after sales. Additionally, the enterprise should be able to pass the effective management and branding stages quickly and efficiently.

The efficient use of Eximbank's resources should be provided for globally innovative ventures, and the use of country credit and guarantee programs should be increased.

Other support mechanisms that can be implemented within this context are loan guarantee mechanisms to support borrowing finances for an enterprise's project that has received a venture capital investment. Private loan guarantees granted to such companies will enable financial input by the venture capital fund to exceed borrowing (leverage). Thus, by taking into consideration the productivity target, loan guarantee supports will be provided to protect macroeconomic balances through selective use.

**Priority #10: Planning a Mission-Oriented Support Mechanism for innovations that will meet strategic needs of the country (Industrial Technology Reward Fund)**

A new incentive approach should be adopted based on mission-oriented support mechanisms while financing the projects that have the potentially to accelerate an increase of TFP<sup>13</sup>. Mission-oriented support mechanism may focus on enhancing the productivity of private sector activities in areas to meet middle to long-term needs of our country. The selection criteria for such areas should be high social and economic impact, high market potential on a global scale, ability for public support to raise awareness and local competencies reaching a certain level of maturity. Within the scope of the mechanism, projects with high impact effect and with the ability to contribute to the development of strategic patents might be prioritized.

In order to solve a defined national problem, one aim may be to create interdisciplinary structures that can lead to the cooperation of different actors such as large companies, small-scale technology firms, research institutions, etc. who do not cooperate under normal circumstances. Finding, purchasing or developing a type of technology might be defined as the responsibilities of project developers within the rules of the reward. By providing a certain amount of pre-financing to companies that have technical competence in the open calls, the total announced reward might be divided between the companies that meet the criteria within the prescribed time.

In this context, it is recommended to adopt approaches that are based on supporting the technology platforms to be determined and the ecosystem around them (electric vehicle ecosystem , etc.) in order to accelerate the change of

<sup>13</sup> For examples similar to industrial challenge fund, see <http://www.rcuk.ac.uk/funding/iscf/>; <https://www.darpa.mil/program/darpa-robotics-challenge>

R&D and support as an initial step. In this approach, it is important to run the companies and research institutions by certain critical technology platforms to meet the objectives set by the state and ensuring the development of ecosystem with this way.

Also within this scope, should be the development of pre-competitive consortium projects (emerging technologies at least 3-5 years away from the market) which are comprised of qualified partners representing a critical mass in Turkey and aim to develop new, authentic knowledge for the use of the industry. Furthermore, fair and widespread use of the knowledge produced (e.g. free use of such knowledge for SMEs, universities and research institutions and the obligation to commercialize this knowledge in three years, etc.) should be encouraged. Within this framework, the Pre-Competitive Collaboration support program, of which legislation was set out last year, should be implemented.

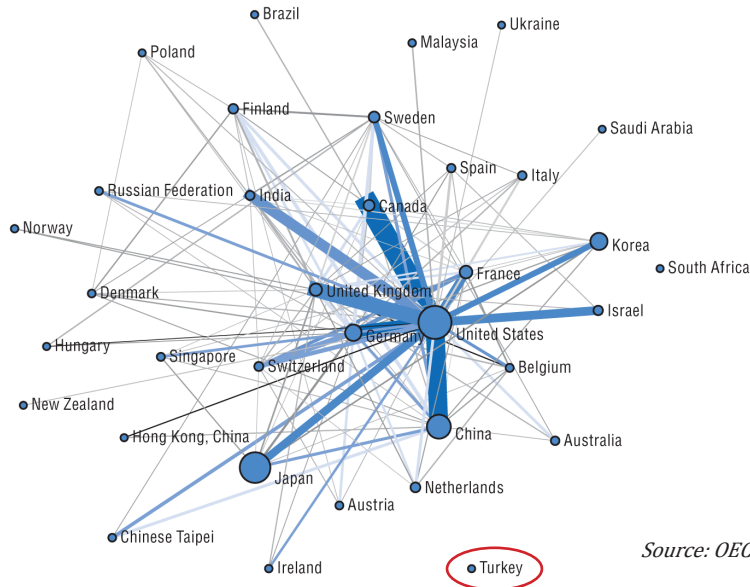
### **Development of Marketing and Networking Competencies, Strengthening the Perception of “Turkish Technology”**

Factors such as the positioning in the value chain; manner of integration into global supply chains; methods to access information and long-term collaborations with other firms might determine a company’s ability to increase its productivity. Such factors increase the importance of the company’s marketing and networking competencies.

One way of progressing within the value chain is to strengthen the relationship between innovation activities and marketing operations. In the upcoming period, the primary goal should be to enhance the economic efficiency of research conducted while increasing the share of the private sector in R&D activities to more than 50%. As in many emerging countries, one of the main limitations in commercialization in Turkey is the weak connection between R&D activities and market needs assessment/analysis. The economic return of many patents is limited because of this weakness. And the risk of the commercialization of R&D activities to meet market demand is lower.

It is seen that our country is quite detached from international networks in these areas (Figure 7). Human capital should be encouraged to take a more active role in international cooperation and networks of leaders and leading candidate companies and the interfaces that support them. Closer follow-up of design, R&D, production and market trends and development of relevant proactive strategies at both the ecosystem and company level would significantly contribute to TFP.

**Figure 7: Network Map: International Collaborations in Patents Related to Information Technology, 2010-2012**



*Source: OECD, Patent Database, February 2015*

Transition to a high-tech structure brings certain paradigm shifts. One of these shifts involves the advancement and improvement of the perception of technologies developed in our country. As in the past, conducting studies that are similar to those that improve the perception of “Turkish Goods” can also be done for “Turkish Technology” from low to mid technology and this might positively contribute to the acceleration of technological transformation processes, and therefore, increase TFP. In the focus group studies and face-to-face interviews conducted within the scope of the TFV Project, it was determined that there was a strong belief that domestic technological skills were limited and problematic in large-scale companies and public procurement authorities. It is highlighted that this situation, deriving from our dependency on import input, has a negative impact on the performance of entrepreneurs operating in high technology areas.

This problem also has an international aspect. It is important for entrepreneurs who develop high technology and have innovative business models to see state lobbying support in order to have a share in foreign markets and, particularly, public tenders. In this process, there should be importance attached to increasing

our country's global "brand value" and measures should be taken to improve the brand value of Turkey that currently ranks 53rd out of 75 countries in the "Country Brand Index"<sup>14</sup>. High-quality product perception of our domestic products by foreigners requires them to visit and study in our country, and additionally, their perception of the quality of our infrastructure are determinant in increasing the country's brand value.

### **Priority #11: Development of marketing capabilities**

Marketing processes for branded products and services which have an innovative business model and/or are based on R&D and have high added value should be supported and awareness should be raised in this area. In this context, support mechanisms should be established to include the development and commercialization of products for international markets, especially in the priority technology areas and sectors determined especially in the Development Plan, Medium-Term Program, Annual Program, Science and Technology Council decisions.

Target market penetration activities, general and sectoral trade missions, procurement committees, expos, and projects should be supported for selected technologies and value chains. The number of companies benefitting from Turquality and brand support programs and conducting intensive R&D activities should be increased, and a branding and marketing support program should be created with a particular focus on the needs of such innovative companies.

Impact of branding-oriented support mechanisms such as Turquality and state assistance in exports that aims to increase access to global supply chains for our manufacturers of intermediate goods should be analyzed and necessary improvements should be made.

Capacity of Turkey in terms of overseas trade representations should be enhanced so that companies that export/have export potential can run more efficient operations abroad.

Besides country-based approaches, it is important to adopt approaches that aim to develop city and region-based strategies for marketing.

<sup>14</sup> <http://www.futurebrand.com/uploads/CBI2014-5.pdf>

In particular, foreign companies and brands operating in high-technology sectors should be purchased and direct access to distribution channels in external markets should be ensured. Mechanisms for providing relevant information, consultancy and technical support should be made operational and their activities should be increased.

**Priority #12: Strengthening Networks (between national and international enterprises, researchers, funders and government executives)**

Due to insufficient international affiliations of our entrepreneurship ecosystem, business models of new enterprises should not be global but be aimed at local markets. Globally operating R&D teams should be encouraged to follow global trends, market conditions and technology trends more closely. An environment and programs should be prepared for R&D centers to establish closer relationships with domestic and foreign funders, large technology companies, research institutions as well as with one another. Mechanisms that enable not only large-scale companies but also small-scale businesses to monitor the world more closely should be created, and the development of long-term networks should be supported.

International affiliations of our entrepreneurial ecosystem should be enhanced. By increasing affiliation levels of commercializing entrepreneurs across international markets, establishing more common and more efficient communication and business relations with the actors in these markets should be encouraged. R&D incentives should be aimed at increasing the proportion of network-based incentives, and cooperation of different engineering areas and competencies should be encouraged.

