

ADVANCED MANUFACTURING AS THE KEY TO SUSTAINABILITY

The last decade has demonstrated Turkey's growing political and economic influence as a 21st-century power amidst regional headwinds and geopolitical challenges. Maintaining momentum to achieve sustainable growth is a priority of policymakers and business leaders; how Turkey will achieve this remains an important question. Establishing a robust advanced manufacturing base is an essential component to enhancing Turkey's global competitiveness and to building on the country's growth in the last decade. Turkey can harness existing resources to strengthen its advanced manufacturing sector, helping further diversify its economy and also ensuring that broad-based economic growth is sustained for years to come.

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Sustainable development has become synonymous with efforts to secure the present and future of humanity and the planet at large. In essence, sustainable development produces lasting economic prosperity and social value while simultaneously contributing to the preservation of the planet.

For national governments, the term translates into creating an economy and environment that meets its population's current needs without compromising the ability of future generations to support themselves, and continually enhance their quality of life. It is not simply about environmental concerns, as important as they are, but also about economic sustainability and the future ability of nation-states to meet the needs of their people.

Development and growth go hand in hand. A successful economy is usually one in which economic and social structures work to induce steady economic growth that meets and improves its population's standard of living. Such growth eventually materializes into a state of sustainable development that hopefully perseveres over many generations. For example, ensuring that a country's energy costs and carbon footprint remain low through sound policy and strategic choices will help retain greater capital within the economy and make it a more attractive investment destination over the long term. These advantages in turn boost the economy, creating a feedback loop that ultimately supports the sustainable development of energy and other dependent sectors, the environment, and the population's standard of living.

However, achieving sustainable growth that then leads to economic and social development remains a significant challenge for many economies. Emerging economies are particularly vulnerable to sudden dips and peaks, and constructing a robust economic framework that guarantees consistent high economic performance will be crucial to lifting such economies to developed and advanced status.

Sustainability requires making every decision with the future in mind. Creating a roadmap that integrates public policy solutions, education, science and technology, and value chain innovation will facilitate Turkey's transition to a sustainable economy and society.

Advanced manufacturing – rapidly adopting and using innovation and cutting-edge technology to produce higher value, specialized processes, and products – is a main pillar of successful societal blueprints, as it improves the country's economic offerings and competitiveness, leading to a healthier economy.

Turkey's Present Situation

Turkey's average annual GDP expansion of three percent between 2012 and 2014 has continued to advance the needs of its 77 million people – a competitive economic performance when compared with other emerging economies such as Brazil (average growth of 1.5 percent) and South Africa (average growth of 1.9 percent) between 2012 and 2014.¹ However, a growth rate of two to three percent, while a positive in this context and the envy of some large developed economies, will be insufficient to sustain gains made and drive future growth in a developing economy such as Turkey's. Turkey is still working to effectively tackle high unemployment rates and internal political uncertainty as well as regional turbulence, which all add challenges to Turkey's goal of achieving higher growth rates.

Although such challenges persist, Turkey has undertaken some successful initiatives to obtain sound economic growth/sustainability.

The country has made some progress in attracting foreign direct investment (FDI) and enhancing its image as a competitive financial market. In 2014, Turkey welcomed 12.6 billion dollars in direct investment flows.² However, this level is significantly lower than the levels in 2006 and 2007 when FDI totaled 20.2 billion dollars and 22 billion dollars respectively. An enabling policy environment has helped make Turkey an appealing investment destination in the last decade. However, greater efforts are needed to maintain investment momentum. Designing and providing smarter incentives to investors in the manufacturing sector will help attract larger international companies willing to transfer research and development (R&D) knowledge.

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In addition to its active participation in multilateral trade and economic liberalization initiatives, Turkey has consistently promoted the development of commercial and economic links and regional integration. It attaches great importance to – and

1 “GDP growth (annual %),” *The World Bank*, <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>

2 “International Direct Investments Evaluation Report (2015-Q1),” *International Investors Association (YASED)*, 2015, <http://www.yased.org.tr/webportal/english/haberler/duyurular/Pages/YASEDInternationalDirectInvestmentEvaluationReport-2015-Q1.aspx>

has made great strides towards – developing and expanding economic and commercial relations with a wide range of countries.

Turkey’s economic ambitions culminate in its 2023 goals, which seek to promote the country’s economic profile in order to be counted amongst the world’s top 10 economies, achieve a per capita income of 25,000 dollars, and use 20 percent less energy than its current total usage in its drive toward economic expansion.