Foreign early-stage funds should be encouraged to open up offices in Turkey or become partners to local funds and foreign institutional investors should be encouraged to invest funds in Turkey to ensure the introduction of foreign actors into Turkey's entrepreneurial ecosystem. On the other hand, in parallel to the "Istanbul Finance Center" studies, Istanbul should be turned into a "hub" for entrepreneurs not only within Turkey but also including the Balkans, the Caucasus, Middle Eastern, North African and Central Asian regions. In this context, the "Turquoise Card" application, launched in March 2017 to make work permits easier to obtain particularly for young foreign entrepreneurs and qualified

human capital, should be facilitated and disseminated and necessary promotional campaigns should be conducted. A program should be developed to support competent staff in languages such as Arabic and Russian, which will serve the consumer during the e-commerce process.

It is recommended that the state partially bears the expenses of networking and collaboration development activities to be conducted between organized industrial zones, technology development zones and university research institutions within a certain program. It is important that the capacity building processes (the formation of teams that can provide high value-added services) within the relevant institutions should be publicly supported.

Studies of highly successful undergraduate and post-graduate students in fast-growing SMEs (start-ups) should be encouraged to accelerate innovation. University academics are encouraged to participate in private sector research projects during their sabbaticals.

It is proposed that a program, in liaison with universities, be developed that invites internationally acclaimed experts in selected fields to Turkey for 6 to 12 months, support their research in interfaces and enable interaction with the executives of pioneer companies that match their respective domains. The program should be financed by beneficiary companies, interfaces, and the public.

In order to improve knowledge and skills of white-collar staff in companies and investment-recipient entrepreneurs, they should be encouraged to attend quality post-graduate, doctorate, short-term (1 to 12 months) education programs as well as capacity improvement activities and research programs.

Experience-sharing programs and cooperation between implementing agencies and establishments should be remodeled to be more extensive and systematic.

### **Priority #13: Boosting the perception of Turkish Technology and increasing brand value**

The following steps are proposed for the purpose of improving domestic perception:



- Extending the scope of The Technology Awards and improving its visibility
- Conducting studies to document and circulate success stories with case analyses
- Creating networks and conducting improvement activities to strengthen the ties between research labs, R&D centers, technology development zones, public institutions, and companies

The following are proposed to assist in altering the perception abroad:

- Conducting publicity, information and capacity building studies to include more technology companies in the Brand Support and Turquality program, and accommodating current supporting mechanisms to meet technology companies' branding needs
- Supporting the integration of clusters around certain technologies with important technology centers abroad, particularly in the areas of technology development zones which have a critical mass
- Informing trade consultants on overseas missions about the capacity of domestic technology companies
- Through our international relations and diplomacy, prioritizing measures to improve our manufacturing industry's status in the global value chain
- In information processing technologies, prioritizing areas such as SMEs, the internet of things, and embedded software that prove input accumulation particularly across the broader industry base within Turkey.

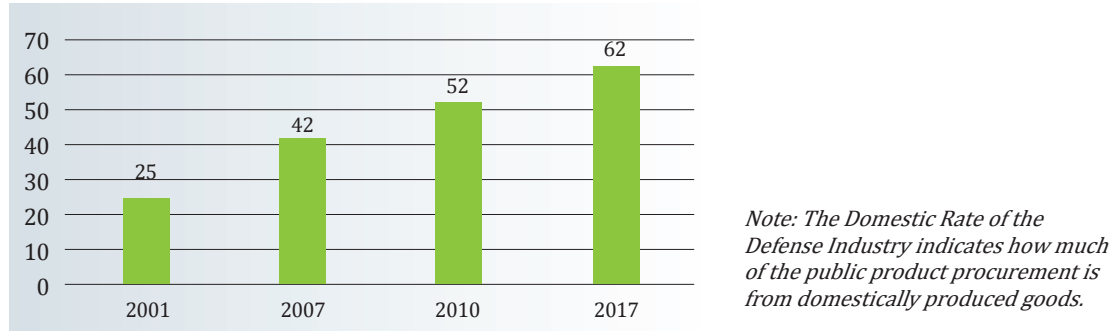
With these investments, we should supply resources for such sectors within our country and establish a “demonstration” for global investors that proves that we are capable of realizing such investments in Turkey.

## Making the Localization (and Nationalization) Agenda Productivity-Driven

The development perspective of improving domestic production capabilities through public procurements in defense, which began with the founding of the Defense Industry Directorate in 1985, has proved to be a substantial success. Having started with the procurement of core equipment at the outset, the process (1980s), firstly, initiated a stage of joint production with global actors (1990s) and then continued by focusing on partial design and core platforms (2000s); it is now in the final stage of authentic design and domestic production. In this process, while the domestic production ratio of the defense industry was 25 percent in 2001, it increased to 62 percent in 2017 (Figure 8).

The next goal is to fully localize core and advanced technologies. In this context, domestic product refers to “products whose design, patent, and international copyrights belong to foreign institutions and agencies but which are manufactured at home” (for instance: manufacturing passenger cars in our country) while national product refers to “domestic/abroad products the design, patent, and international copyrights of which belong to domestic institutions and agencies (for instance: manufacturing white goods in our country).

**Figure 8:** Domestic Rate in the Defense Industry (%)



*Source: Defense Industry Directorate*

In the preparatory stage of the 10th Development Plan, the manner in which the experience could be applied to areas other than defense proved to be an important matter of discussion. The developments and achievements in the defense industry as well as the return of many countries to more effective industry policies following the 2008 Global Crisis contribute to the importance of localization policies. Even though the rules of public procurements in the World Trade Organization, EU Customs Union, and the EU *acquis* constrain localization programs, the obligations created by these rules have diminished under the newly-shaped conditions that have flowed from the global crisis. Out of 117 localization programs in the world, only 3 of them have been transferred to the enforcement mechanism of the World Trade Organization (PIIE, 2013).

As a consequence of these developments, the 10th Development Plan states that, “Public procurements will be used as an effective tool in increasing the innovative and green production capacities of local companies. In this context, the capacity to prepare and assess qualified tender specifications will be developed, and the introduction and extension of best practices will be conducted publicly”. Additionally, one of the 25-priority transformation programs is “Program of Technology Development and Local Production Through Public Procurements.” Subsequently, an array of programs such as the Industry Cooperation Program and the establishment of the Health Industries Steering Committee and Renewable Energy laws were initiated; and in 2018 the Localization Executive Council was founded. The main goal here is to increase the annual public procurement budget of approximately 50 billion dollar, not only from the minimum cost perspective, but also by increasing domestic industry development and technology competencies. There is significant elbow room for expediting technology transfers, innovations, and localization processes in public procurements especially in health, transport, and energy.

There are a number of elements that complicate the transfer of the approaches that are valid for the defense industry to other industries. The fact that defense industry procurements are made from a central authority makes orchestration among market actors more achievable. Concept and prototype development and verification processes can be coordinated with a minimal number of actors on the procurement side. Further, the fact that national security concerns remain in the forefront in these processes makes the factors like cost and efficiency become of secondary importance. Therefore, despite the fact that these localization programs have become some of the most critical tools in industrial policy, there is still a risk that the localization programs contribute nothing to, and that they may even adversely affect TFP. Managing this risk and transforming it into a gain for TFV must be one of the fundamental elements of the TFV policy framework.

#### **Priority #14: Making the Nationalization Agenda Productivity-Driven**

It is stipulated that industrial policies focused on nationalization will increase in the long term. Therefore, it is a necessity to develop an approach that is driven to increase the positive effects of industry policies on TFV.

The public procurement policies (See: Box 3) in the medium-term program (2018-2020) must be prioritized along with the TFV perspective.

### **Box 3: The Public Procurement Policies in the Medium-Term Program (2018-2010)**

Public procurements will contribute to R&D and innovation activities, and will be used as investments to promote localization and technology transfer. Within this scope;

- Long-term supply plans for public procurements and B2B joint procurement opportunities will be created.
- Priorities will be the pharmaceutical and medical device industry; rail systems and airline vehicles; defense systems; energy equipment and; information and communication systems.
- Domestic products will be preferred in State Supply Office (DMO) purchases and TOKI projects.

*Source: Mid-Term Plan 2018-2020, p. 53*

In the execution of these policies, it is important to adopt the following principles and take steps for the operationalization of these principles to enhance their efficiency:

- For the products to be included in the nationalization program, the support projects should be built upon a global vision with emphasis on global dynamics and demand conditions as much as import substitution priority. It is important to carry out these investments in coordination with project-based incentive mechanisms.
- A long-term perspective for the design, implementation, monitoring, and evaluation of the programs is essential, and it calls for an approach that consists of development surpluses and competency construction stages just like in the development of the defense industry.
- Priority should be given to public development of human resources with a global perspective in terms of innovation, efficiency and technology to identify the characteristics of products and services to be procured by the public, for which capacity building is necessary.
- Nationalization practices should focus on the construction local competences. In this context, it is necessary to construct complementary measures not only for individual companies but also for their ecosystem, which should further be endorsed by an approach that concentrates on the market and coordination

malfunctions. The decision to expand the implementation of programs should depend on the supplier's resources in the relevant field, and focus on enhancing local productivity advancement and strengthening competencies beyond mandatory localization. For example, the development of human resources that can integrate system engineers and different technologies can be a priority.

- Other than the public procurements, a priority to create demand for the locally-developed technologies should be a priority, for which regulations and support mechanisms should be vigorously constructed in consultation with technology developers. For instance, in order to increase the use of composite materials in the construction sector, construction and development arrangements in cooperation with municipalities can be used as a tool.
- The formation of a healthy and constructive dialogue between the public and private sector should be ensured, the localization and nationalization criteria should be adopted and internalized by private sector players.
- In order to ensure a positive impact on the quality of production, public procurement should be given priority not only on the tender cost but also the "total procurement cost".
- Promoting the use of locally developed materials in public procurements particularly for railways, airlines, subway cars, and wind turbines can massively contribute to the increase of Total Factor Productivity in our country.
- Based on the fact that the nationalization process is a long-distance marathon rather than a short-distance run, it is necessary to develop effective negotiation processes with international companies. In these negotiations, knowing the extent of Turkey's negotiating power in relation to various products, it is necessary to construct a comparative negotiation framework with Turkey's potential competitors such as Eastern European and Middle Eastern countries.

### **3. The Interface Approach for the Effective Use of TFV Policies**

#### **Why Do We Need a Different Approach in Policy Implementation?**

The recent support mechanisms initiated to increase high-value-added products and exportation in Turkey have failed to yield the expected results. High technology exportation has not reached the expected level; the efficiency level has not improved in a sustainable fashion; no global-scale product, brand, or company has emerged; and our country has not increased its ranking within competitiveness and innovation indexes. Therefore, it is very important to review the relevant public policies and tools in a way that can yield more effective results.

Turkey has developed policies, institutions and supports that are similar to its global peers. There are institutions that work for the development and implementation of policies relating to the foundational and applied research, design, manufacturing, marketing and services of the production value chain; as well as entrepreneurial awareness, early stage, business foundation stage, the initial stage following the foundation of the business; loan, grant, and tax-related advantages for the growth stage; and consultation support for the business policy. However, the efficiency level in implementation differs. It may be due to three main problems:

- (i) Transfer of authority and coordination between policy, program and implementation tools in the areas of interest, responsibility and jurisdiction of different ministries
- (ii) Evaluation of implementation results
- (iii) Shortcomings in technology, theme, company selection and concentration

Therefore, the policy focus for TFV should emphasize the implementation stage. The policy of interface development and creation should be considered in terms of perfecting implementation. The new executive corpus, institutions and functions invented in the Presidency Government System provides a convenient environment to design and implement a more radical reform towards this end. Therefore, it is the time for a reform that enhances the efficiency of industry support institutions and tools.

In the reforms that horizontally intersect with several institutions and policies, we should address two different kinds of nested problems: General problems, and specific problems within the relevant public policy. The general problems related to the Turkish public sector can be identified as follows: Despite the fact that the budget implementation is focused on inputs rather than results and outputs,

the compliance with the legislation comes before the quality or quality of the work; a short-term and narrow perspective on notions of public welfare-loss; the ineffectiveness of the implementation of the long-term planning process; the lack of implementation of performance and impact evaluation; conservativeness in the delegation of authority and localization; and public personnel policies that do not reward or hinders taking initiatives. These problems bind the public's hand in a policy area that requires risky, time-consuming and collaborative work with the private sector, such as innovation, narrowing the policy toolkit and eliminating its flexibility. Resolving these problems in the short-run does not seem likely. In such cases, the implementation of a pilot implementation before the dissemination of policy implementations, which are structural reforms, to all public administrations, the application of a kind of public "experiment" (sand box) can increase the likelihood of success. Such pilot implementations are currently being run in Turkey. The main issue is the capacity of an active administration that is capable of monitoring the pilot implementation, flowing from the evaluations and implementing change as required. The last section will include more detailed proposals on this topic.

Another problem that stands out in the corporate structure of the public sector is the tendency towards "silofication". Public institutions operating in a particular policy area are tightening their missions into the narrow interpretation of their vertical organization structure and establishment legislation. Though coordination committee-like structures at the ministry level function somewhat as a kind of a horizontal platform for the discussion of the general policies, the meeting, agenda-creating and decision-making of these committees is generally time-consuming and the decisions made in these committees become ambiguous and lose their significance as they move through to the lower levels of bureaucracy. In addition, follow-up is inadequate. Unfortunately, such "silos" are commonly seen in different units and affiliates of the same ministries. Instead of developing and discussing common policies with other units and other stakeholders (the private sector), the units focus only on themselves and their limited tool set an narrow interpretation of regulations. This results in repeated tools, ineffective practices and insufficient results.

In general, the main shortcomings of incentive policies (particularly innovativeness-related policies) based on previous investment environment surveys as well as the survey studies and negotiations conducted within this TFV Project are summarized as follows:

- The supports are not implemented in accordance with the properties and needs of the companies, which in turn lead to the low impact of the additionality of the supports in reaching the intended results.

- The supports often do not correctly differential between the companies using standard technologies and the companies with the potential and capacity to develop new and innovative technologies.
- The bureaucratic formality of the supports creates a burden on both the companies and the public, decreases its flexibility, and cannot be sufficiently linked to the performance or results of companies or projects. The supports also lack integrity in the selectivity level.
- The impacts and results of the supports are not sufficiently evaluated, and public-company-sector dialog and a long-term partnership on support policies are not sufficiently established. This situation prevents mutual trust from being built and reduces the supports to a one-time only and unilateral transfer status.
- The supports are mostly financial and short-term. There is a lack of concern for issues such as developing companies' networks, receiving expert consultation, information transfer and risk sharing.
- Similar public supports are provided by many different organizations; there is not enough coordination among the organizations and even the support policies implemented by different departments within the same ministry are applied independently of each other. Therefore, it does not appeal to the entirety of the ecosystem of innovation.
- The fact that the “program owner” (resource supplier) role and the “program executer” (service provider) are in the same institution within the system obstructs performance management and the ability to monitor the channels of support.
- The “post-implementation evaluation” culture in public administration is still in its infancy; in this context, there are critical shortcomings in assessing, monitoring, evaluating, and designing more effective supports by learning from the impacts of the government supports.

### **Definition; What is Interface? A New Layer Between the State and Companies**

Interface institutions are institutions that assist in the use of tools where the market falls short, such as in information, consultation, networking, and financing, with a focus on the companies' needs in developing their current or prospective business operations relating to innovation and technological advancement and for developing the corporate functions between the public sector, academia, and businesses to ensure the enhancement of Total Factor Productivity.

The general characteristics of the interface institutions that can take on different missions according to the needs of the sector or the technological area they focus on are as follows:



- In order to efficiently realize the policies of TFV enhancement, these institutions assuming a role in policy implementation are expected to: redefine the relationship between the public sector and the companies based on 21st century needs;
- support not only the individual companies but also the value chain and ecosystem;
- focus on strengthening the efficiency and innovative performance of the companies in implementing the programs in the strategical fields on behalf of the public;
- ensure the use of public supports in the most fundamental, effective, and efficient way.

As part of their function working as an interface institution in the application of public policies and support as well as acting closely with the business side of the field in which they operate in and in which they build trust, it is possible to remove the information asymmetry by providing feedback regarding the design of public policies to the public.

Looking at the interface structures in this context, the TFV can be seen as structures that focus on interventions to companies that are pioneers in the implementation of the policy framework (on the technology frontier) and leading pioneers (near the technology boundary). In order to realize the goals for TFV enhancement, the state should make transparent, objective, and professional preferences, create structures that work in tandem with the principles that provide consistency for these preferences in the long-term, or transform the current structures.

Here are some examples of the tasks that the proposed interface structures can assume:

- Increasing inputs for technology and innovativeness: Providing public resources for R&D grants and incentives and risk capital; developing programs to improve shortfalls in the market and system and; reducing the risk of R&D activities
- Increasing non-material (skills, expertise) competencies: Conducting joint research projects, presenting technological consulting services, using copyrights, supplying technical support services, attracting highly qualified migrants, and exercising mobility programs
- Focusing on creating and strengthening ecosystems: Conducting studies to develop new sectors and technologies (green technologies, biotechnology, nanotechnology etc.); creating support mechanisms for clustering, networking, R&D collaborations, TTOs, and incubators

- Improving environmental aspects: Helping improve investments and businesses; implementing new policies and programs for the more effective operation of the innovation ecosystem through an experimental approach
- Developing missions, rhetoric, and preparation: Focusing on studies that target dramatic change (defense, energy, environment, etc.) rather than slow-paced improvements that try to resolve major social and economic issues; conducting visionary and horizon-expanding studies; preparing technology road maps
- Expansion of information and innovation: Conducting studies that aim to improve the main skills of companies; developing management quality; improving human resource management (digital transformation, branding, and marketing skills etc.)

When international implementation samples conducted by states to increase company efficiency are reviewed, we observe in many countries that there is a transition from first generation “support” mechanisms to second generation “service supply” interfaces. In this context, first generation support mechanisms include elements such as economic incentives (tax reduction, easy access to financing, infrastructure supports etc.) provided by the state for the progress of the private sector. Second generation service interfaces focus on an approach that delivers services that are not sufficiently provided to companies in different market conditions (R&D competencies, networking, ecosystem creation etc.) (See: Table 3).