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These attributes, in addition to its highly strategic geographic location, make Turkey a formidable political and economic player on the global stage. However, these efforts require further harmonization, a coordinated strategy with a clear plan of action on how to achieve the various economic goals the country is pursuing. With the final objective being robust, sustainable development, ensuring the opportunity for innovative thinking is imperative to producing an effective plan to steer

Turkey toward its laudable goals.

How Can Advanced Manufacturing Deliver Sustainable Growth?

Manufacturing is an essential pillar of any economy; it has the power to create jobs, value, and growth to a degree that no other sector can.

What is the value-added of advanced manufacturing versus traditional manufacturing? While traditional manufacturing plays a compulsory role in producing commercially necessary products, it does not require highly technical and specialized labor or innovation. As such, it does not generate enough to buoy a country’s economy in the long term.

Moving beyond simple manufacturing into advanced manufacturing further pushes an economy into creating higher value-added products, a key element to sustainable economic growth, job creation, and the development of new markets.

Advanced manufacturing requires the use of cutting-edge technologies and knowledge from specialized fields including chemistry, nanotechnology, and biology.

Processes are also streamlined, automated, and coordinated, making production more efficient and thus increasing profitability potential. This form of manufacturing requires a greater degree of skilled labor, abundant innovative and technological inputs, and an expansive industry network. For example, while traditional manufacturing might produce steel, advanced manufacturing creates semiconductors and photovoltaics – essential products of the future.³ Ultimately, advanced manufacturing generates progress in existing manufacturing processes and develops new methods and products to meet emerging demands of the modernizing global economy.

Building a strong advanced manufacturing framework has direct positive impacts on economies of any scale. For every job created in the manufacturing sector in advanced economies, three to five jobs are created across the economy.

Case Study: Advanced Manufacturing in the US

Consider the case of the US manufacturing industry. While its manufacturing sector suffered greatly in the first decade of the 21st century, advanced manufacturing now plays a key role in creating jobs and providing a sustainable cycle of economic activity. Since 2010, manufacturing has created nearly 800,000 new jobs in addition to producing high-value products and creating entirely new markets.⁴ The manufacturing sector contributes to nearly two-thirds of private sector research and development. Every dollar in final sales of manufacturing products supports 1.40 dollars in output from other sectors of the economy.⁵ Advanced manufacturing is the driving force behind innovation, introducing new products and pushing the frontiers of science and technology.

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Leaders from the public and private sector across the US understand the importance of a vibrant manufacturing sector. High unemployment and unsustainable spending at the federal and state levels along with large federal deficits stem, at least in

³ Andrew Liveris, “The State of the Union: A CEO’s Path to a Sustainable Future,” speech given in 2011.

⁴ “FACT SHEET: President Obama Announces New Manufacturing Innovation Hub in Knoxville, Tennessee,” *White House, Office of the Press Secretary*, 9 January 2015.

⁵ Andrew Liveris, *Make It in America: The Case for Re-Inventing the Economy* (New Jersey: Wiley, 2011).

part, from the country's weakened manufacturing sector. In an attempt to reverse these trends, US policymakers have been diligent in recent years in introducing strategies to revamp the country's manufacturing sector. They hypothesized that by implementing a broad policy framework and allowing the industrial base to grow in an economically sustainable way, innovation hubs can become business centers, attracting and retaining the brightest talent and contributing to sustainable long-term prosperity.

“Converting [Turkey’s] available labor resource base into a highly efficient and skilled force can be achieved through sound policy making.”

The US has been successful thus far in leveraging private-public partnerships to strengthen its manufacturing sector and enhance its competitiveness on a global scale. In September 2013, President Barack Obama launched the Advanced Manufacturing Partnership Steering Committee 2.0, a cross-sector initiative bringing together leaders from industry, academia, and labor with the aim of securing a leading position in

emerging technologies. The Steering Committee is co-chaired by Andrew Liveris, President, Chairman, and CEO of the Dow Chemical Company.

Additionally, President Obama proposed the National Network for Manufacturing Innovation (NNMI), a nationwide web of research institutes that will focus on developing and commercializing manufacturing technologies. The federally-backed network will be comprised of up to 45 Institutes for Manufacturing Innovation (IMIs), each specializing in a unique concentration and serving as a regional manufacturing hub.

The first NNMI institute, called “America Makes” in Youngstown, Ohio, specializes in reducing the cost of 3D printing, connecting small businesses with new opportunities, and training American workers to master these technologies. Not only has it made significant headway in accelerating the speed of 3D metal printing, the institute has partnered with over 1,000 schools, providing them with access to 3D printers, and has launched several training programs, educating over 7,000 workers in the fundamentals of 3D printing.

Following the success of “America Makes,” in January 2015, President Obama announced plans to launch a Manufacturing Innovation Institute for Advanced Composites in Knoxville, Tennessee. The Department of Energy along with a

consortium of 122 companies, nonprofits, and universities led by the University of Tennessee-Knoxville will spend over 250 million dollars (70 million dollars in federal funds) to launch the new IMI.

In emerging economies like Turkey, advanced manufacturing can create the same results. Pursuing advanced manufacturing would open up new industries and job prospects, assisting Turkey to become more competitive in knowledge and labor skills, and allowing Turkey to effectively address its current population's needs while ensuring that future generations can also thrive. In addition, advanced manufacturing encourages, and indeed requires, a strong R&D ecosystem within a country and promotes innovation. Both are key priorities for Turkey.

Turkey's Manufacturing Capability

Turkey is committed to pursuing long-lasting growth and building its manufacturing base. The country's main priorities over the medium to long term include increasing its domestic manufacturing base, developing Istanbul into a regional and global financial hub, rejuvenating the labor market, improving the investment and business climate, reducing import dependency, and improving energy efficiency.

These goals reveal Turkey's existing potential for greater economic diversification. In particular, Turkey has significant manufacturing capacity, which it should leverage to address its main economic issues, and which will be crucial to reducing the country's widening current account deficit and buoying quality economic growth.

According to a 2013 global manufacturing competitiveness index report, Turkey scored 20th out of 38 countries listed, demonstrating the country's room for growth and advancement in manufacturing.⁶ Turkey's competitive positioning and promising potential as a manufacturing hub should encourage a positive change in mindset in Turkey toward manufacturing being the premier route toward economic sustainability. The country's existing manufacturing base provides ample opportunities to further a strong advanced manufacturing agenda. In pursuing advanced manufacturing though, the initial aim should be to develop existing assets and capacities rather than generating entirely new offerings. This path to sustainable development does not require developing entirely new industries and products in the beginning; instead, it requires concentrated efforts to build upon present strengths and capabilities. Ultimately, furthering an advanced manufacturing plan that benefits stakeholders across the spectrum – from government to large conglomerates, small- and

6 "2013 Global Manufacturing Competitiveness Index," *Deloitte*, http://www2.deloitte.com/content/dam/Deloitte/global/Documents/Manufacturing/gx_2013%20Global%20Manufacturing%20Competitiveness%20Index_11_15_12.pdf

medium-sized enterprises (SMEs), and constituents – proves a realistic, attainable, and desirable goal for Turkey.

There are a few main elements required for developing an advanced manufacturing industry – all are present in Turkey but need to be properly cultivated via sound policy and productive public-private partnerships.

Talent resource is key to the establishment of a strong, advanced manufacturing base and therefore a sustainable, growing economy. Turkey's real strength and long-term potential lies in its population. In relation to members of the European Union (EU), Turkey ranks fourth in the size of its labor force.⁷ Converting an available labor resource base into a highly efficient and skilled force can be achieved through sound policymaking and, among other efforts, private sector support for the promotion of science, technology, engineering, and mathematics (STEM) education from a young age as well as internships, apprenticeships, and other critical skills development programs.

Turkey also has advantageous access to energy resources to sustain a strong manufacturing base. It is geographically located in close proximity to more than 70 percent of the world's proven oil and gas reserves. The country has already realized its geographical advantage through serving as a crucial hub for important commodities between Asia and Europe, particularly oil and natural gas that are transported via pipelines such as the Baku-Tbilisi-Ceyhan pipeline, the Kirkuk-Ceyhan pipeline, and the upcoming Trans-Anatolian Natural Gas Pipeline (TANAP), as well as the potential Turkish Stream natural gas pipeline. Moreover, with an annual irradiance potential of approximately 1.33 megawatts per hour (MWh) per square meter, Turkey is primed to develop its renewable energy portfolio and achieve the government's objective of generating three gigawatts of energy through solar power by 2023.⁸ Such advantages in the energy field can be leveraged to obtain long-term sustainable development.