**Table 3:** Transformation of Incentive Systems: First Generation Support Mechanisms and Second Generation Service Interfaces

First generation “support” mechanisms	Second generation “service” interfaces
<ul style="list-style-type: none"> <li>- Focus: Economic incentives (taxes, access to financing)</li> <li>- Top-down central management</li> <li>- Same rules for all companies</li> <li>- Limited interaction and information sharing between companies and the state</li> <li>- Limited flexibility and risk-taking, focus on procedures</li> <li>- Sharp contrast between private and public sectors</li> </ul>	<ul style="list-style-type: none"> <li>- Focus: Enhancing information and skills, developing networking and consulting activities</li> <li>- Localized, horizontal and company-specific solutions</li> <li>- Intense dialog and information sharing between the state and companies by way of interfaces</li> <li>- Operational autonomy and flexibility, risk sharing and experimentation in implementation</li> <li>- Cooperation between private and public sectors, joint decision-making, and agreement-based service delivery types</li> </ul>

## Aims, Tools, Tasks, and Functions

The ultimate aim of the interfaces is to increase Total Factor Productivity. The interfaces must exercise the following 3 interim tools to achieve it:

- (i) Renewing and upgrading the technological equipment of companies (especially SMEs) in general, providing technology diffusion (such as digitalization), and improving work practices (management, quality, network relations etc.)
- (ii) Helping technological innovations in scientific (and research) infrastructure emerge and develop them as commercial products
- (iii) Developing technology areas or product groups that are considered to be strategic and are still in their infancy (autonomous vehicles, space technologies, etc.)

Exercising these interim aims require different tools and interfaces that will use these tools. While promoting technological expansion (for SMEs) requires more horizontal policies and tools (awareness policies, technological consultation, technological financing), innovative and new technologies require more vertical, private policies (sector-based, value-specific, company-specific) and tools. It is essential that the interfaces that use these tools are equipped with different skills with regard to the realization of the tools used and the desired results.

For instance, while the organization of the interfaces to use technological expansion both nation-wide and on a local level is enough for the companies in the region to recognize them, it is necessary that the companies that have the potential to be the innovative interface, deliver a more extensive support menu and develop a trust relationship that can accommodate the sharing of tacit knowledge between companies and entrepreneurs. The connection of the interfaces that develop strategic technology areas within the public will also emerge as an important matter. This is because, initially public orientation and resource supply will stand out, and as the ecosystem improves over time, the public will be able to delegate several of its functions to interface(s). The main difference between public policies and others in the area of strategic technology fields/products is the determining of a specific technology or product that is considered to be strategic for the nation by the public, and supporting relevant projects-activities of large companies with various tools. This way, it provides a kind of a regimented project support.

In fact, when industry support systems in Turkey are reviewed with the perspective of the categorization described above, KOSGEB and Development Agencies can be said to be the institutions that promote technology expansion while TÜBİTAK is one of the public interfaces of innovation policies. For the support of some specific technologies and products, more ad hoc actions are required. For instance, with

the guidance of the government, TOBB and a 5-partner company undertook the initiative leadership for the electric vehicle, while the Ministry of Trade applied the “Project-Based Incentive System” to support some strategic products and sectors<sup>15</sup>. Additionally, within the project-based incentive system, no relationship related to development of technology has been established with SMEs so far on the research infrastructures, technology-oriented companies and the expansion of technology in line with a larger innovation policy.

The above-mentioned organizations have also had to undertake functions that do not coincide with the functions or original missions overlapping with each other. For instance, KOSGEB initially developed a program to support small-scale grant programs and micro-enterprises as a social policy tool. On the other hand, KOSGEB formed several programs that fall within TÜBİTAK’s field of work to support the strategic sectors and innovation. In the meantime, it abandoned its TEKMER program, a real technological expansion program. One of the things to do is to create a structure that evaluates the tool portfolio and implementation practices of the institutions in a more holistic way, to facilitate a simplification that complies with the institution’s mission, and to ensure institutions work in collaboration.

There are some obvious facts without having to evaluate the current support tools in detail. For instance, since TGBs are already extended nation-wide without considering their capacity and implementation performance, most of them work as property management businesses that provide tax-advantageous office space. Considering the missions in accordance with the industrial policy components described above, it may be appropriate for KOSGEB to re-specialize in SMEs in order to expand technology nation-wide, and to transfer the support programs that function as social policy tools to other institutions.

Beyond doubt, these policies should be implemented in a mutually complementary fashion. For instance, there is a direct relation between technology expansion and innovation. As technology expansion scales up, innovative companies more frequently stand out nation-wide. Likewise, developing strategic technologies and strategic products and sectors are related. Therefore, it is necessary to form horizontal coordination between these policies and the public interface institutions that apply them. The main policy documents that will determine the process and objective of the coordination are development plans and related sector strategies. It was already mentioned that there has not been sufficient

<sup>15</sup> *This policy was implemented in Turkey under ordinance numbered 2016/9495 “Ordinance on Project-Based State Support for Investments” which specifies the procedures and principles for the “Project-Based Incentive System” and article 80 of Code number 6745 “Code for the Law Amendment of Some of the Laws and Statutory Decrees for the Project-Based Support of Investments” which was published in the Official Gazette numbered 29824 and dated 7 September 2016 thereafter enacted under the title, “The Project-Based Incentive System”, by Cabinet as directed by the Ministry of Trade. The Project-Based Incentive System was introduced in a press conference on 9 April 2018. In 23 projects of the 19 firms, 135 billion TL in super investment incentive certificates were officialized in a ceremony. In order to receive incentives, the minimum fixed investment amount of the project must be US \$100 million.*

communication and coordination between these institutions so far. The state also needs a superstructure to conformably implement these different policy objectives that are the components of industrial policy. It is essential that the private sector is active in the execution of this superstructure.

These interface structures should focus on implementing the programs whose strategic aims and scope are set to be determined in the 11th Development Plan. The interface structures should use and assist in the usage of its public resources to support TFV enhancement of the relevant companies and ecosystem through these programs. The utmost priority in the operationalization processes of these structures is to build trust of both the state as well as the private sector.

**Figure 9:** Innovation Policy Actor Organization

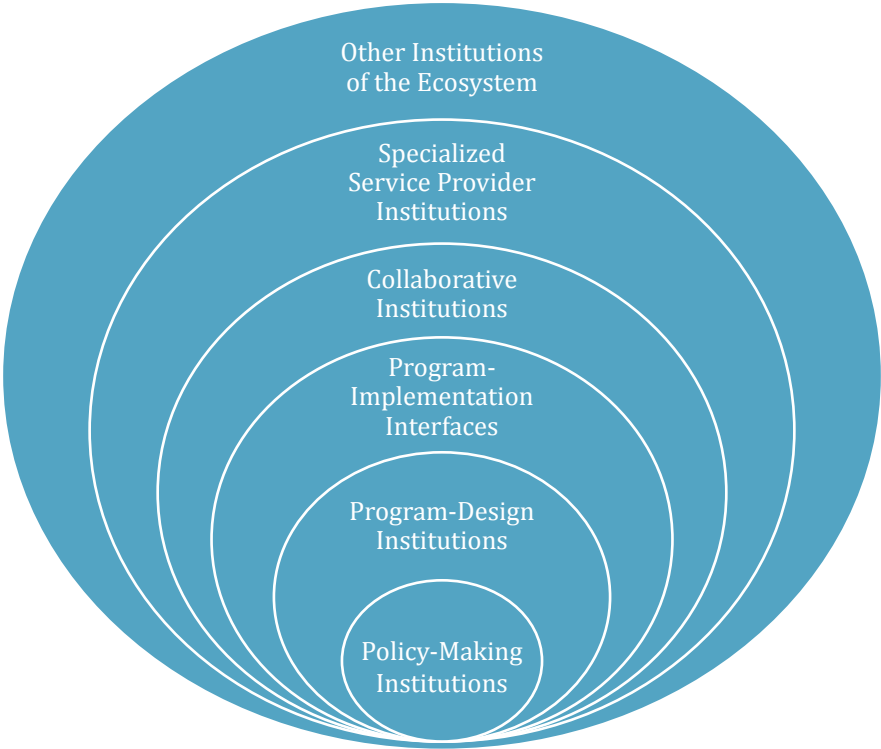


Figure 9 illustrates the organizational layers that implement the industrial policy in general, and the innovation policy in the private sector. This distinction provides a favorable indication of the different functions that are valid in many of the public policies and which are evident in the Presidential System. From the perspective of TFV policies, we can define this functional distinction as follows:

**1. Policy-Making Institutions:** These are the public institutions and establishments that evaluate and design industrial and innovation policies. The newly-formed “Science Technology and Innovation Policies Committee” in the Presidential System stands out as the top level policy-making institution. The Ministry of Industry and Technology can assume this function until this committee becomes fully operational. The Strategy and Budget Directorate formed within the Committee of Economic Policies and the Ministry of Economy and the Presidency (with regard to designing 5-year development plans and budget policies despite the fact that it does not directly create industrial policies) can be considered to be among the relevant policy-making institutions.