Finally, Turkey has already become a center of excellence with regards to manufacturing, particularly with respect to the production of commercial vehicles. As a result, Turkey has become the 17th largest motor vehicle manufacturer in the world. In May 2015, President Recep Tayyip Erdoğan announced Turkey's automobile and other transport ambitions have now transitioned to the design phase, signaling the

7 "Demography and Investment," *The Republic of Turkey Prime Ministry Investment Support and Promotion Agency (ISPAT)*, <http://www.invest.gov.tr/en-US/investmentguide/investorsguide/Pages/DemographyAndLaborForces.aspx>

8 Ozan Karaduman, "Solar Power in Turkey takes its First Steps on the World Stage," *Solar Industry Magazine*, Vol. 7, No. 9 (September 2014), http://www.solarindustrymag.com/issues/SI1409/FEAT_02_Solar-Power-In-Turkey-Takes-Its-First-Steps-On-The-World-Stage.html

country's movement toward producing as well as manufacturing its own transport vehicles and systems.⁹

Developing an advanced manufacturing base grounded in these existing advantages will help to pull the country out of a middle-income trap – with slowing growth putting the country's ambition to join the ranks of high-income countries at risk. Preferring advanced manufacturing to traditional manufacturing will allow Turkey to export higher value, higher quality, and technically advanced products rather than raw or basic materials, thereby decreasing the deficit and securing a healthier economy. Securing a stronger export market is imperative for reducing Turkey's large current account deficit, which continues to impede Turkey's progress toward sustainable development.

“Developing an advanced manufacturing base grounded in [Turkey's] existing advantages will help to pull the country out of a middle-income trap.”

Investment levels in manufacturing in the first quarter of 2015 decreased by 70 percent as compared to the same period in 2014.¹⁰ Pursuing a structured course of action at the policy and execution levels will help grow the country's present manufacturing capacity to an advanced level and make Turkey even more competitive on a global scale. This will also encourage wary investors to actively participate in the manufacturing sector.

Next Steps: Opportunities for Public-Private Partnerships

Perhaps the most crucial element to create sustainable development is aligning policies and enhancing cooperation among the three main players of the “golden triangle”: the government, the private sector, and universities and other educational institutions. Emphasizing a stronger synergy between public and private sectors, with the consistent involvement of the education sector and the continued support of multinationals and SMEs, will be critical to identifying and seizing opportunities that create a long-lasting, healthy economy.

Encouraging key industry players (like the Dow Chemical Company) to adopt sturdy sustainability goals will be essential. Companies should work to reduce their

⁹ Onur Kanan, “President Erdogan: Turkey aims to use no external resources for defense systems,” *Daily Sabah Business*, 5 May 2015, <http://www.dailysabah.com/money/2015/05/05/president-erdogan-turkey-aims-to-use-no-external-resources-for-defense-systems>

¹⁰ *International Investors Association (YASED)* (2015).

carbon footprint and maximize value with minimal environmental and economic disturbance. Exercising measures such as valuing nature and resources, embracing and delivering breakthrough innovations, advancing a circular economy and reducing waste, and increasing supplier and consumer confidence in cutting-edge industries (chemicals, design, technology) all contribute toward the private sector's sustainability efforts, which in turn positively impact Turkey's journey toward a sustainable economy and sustainable development.

With the right strategy that aims at competitiveness of strategically chosen domestic industries, Turkey can become a hub of manufacturing and commerce, attracting the best and brightest talent – business investment and manufacturers who know how to commercialize products throughout the pipeline. This, in turn, will create a prosperous cycle of economic activity, a supply chain of sustainable jobs and an abundance of high-value products. In some cases, this will drive the creation of entirely new markets and industries.

Conclusion

Turkey is truly building its presence on the global stage. At this juncture, the country could explore and experiment with various strategies to boost economic health. However, a more effective approach would be to focus on one streamlined, proven strategy. Concentrating policy and execution capabilities towards establishing a strong advanced manufacturing base will allow Turkey to obtain sustainable growth and development more successfully than attempting to achieve excellence in several uncoordinated and unsupported initiatives simultaneously. As President, CEO, and Chairman of the Dow Chemical Company Andrew Liveris notes, manufacturing has proven to be “an incredibly powerful economic engine” because it constantly adds value to a country's economy at all stages of the value chain and consistently drives innovation. The self-propelling cycle of growth generated through advanced manufacturing is crucial for sustainable growth.

Producing a streamlined societal blueprint based on Turkey's manufacturing potential will require the three pillars of the golden triangle to make strategic choices through systematic collaboration. With the private sector, government, and universities working together, Turkey can continue to develop a strong, diversified, and manufacturing-based economy to create opportunity for Turkish people and meet the global challenges that lie ahead.