**2. Program-Design Institutions:** These are the institutions and units that develop programs in their field of expertise in order to implement long-term policies. KOSGEB, which is affiliated with the Ministry of Industry and Technology in the field of Science Technology and Innovation, has been active in the expansion of technology and TÜBİTAK has already been focused on the development of innovation programs. The General Directorate of Development Agencies within the Ministry of Industry and Technology seem to have assumed a similar role in terms of Development Agencies. In addition to the Ministry of Trade’s project-based incentive system, these are the institutions that design (and execute) programs of internationalization (URGE) and branding (TURQUALITY).

**3. Program-Implementation Interfaces:** The execution of this function by different institutions other than the ones above is essential as it assists with both the division of labor, and by extension broadening the scale. More importantly, these interfaces facilitate a more objective environment for evaluation and performance assessment. In this respect, as defined above, interfaces are autonomous institutions with an extensive support menu including financing rather than merely providing passive, ready-made packages to which public authorities are delegated on the basis of their administrative capacity, and which provide solutions for companies. As proposed within this study and to be explained in detail in the last section, for the Technology Development Zones, Technology Transfer Offices, TTGV, and Research Institutes innovation policies, the Development Agencies, too, can be included in the experimental policy as an interface for the expansion of technology.

**4. Collaborative Institutions:** As explained below, these institutions are expected to work in collaboration with the public in the design and implementation stages of innovation and technology programs. This definition is already stated in the Ministry of Trade’s URGE Program<sup>16</sup>. These institutions are identified as NGOs or, as in the TOBB example, Democratic Mass Organization which represent the collective interests of the companies on the basis of sector or geography. With such properties, public policy makers can raise awareness and offer consultancy.

<sup>16</sup> *The Collaborative Institution in the Ur-Ge Statement: This includes the Turkish Exporters Assembly, Union of Chambers and Commodity Exchanges of Turkey, The Committee of Foreign Economic Relations, Exporter Unions, Trade and/or Industry Chambers, Organized Industrial Zones, Industrial Zones, Technology Development Zones, Sectoral Foundations and Associations, Sectoral Foreign Trade Firms, Commodity Exchange Markets, Employers’ Unions as well as the foundations, unions, and associations founded by manufacturers.*

Collaborative organizations can perform these functions in relation to relevant public institutions at every stage of the policy process.

**5. Specialized Service Provider Institutions:** These are the institutions that provide privatized services in certain stages of innovation policies (mentoring, incubation, and acceleration), specific package programs (education) demanded by program-executing institutions (companies, associations, foundations etc), and specialize in certain fields that intersect the business segment horizontally (e.g. KALDER). Program-executing interfaces might choose to purchase services from these institutions when needed.

**6. Other Institutions in the Ecosystem:** Other organizations that make up the innovation ecosystem are the natural stakeholders of this policy area. Universities, finance institutions, audit-accounting-consulting-design companies can be both stakeholders and the subject of public policy in certain parts of the innovation field. For instance, universities are at the center of innovation policy in terms of both educating scientists and conducting research. The same can be said for venture capital companies. One of the main goals of innovation policy is to improve this ecosystem and facilitate communication and connection among actors. For instance, TÜBİTAK has support programs in which universities are the direct subject.

The above categorization has been prepared in order to describe the position of the interfaces in the public policy chain by aiming to look at through the public policy window. This does not mean to suggest that the institutions in each category are in a hierarchic vertical structure limiting access to other categories. In fact, there are healthy horizontal relations and communication between the actors in all categories. However, from the perspective of public policy, mapping of the functions and institutions is an indispensable component of policy effectiveness. A result-oriented public policy aims to establish an input-output-result relation based on the assumption that the institution who executes this policy fulfills its functions. Any ambiguity in the functions might disconnect or obscure the causality link in this chain. Additionally, the functions must comply with corporate structures. This is what necessitates interface institutions.

In the building process of the interfaces, what fields these interfaces will be formed in is a priority issue. The interfaces need to be formed in the following fields where they will have a more accelerated and transformative impact. The 11th Development Plan should be a guide at this point. The following three critical field groups can guide the process from the long list to the short list:

- **Public procurement.** Fields where public procurement can be utilized and which are open for improvement within the world economy could be prioritized. The fields of health, energy, and transportation as indicated in the 10th Development Plan could serve as the starting point; they can be examined through detailed analyses, and long-term road maps can be prepared with regard to the perspective of productivity growth. It is important that local competencies and demand remain

at a certain level in the areas to be selected; however, the perspective of global competitiveness must be a joint precondition. Targeting global competitiveness is essential to ensure sustainability of productivity increases.

- **Horizontal areas.** Horizontal areas that might accelerate increases in productivity in many sectors should be prioritized. Acceleration of competency acquisition in areas such as material technologies, informatics and robotics will have a positive impact on the overall increase in TFV in the economy.
- **Intersection and implementation areas.** Intersection areas of the sectors and value chains should be prioritized. For instance, significant interactions may take place between defense and health, automotive and electronics, ready-made clothing and furniture, as a result of which creative business models can emerge. By focusing on multidisciplinary and interdisciplinary approaches, focusing on high potential areas of specific technologies in our country can accelerate the increase in TFV. Important areas of opportunity may be defined that could impact the manufacturing industry with regards to smart cities, education, agriculture, health, etc.

### **Transition from Existing Structures Carrying Interface Attributes to New Interfaces**

The interface structures proposed to be set up in lieu of the current public institutions that function as interfaces should be developed to take on various functions and focus on various intervention types rather than concentrating on standardization. It is important to provide diversity in the system for different technological priorities and value chains need different interface structures.

Though the interface institutions might seek to possess different corporate structures (diversity), it is necessary that all of them have flexibility and autonomy to an extent, to have human capacity that is capable of evaluating and developing strategies in certain calibers, and possess recording (accounting-statistic) infrastructure with transparent management for the provision of good governance principles as a way of accountability.

In Turkey there are few examples of services that could be covered in the secondary generation interfaces. The Technology Development Foundation of Turkey (TTGV), founded in 1991 to promote public-private sector collaboration and technology and innovation activities in the private sector in Turkey, has adopted the model of a “non-profit interface/implementer institution” and conducts innovation programs on behalf of the public. The “Interface Supports” (AYDE) component within the “The Code of Practice Directive of the Innovation Support Program”, enacted on 1 January 2018 and conducted by TÜBİTAK aims to increase the capacity in the fields of innovation and entrepreneurship and to improve relations between the public, university and industry by supporting the facilitation of mechanisms for achieving effective and efficient results from the TÜBİTAK Industry Supports (SADE).



- With The Code of Practice Directive of the Innovation Support Program, enacted on 1 January 2018, TÜBİTAK began seeking solutions to the problems mentioned above. Scores of support programs were simplified and reduced to two different general support programs. This also diminished the bureaucratic burden. TÜBİTAK committed to preparing these supports institutionally and will announce them to the public. It will prepare the supports using a more participatory method that involves strategic and operational information such as the conceptual frameworks of the support programs, goals, expected impacts, monitoring and evaluation methods, and budget. Finally, it has committed to conducting the program on a 2-year plan (TEYDEB Rota - TİP) which will be updated based on the implementation results. In this way, transparency and predictability has increased, and impact assessment has been easier.

- To provide support to the implementing institutions named “Interface” that are close to the business segment and are located between TÜBİTAK and the beneficiaries, the Interface Support Program is structured for the implementation through these institutions. In this way, a significant step has been taken to involve an actor whose absence is severely felt in the innovation policy in the ecosystem. This step will also contribute to a more policy-and-result-oriented way of thinking for TÜBİTAK (TEYDEB Directorate) by transferring its operational functions to institutions that will become more flexible and expert through the implementation over time.

- In the long term, the need to distinguish the supports given to medium-size companies and small-and-micro-size companies might emerge as a topic of discussion. In order to effectively support every company segment within its current capacity, it is possible that the support allocated to micro and small companies are evaluated within social policy (except for innovation and technology based start-ups) while the supports allocated to medium-size companies should form the focus of the institution itself. Even though KOSGEB (Small and Medium Enterprises Development Organization of Turkey) hasn’t used interfaces in service provision until now, it may start to effectively use these entities from now on.

- Some TGBs (Technology Development Areas) have developed the capacity to enable them to provide support to companies and execute multiple programs and projects at the same time in order to benefit from state support. For example, there are collaborative organizations in support programs offered by the Ministry of Commerce for the development of clustering for the Support of the Improvement of Competitiveness. Their role is one of an implementing organization in TÜBİTAK’s (the Scientific and Technological Research Council of Turkey) Techno-entrepreneurship Capital Support (BIGG - Individual Young Entrepreneurship) Programme and they are the beneficiary organization for TÜBİTAK’s Technology Transfer Office and KOSGEB’s International Accelerator Support Programme.

The functions of TGBs included in their establishment law are similar to those of interfaces organizations defined under this heading.

- The needs of companies in the OSBs (Organized Industrial Zone) for improving capacity in the areas of design, R&D, marketing, exportation and innovative business models are obvious. In the short-term, the provision of services by the OSB managers to these companies in these areas as in accordance with the legislation, together with the mission they have identified for themselves, will only be possible through collaboration with specialized organizations and the assignment of sites and resources within the OSBs. It is stated that even in OSBs with the highest management capacity, significant problems in project management as well as access to companies can be experienced, and companies can remain indifferent to event announcements by the OSBs.
- Development Agencies are mechanisms that are equipped with human resource instruments, governance mechanisms and support for discovering and driving internal growth potential and competitiveness within regions. However, there has been too much focus on support programs in agency activities and support programs have become a local funding instrument rather than being responsive through leverage functions. The focus and power of agencies as interfaces for identifying and guiding of companies in the region and for leading or potentially leading these companies must be improved in upcoming periods.
- Large corporations have begun to assume the role of interface institution for some of the state programs. For example, Arçelik Garage under the banner of the Arçelik corporation has become one of the executors of the TÜBİTAK's BIGG Acceleration Programme and has begun to execute the first hardware-focused corporate interface program in Turkey<sup>17</sup>.

While the process that TÜBİTAK initiated in early 2018 with the Guidelines for the Codes of Practice for the Innovation Support Programme has been helpful, it is possible to categorize the interface functions defined in these guidelines as follows:

**a. Intermediation (sub-contracting)/implementing organizations.** A number of support programs and services previously provided unilaterally by TÜBİTAK can now be offered through other organizations as interfaces. The interfaces have no flexibility in this case and the products designed by TÜBİTAK are made available to companies under the supervision of TÜBİTAK. In this relationship, TÜBİTAK is not able to obtain any policy information; it is only able to reduce the bureaucratic burden on it.

<sup>17</sup> <https://arcelikgarage.com/bigga>

**b. Collaborative organizations:** These may exist on various levels but their determining feature is their ability to develop relationships bilaterally (Tübitak <-> Company or industry) This relationship can be on the basis of information transfer or as a policy consultancy. These organizations are those that do not necessarily have the capacity to directly provide managerial or technological support to companies but can be functional “where necessary” under certain programs mostly due to their networking abilities. These organizations may have different advantages: For example, they may be effective through their various features such as knowledge of a specific industry (having been established by companies in that industry), a capacity to bring companies together or widespread access throughout the country. While these organizations may have had different purposes for their establishment, they are organizations that TÜBİTAK can benefit from in order to support its innovation policies. The features of these organizations are compatible with the definition of a Collaborative Organization included in the UR-GE notice (Notice on the Support of Improvement of International Competitiveness).

On a higher level, there are organizations that are more likely to be “Interfaces” as defined in this White Paper. Benefiting from the support of not just TÜBİTAK but many other institutions, these are organizations that have close relationships with companies and are therefore able to develop relationships based on mutual trust or to provide company-specific solutions.

Some TGBs, TTOs (Technology Transfer Office) and Research Institutes in our country which have a high institutional and financial capacity can be provided as examples to such organizations. The relationship between them and TÜBİTAK is much more comprehensive and is based on a partnering relationship. Relationships with these organizations can be developed on different dimensions and related experimental practices can be implemented. Regarding TGBs, a relationship can be developed with a TGB which is already successful on an experimental basis and with sufficient managerial infrastructure and financial transfers performance can be achieved through the initiative of the TGB. In such a relationship, TÜBİTAK can grant financial resources (for example, matching funding) to a selected TGB for a certain period of time by entering into an agreement with the TGB under which the TGB would be able to benefit from the funding for improving its own capacity as well as providing more financial support to companies through its own initiative. The agreement may require the TGB to meet defined performance criteria.

In this context, existing institutions, (e.g. one of the MAM institutes), can be restructured or a new institution can be established in partnership with the private sector and hence these institutions can be enabled to have an autonomous structure on a more experimental basis for the purposes of obtaining specific results (similar to Fraunhofer).

## Design Principles for Interface Institutions

Interface institutions can be existing public entities or private legal entities as well as any entity (foundation, association, joint-stock company, etc.) assuming a designated mission based on an agreement. When these structures are being designed, consideration must be given to the following nine principles:

- **Employment of qualified personnel.** Within these structures, employees must not be limited only by what required of them as set out in the legislation, must be “personally invested” in the mission they are given and must have the ability to develop creative solutions accordingly. In order to do this, it is necessary to establish highly qualified teams who are risk takers, who can learn by way of trial and error and who can direct proceeds to areas displaying future potential.

- **Work based on performance.** The performance of interface institution must be monitored based on the programs they execute and subsequently the effects of those executed programs must be assessed together with the performance of the interfaces. A competitive environment should be ensured and high performance should be rewarded in the process of accessing interfaces to public funding sources. The system and the process required to understand the results must be established at the outset together with a definition of the method to enable a general understanding of the value of the organization; in addition, effective communication must be ensured. When defining the criteria for success, rather than focusing only on quantitative indicators, there must, as far as possible, also be a focus on qualitative elements together with a concentration on the quality of the management of the interface institution, the type of lessons that can be learnt from its practices and its ability to execute the program.

- **Budget and sustainable funding.** Interfaces must have their own budgets and incomes, funding support based on performance, tax exemptions and exceptions. In addition, fund and portfolio management and investment capacities should be developed where necessary. Since budgeting is an annual activity within state organizations, the time period for considering and taking action is inevitably limited in areas requiring long-term perspectives such as technology and efficiency. In order to solve this problem of time limitations, it is useful to design interfaces as extra-budgetary structures. The time periods for some programs that are critical in terms of technology development must be allowed to be extended over more years.

- **Result-based evaluation.** In policy practice, the public sector traditionally focuses on inputs and outputs. The focus must shift from inputs and outputs to results and effects in order to develop effective practices. To this end, interfaces must be established with a 5-year perspective and it must be possible for them to make decisions such as closures, continuations, expansions and downsizings based on result and effect. Under this new system the roles of “program owner” (resource provider) and “program executor” (service provider) must be separated.

- **Accountability.** The design of accountability mechanisms is quite important for the continuity of the interfaces. In this context, the notions of public interest and public harm must be defined from an innovative and realistic point of view and must be evaluated in the process. Concepts such as “additionality” (additional contributions) and economic rates of return may allow the extension of the definition of public interest. As interfaces use more resources from the state budget, this definition narrows down and, consequently, the risk of incurring losses cannot be taken. The success of risk-free entities in areas of advanced technology will be extremely limited.

- **Flexibility and integrity.** The ability to adapt responses to the requirements of an individual company is important. In this context, it is necessary to ensure that support programs are able to solve the specific problems that the companies experience as well as monitoring the changing requirements of the companies and developing measures in response to those problems and requirements. In addition, it is also necessary to ensure that the approach to technological progress is holistic and that the support programs focus not only on the solution to technical problems but also on the managerial, organizational and technological changes required. The capabilities of companies, particularly those with a high level of R&D focus in areas such as product design, product diversification, branding, marketing and promotion, must be improved.

- **A “high-frequency” relationship with leading and potentially leading companies.** Attention must be paid to the various kinds of interventions affecting the ecosystem and productivity potential of the companies. Interfaces must function as mechanisms able to constantly monitor and evaluate the performance of their related companies rather than being entities that merely provide funding for a company as a one-off and then end the relationship. They must be organizations that can contribute through the transformation of aids and grants into the creation of tools for the company, rather than merely to the end-goal, and that can then execute support programs for the benefit of a number of groups of companies within the value chain.

- **Coordination and networking improvement initiative.** Interfaces must be able to establish joint infrastructure to be able to show initiative in areas that require coordination and joint action, establish companies, become partners to companies and/or engage in activities such as platform creation, networking improvement and supporting collaborations. Rather than being an agent or a lobbyist organization that advocates the common interests of certain types of companies or industries to the government, interfaces must be able to facilitate coordination between companies and the government as required through the executed program and must be able to instill confidence in both parties for this purpose. Interfaces must be able to share information and collaborate with, not only the actors under their area of responsibility, but also with other interfaces and must be able to act as part of a network where required and as the central focus of the network in other cases. In this context, particular attention must be paid to articulation within international networks.

• **Spatial connection.** Interfaces can exist on a national, regional or local level. Nonetheless, they must be able to perceive the advantages of spatial scales and clustering as well as the dynamics of urban economies. To this end, Organized Industrial Zones, Chambers of Commerce and Industry and Development Agencies that serve within the restraints of a specific geographical area can assume certain interface roles or can collaborate with interfaces serving regardless of location.

International examples provide lessons in the design process for the interfaces. In the table below, lessons learned from international examples under the headings of personnel regime, funding model, performance management and risk sharing are discussed along with the situation in Turkey.

**Table 4:** Suggested Measures to be Taken During the Design Process for Interfaces

Subject	What can we learn from foreign examples?	What is the status in Turkey? What can be done?
<p><b>Arayüzün yönetiřimi</b></p>	<ul style="list-style-type: none"> <li>• The roles of research with a focus on problem-solving, innovation on the cutting edge of technology and entrepreneurship must be brought together.</li> <li>• The fact that interfaces will be using and providing public resources while having the freedom to use tools and resources that provide flexible solutions for companies in which they are in a special relationship and their potential for failure in many cases requires the development of a new type of relationship between these interfaces and the central administration.</li> <li>• Creating an organizational structure with a horizontal (between interfaces) and vertical (between interfaces and public policy makers) network of communication that would ensure a constructive and guiding means of communication between multiple interfaces.</li> <li>• It can be seen that most interfaces are decentralized both industrially and spatially but they all have a relationship with a central management and this relationship has a structure that facilitates coordination and communication rather than being in a hierarchical relationship.</li> </ul>	<ul style="list-style-type: none"> <li>• When the companies, associations or foundations turn into interfaces there are no key issues in terms of legislation in areas such as establishing companies, becoming partners of companies, employing personnel and having its own budget. However, some types of organizations are excluded from the support programs. For example, foundations and associations that are not established by law cannot apply for a grant to function as an interface organization under the interface organization support program (AYDE) provided through TÜBİTAK's innovation support program.</li> <li>• The compatibility of mechanisms established by law such as OSBs, Chambers of Commerce/Industry, Development Agencies and Technology Development Areas, which can be considered as interfaces with interface qualifications, must be addressed within these special laws.</li> <li>• While interface entities work with the companies in the relevant industry in a contractual relationship in accordance with their own managerial autonomies, they must also be able to execute joint programs with other interface organizations as well as in horizontally intersecting thematic areas.</li> <li>• Another critical issue is the design of the managerial culture and the transition program that would transform existing organizations. Performance of this in cooperation with key stakeholders and the scientific community would ensure, as far as possible, the formation of an environment of mutual trust and dialogue from the outset.</li> </ul>

<b>Subject</b>	<b>What can we learn from foreign examples?</b>	<b>What is the status in Turkey? What can be done?</b>
<b>Personnel regime</b>	<ul style="list-style-type: none"> <li>Information is distributed better in areas where the level of labor circulation is high.</li> <li>To be able to employ highly-qualified personnel, salaries must not be below the alternative salaries within the labor market where such personnel could otherwise be employed.</li> <li>The transition of personnel between academia and the private sector increases the impact.</li> </ul>	<ul style="list-style-type: none"> <li>Entities that will work as interfaces must be able to develop salary policies that are different from those of their founders or entities of which they are a part.</li> <li>It is possible for faculty members to engage in consulting activities out of their office hours and establish their own companies, however a better-quality part time or day-based working relationship should be established during office hours.</li> </ul>
<b>Funding model</b>	<ul style="list-style-type: none"> <li>It must be ensured that the following three key revenue items are similar in size:               <ol style="list-style-type: none"> <li>Revenues from the service provided to companies</li> <li>Revenues gained through competitive tenders</li> <li>Results-based government grants</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>As an indirect revenue item, tax exemptions and exceptions in Turkey are used in areas such as investment incentives and technology development areas and a certain level of experience in practice can be gained as a result.</li> <li>In order to the state to support interfaces on a program basis, such exceptions should not be granted to the interface organizations just because they are interfaces and the grants should be based on minimum requirements such as the employment of qualified human resources.</li> </ul>
<b>Performance management</b>	<ul style="list-style-type: none"> <li>Performance cannot be realized only by creating performance indicators. The role of an evaluation mechanism that can challenge the created value and go beyond the indicators is critical.</li> </ul>	<ul style="list-style-type: none"> <li>In the example of the Research Infrastructures (Law No. 6550) the support that will be provided for the research infrastructure is determined by considering the performance of the infrastructure. Performance indicators are determined according to the strategic goals identified within the annual action plan. The continuity of the support is determined according to the status of the indicators and the evaluation of the research infrastructures' board.</li> </ul>
<b>Risk Sharing</b>	<ul style="list-style-type: none"> <li>The ability of interfaces to be able to take and share risks in line with their budgeting responsibility and accountability liability is an important element. In most interface models abroad, it has been observed that these entities are able to establish companies and form partnerships with companies.</li> </ul>	<ul style="list-style-type: none"> <li>In the case of research infrastructures (Law No. 6550), the risks related to joint infrastructures and public shares are shared through the participation of the private sector and non-governmental organizations.</li> <li>In government grants where the public sector contributes as a co-financier, risks can be shared on a project basis.</li> </ul>

## How and Where to Get Started on Experimenting

States try to increase the added value of their production by using various industrial policy instruments. Even though such instruments are limited, the state's form of responses in the research and innovation ecosystem become diversified through the new combinations created by policy instruments along with the changes in the structure of the manufacturing value chain. Experimenting with policy practices is also available through the Turkish public administration experience under the title of "pilot"<sup>18</sup>. In this section, 3 pilot practices or "interface experiment" practices can be applied in line with the general identification and approach addressed in the previous sections. It is very important to monitor the experiment from the outset in line with the success criteria, to identify the lessons learned from the practice for the experiment and to evaluate and disseminate the results. Since the present mechanism and support programs have not been designed as an experimental approach from the start, they cannot be evaluated. Interface experiments should not be expected to further complicate the present mechanism or the support programs but rather to simplify the forms of response while increasing the impact in selected areas.

The first two of the three experiments proposed in this section are related to the innovation policy, while the third experiment focuses on the development of an interface for the dissemination of technology.

### **The First Experiment: Research Institute offering applied research services**

The first of the experiments proposed for the concept of an interface addressed in this section to become operational in Turkey is the establishment of an entity that will provide applied research services for industry. This entity should be established with the mission of supporting the R&D capabilities of medium to large-scale companies in particular and it should be designed as an experiment. The objectives of the experiment include: supporting the capacity building process in R&D centers whose numbers have been rapidly increasing and have reached nearly 1000; contributing to the coordination of Research Infrastructures and R&D centers; and carrying out project (demand) based research on both the common needs of companies and specific issues.

This entity will function as a bridge between companies in the sector or sectors of its focus and the research infrastructure they require. In the design of this entity, which will fully comply with and also have the purpose of transforming sectoral and regional dynamics, lessons, particularly in areas such as the use of qualified human resources, concentration, cooperation and sustainability, which are addressed in the section on design principles for interfaces, must be learned from the positive/negative experiences of institutions in our country such as TÜBİTAK Research Institutes, the National Productivity Center and ABİGEMs (European Union Business Development Centers) all of which have operated or continue to operate in similar areas. At the same time, after evaluation of the lessons learned from the practice and in line with the success of the experiment, it is necessary to determine how the program can be scaled and how it is to be controlled by the government.

<sup>18</sup> Public sector experiments in Turkey where the pilot was initially implemented and then generalized include practices such as the Whole City practice, Development Agencies, Strategic Plans and the sole 112 emergency call center in Antalya.



**Table 5: Governance Structures and Core Characteristics of Applied Research Interfaces**

	<b>Fraunhofer - Germany</b>	<b>ITRI - Taiwan</b>	<b>Catapult - England</b>
Registered Institution/Agency of Interface	N/A	The Ministry of Economics	Technological Strategies Council
Legal entity	Private, non-profit foundation	Public research agency	Various private and public offices
Geographical influence area	Aggregations in 19 different regions in Germany	The center in Hsinchu region, the secondary office in the Tainan region	A network of centers in 31 different regions
Prototype development service for companies	Yes	Yes	Yes
Pilot production and simulation lines	Yes	Yes	Yes
Yearly average public budget per center (core government funding) (millions of dollars)	12	150	9

Source: National Research Council (2013) <sup>19</sup>

The services to be provided within the scope of the experiment should be determined in accordance with the needs analysis and should be sensitive to local demand; areas such as “technology acceleration“, ”innovation engineering” and ”data analytics” which are newly developing areas in the world should also be taken into consideration. It is necessary to design the human resources necessary for the portfolio of services to be offered within the scope of the experiment, as well as business models and financing models taking sustainability into account.

Issues that would be useful to consider for the construct of this structure are outlined below.

- It is critical that the services to be offered have a high level of added value that medium-sized companies cannot obtain from the market. The most important

<sup>19</sup> 21st Century Manufacturing: The Role of the Manufacturing Extension Partnership Program (2013)

way to achieve this is through the nature of the human resources of the entity to be established. Priority must be given to people with industry experience rather than new graduates or academics. For example, the experts in the MEP (Manufacturing Extension Program) entity in the USA have average experience of 15 years in industry companies. In this context, it would be appropriate for R&D experts and recently retired managers or those who have retired early from corporations in our country to be included in the staff of the center.

- In addition to the concentration of the services to be offered in R&D areas in manufacturing, it is also important to consider other areas with high added values in the value chain relating to technological improvements. These areas could include engineering services, embedded services, human resource management or organizational development.

- This entity must be the first point of contact for medium-sized companies that have established an R & D center in the region or sector in which they operate. It should be a priority to respond quickly to the demands of the companies and turn them rapidly into research projects.

- In the first phase, physical facilities and common areas for which the capacity of the R&D centers of medium-sized companies will be insufficient can be prioritized.

- Sectors and research themes to be focused on will need to be selected in line with the areas and regional requirements indicated in the 11th Development Plan.

- These interfaces may take part in the implementation of the innovation voucher program. Dissemination of the innovation coupon programs across Europe is supported by the European Commission through the Declaration of Riga. In this model, the company summarizes its request relative to the research area it requires and files an application with the competent authority (the interface). Where the application is considered to be technically and administratively appropriate by the interface organization, the company receives a voucher and refers to the respective research infrastructure (e.g., the nanotechnology center in a university). After the research infrastructure presents the results of the research developed in response to the company's request, it receives the amount that it is entitled to from the authorized interface organization.

The experiment can also be designed by the assignment of the research function to an initiative to be selected from the Applied SME Capability Building Center (Model Factory) which is currently in the project phase and have many features of the interface institutions as discussed in this section as well as capacity development for this. Another alternative is to change the governance structure of one of the TÜBİTAK MAM institutes or to create a new research institute with a similar mission that is not available in the TÜBİTAK hierarchy. Certainly, alternatives other than these could also be available, but whatever the alternative would be, its identification through a discussion with the stakeholders who are expected to be involved in the management of the model will create an atmosphere of collaboration from the outset. The governance structure of the experiment must be configured to be as localized and autonomous as possible and the involvement of large global corporations that could provide guidance to SMEs according to the attributes of the sector on which the experiment will focus should also be discussed. In any case, it is necessary to ensure that there are representatives of the private sector and the scientific community in the governance structure of the organization and that they may even form the majority of management.

The structure of the experiment's legal entity (company or not) should be decided following a cost-benefit analysis. The basic criterion in decision-making is that the institution has an organizational structure consisting of a strong back office (accounting, statistics, HR, procurement , etc.) that is completely **autonomous, does not pursue profit, and supports managerial flexibility, together with a middle office (research, monitoring, evaluation, reporting).**

As in best practices, the funding model of the organization should be a combination of the agreements that will be made with the companies and the research funds that will be provided by the state. Ideally, these two sources of funding are expected to be equal or the agreement revenues are expected to be more than the other. Although the financing model is a performance indicator, the state also evaluates the process with various performance criteria to obtain the results.

### **The Second Experiment: Interface that provides a full portfolio of services to the technology SMEs and start-ups:**

This interface institution will provide technology based enterprises with all the services and funding they require from the research phase to the product

development phase. A significant portion of these services are already provided by some TGBs, TTOs and accelerators. We recommend building a more comprehensive and performance-based relationship that goes beyond the geographical boundaries of the region with one or more TGBs<sup>20</sup> to be **selected**. In this relationship, it is suggested that TÜBİTAK fully transfers the **implementation** of its programs to the selected TGB and that the TGB sets up a fund to be used as a “matching fund” under these programs. Although the procedures for the use of this fund will be determined with the TGB, the fundamental principle is that the TGB will also assume responsibility. There is a need to develop a procedure for the TGB to contribute to the program funding from its own resources. The TGB should have the flexibility to support not only the programs developed by TÜBİTAK but also the non-program activities it deems appropriate and should be able to provide any service it would like through specialist firms or organizations. The relationship with this kind of an interface is important for the state in terms of the **scale**, the **results** and the quality of the policy dialogue between the interface and the program development organizations. Therefore, the performance relationship must be designed based on these variables. Performance indicators for innovation accounting have already been developed over some time. (Table 6) In addition to these performance indicators, the provision of sector and implementation information to address the information asymmetry of the public policy makers should also be part of the performance evaluation of these interfaces.

<sup>20</sup> *The TGB with the assumption that the TGB and TTO are under the same roof for purposes of simplicity*

**Table 6: Innovation Accounting Performance Indicators**

Key Performance Indicators (KPIs)	Activity Indicators	Impact Indicators	Activity Indicators	Impact Indicators	Activity Indicators	Impact Indicators
	Stage of idea generation		Stage of idea testing		Scaling of ideas	
REPORTING	Number of developed ideas Number of selected ideas Specified Assumption	Developed hypotheses Minimum failure criteria set	Number of conducted experiments Number of dialogs with customers Number of interviews with customers Number of customer observations Number of developed prototype/minimum developable products Hackathon, number of design contests	Experiment results Decisions (changing or remaining in the same course) Cost per learning Time cost per learning Learning speed Verification speed	Tested growth tactics Number of conducted experiments Number of interacted customers Number of tested channels Number of usability tests conducted Verification speed	Cohort analysis Pirate metrics (acquisition, activation, retention, suggestion, reacquisition) Growth motors (product life value, retention rates, viral coefficients) Income and profit
GOVERNANCE	Number of submitted ideas Number of taken decisions Products in the next stage Average amount of investments made	Compliance with thesis Compliance with portfolio Assumption-knowledge ratio	Number of products in the prep stage Number of submitted applications Number of taken decisions Number of products advancing in stages Average amount of expenses in each stage	Stage-gate criterion Assumption-knowledge ratio % of products with problem-solution compliance % of products with product-market compliance % of products ready for scaling	Number of products in the prep stage Number of submitted reviews Number of taken decisions Number of products advancing in sub-stages Average amount of expenses in each sub-stage	Stage-gate criterion Average growth rates Verified growth hypotheses Return on investment (ARR, IRR, NPV) Processes improvement indicators
GLOBAL	Number of products based on innovation type (core, neighboring, transformative)		Number of products based on innovation type (core, neighboring, transformative) Number of products in each sub-stage (problem, solution, task) % of products reconciled with thesis Number of patent applications Partnerships and collaborations	Processes improvement indicators Number of registered patents New business models ready for scaling Cost savings Innovation transformation New market segments added	Number of products based on innovation type (core, neighboring, transformative) % of products reconciled with thesis Number of patent applications Number of products developed through simple methods Partnerships and collaborations	Innovation coefficient Cost savings Innovation transformation Market share (new segments, shelf area, wallet share, distribution footprint) Patents obtained Customer satisfaction

Source: *thecorporatestartupbook.com*

In the medium term, two public policy changes related to the dissemination of such an interface are required. The first of these is a review of the TGB implementation and the development of only active, fit for purpose TGBs that are considered to be operating successfully as interfaces along with the maintenance of TGB applications in other cities and regions in a revised format. It is necessary to ensure that the TGB applications in these cities are designed to primarily support the dissemination of technology rather than innovation policy and innovative ideas and initiatives that will emerge during this process should be directed to the interface TGBs.

It is a matter of human capacity that the TGBs are able to operate in a manner that serves the innovation policy as intended. In geographical locations where such human capacity is insufficient, a new, smaller format that could be more effective and whose predominant function would be the dissemination of technology.

The other policies that require review include the rationalization of the different support programs offered by the state, the establishment of the relationship between such different programs and consideration of the experimental interface organizations as the “outlets” for all these public support programs. Even if these policy components are not immediately realized, this vision will dominate public policy, improve the effectiveness of the interfaces and increase the chances of success of the innovation policies.

It is recommended to start this interface experiment with METU (Middle East Technical University) Teknokent (Technocity) or ITU (Istanbul Technical University) Ari Teknokent. The past performances of these TGBs, the fact that they are operating under a state university, that they have already been running the TTO services and that they have a constructive dialogue with TÜBİTAK makes one of these choices a reasonable one.

The fact that TGBs are already legal entities allows this experiment to be developed more rapidly than the first one.

### **The Third Experiment: Technology diffusion interface**

We have mentioned above that technology propagation diffusion from the innovation policy to a certain extent in that its dimensions are more horizontal (with more generic elements), more geographically wide-spread and that it directly prioritizes SMEs. On the other hand, we have also mentioned that technology propagation and innovation policies have dimensions that complement each other. Even though each technological improvement does not imply an innovation, as the

spread of technology improves, it will not just be the productivity of the companies that will improve but also the likelihood that they will become innovative. In addition to this, a pilot implementation of the propagation of technology with an interface approach is recommended due to its advantages, such as, its offering of special opportunities for companies and its improvements in relationships based on mutual trust. As we have mentioned above, the institution taking on this function is KOSGEB, but the impression obtained from the performed analyses and the interviews is that the functions of KOSGEB are becoming increasingly blurred. KOSGEB also has support programs with low levels of selectivity that could be included in the area of social policy as well as programs that are compatible with innovation policy. On the other hand, the geographical insufficiency of human resources prevents it from developing an effective relationship with companies on a local level. Therefore, our third suggestion is bringing the program development function of KOSGEB to the forefront and performing an experimental practice with a few Development Agencies that would allow KOSGEB's functions to be performed through the Development Agencies.

The other reason behind this suggestion is that the Development Agencies have also begun to report to the Ministry of Industry and Technology, and the Development Agencies have the objective of operating on a program basis to a greater extent, beyond distributing grants (transition to result-based programming) and the local organizations are relatively strong in capacity. It is suggested that the local organization of KOSGEB becomes a part of or operates under the Development Agencies as per the experimental practice and a performance agreement is entered into between KOSGEB and the Development Agencies.

Other organizations that can potentially become technology propagating interfaces are the OSBs. An interface relationship with selected OSBs that could go beyond the management of infrastructure and provide services for companies to improve their productivity could be developed on an experimental basis. An agreement could be executed directly between KOSGEB and the management of an OSB or, alternatively, this partnership could be developed through a triple model with the Development Agencies.

It is suggested that these pilot applications be performed through the participation of stakeholders during, not only the design phase, but also the evaluation phase. The main principles, objectives, performance metrics, and application models of each pilot application must be thoroughly discussed and the decision on whether the pilot application will be generalized or not must be taken following an assessment at the end of an implementation period of at least 3-4 years.

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